C.E.S. NW Inc.
Civil Engineering & Surveying

PRELIMINARY STORM DRAINAGE REPORT FOR SUNSET POINTE

REVISED OCTOBER 2020
FEBRUARY 2018

PREPARED FOR:

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FOR

Sunset Pointe
Puyallup, Washington

Revised October 2020
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Prepared for:
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REPORT #04148.7

This analysis is based on data and records either supplied to, or obtained by, C.E.S. NW, Inc. These documents are referenced within the text of the analysis. The analysis has been prepared utilizing procedures and practices within the standard accepted practices of the industry.

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STORM DRAINAGE

1. Project Overview

This preliminary report accompanies the preliminary plat plans prepared for the Sunset Pointe project which are submitted to the City of Puyallup for review and approval. This document provides site information, and the analysis used to prepare the preliminary storm drainage design. The *Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2012* (Manual), as Amended in December 2014 and the City of Puyallup's modifications to that document establishes the methodology and design criteria used for this project.

The Sunset Pointe project proposes an 18-lot plat on parcels 0420353027 and 0420357011, with an area totaling approximately 9.18 acres. An offsite parcel, 0420353009, is proposed as a natural vegetation area for full dispersion of surfaces from this project. The existing site address is 2301 23rd Street SE, Puyallup WA, and a Vicinity Map has been included in Appendix A of this report. A project summary is as follows:

Permit Applied for – Major Plat - Preliminary
Address – 2301 23rd Street SE Puyallup, WA 98372
Parcel Numbers – 0420353027 & 0420357011
Legal description – Parcel C: That portion of the southwest quarter of Section 35, Township 20 North, Range 4 Eat, W.M., more particularly described as follows:

Commencing at the southwest corner of the southwest quarter of said Section 35, Thence east along the south line thereof a distance of 1,974.60 feet; Thence North 01º06'54" East 615.92 feet to the northeast corner of Lot 10, Stonegate, as shown on the Plat thereof recorded under Auditor's No. 9507200366 and to the true Point of Beginning; Thence North 87º01'41" West 292.30 fee; Thence North 61º33'32" West 44.88 feet; Thence North 15º57'28" West 243.13 feet; Thence North 00º48'44" West 226.43 feet; Thence North 27º29'55" West 143.38 feet; Thence South 88º56'26" East 145.92 feet; Thence North 28º41'48" East 80.82 feet; Thence North 51º21'11" west 132.18 feet to a point on the north line of the south half of the southwest quarter of said Section 35; Thence South 89º22'06" East along said line a distance of 605.46 feet to the northwest corner of Lot 2, Short Plat No. 8105200168; Thence south along the west

line of said Short Plat 750.69 feet, more or less, to the true Point of Beginning. (also known as revised Parcel D of Boundary Line Adjustment No. 9507170491).

Parcel D: That portion of Lot 2, as shown on Short Plat No. 8105200168, in Puyallup, Pierce County Washington, Described as follows: Beginning at the northwest corner of Lot 1 of said short plat; Thence along the north line of said Lot 1, North 89º49'07" East 4.70 fee; Thence North 00º22'05" West 78 feet; Thence 00º49'54" West 128.70 feet; Thence 00º32'11" West 325.48 feet to the north line of said Lot 2; Thence along the said North line thereof North 89º29'52" West 11.33 feet to the Point of Beginning.

Situate in the County of Pierce, State of Washington.

The site is accessed from two public roadways 23rd Street Place SE to the south and 19th Avenue SE to the east. According to Figure 2.2 of Volume I in the SMMWW, the project must evaluate all minimum requirements, see Section 5 of this report for a detailed discussion of each minimum requirement. As mapped by the City of Puyallup, the project exists within two drainage basins: Shaw Road basin to the east and State Highway to the north. These are further delineated into sub-basins for sizing the proposed detention pond, sizing full dispersion BMPs, and wetland recharge calculations.

2. Existing Conditions Summary

The existing parcels are located northeast of the Plat of Stonegate and west of Kodiak Estates Division III. The site is accessed from 19th Ave. SE from the east and 23rd St. Pl. SE from the south. The existing parcels are approximately 9.18 acres and are irregular in shape. Currently, the site is within the Single-Family Residential (RS-10) zoning district. There are three interconnected wetlands that bisect the site. These wetlands are hydraulically connected to Tract C and E of Stonegate and they are drained by an existing 6" culvert pipe that outfalls to the closed conveyance system within Kodiak Estates Division III. An existing 10 feet wide gravel road crosses the site from the northwest corner to the south of the property line, which will be improved to 12 feet wide along with this project. There was five existing structures onsite, which helped form the onsite wetlands, that were demolished in approximately 2017. The remaining area of the

site consists of pasture areas and a mix of native second-growth conifer and deciduous trees primarily around the perimeter of the three connected wetlands.

The site soils have been mapped as Everett gravelly sandy Loam (13B) and Kitsap silt loam (20B, 20C) as determined by the National Cooperative Soil Survey of Natural Resources Conservation Service (NRCS). These soils are classified as type A and C, respectively. Type A soils have a low runoff potential and type C soils have a moderate to high erosion potential. A description of these soils and a copy of the soil map for this site have been included in Appendix A of this report. A geotechnical engineer's report was prepared by Earth Solutions NW, LLC. (ESNW) on January 11, 2018 and was updated on June 24, 2019. They performed 18 onsite soil explorations where they encountered native soils generally consistent with Vashon Drift, classified as gravelly sands and loams. On January 22, 2020 ESNW performed two small scale-PIT tests (TP-201 and 202) where they measured an infiltration rate of 0-inches per hour; therefore, infiltration is not feasible for this project. A copy of the updated geotechnical engineer's reports can be found in Appendix D.

Federal Emergency Management Agency (FEMA) has prepared flood insurance maps identifying floodplains within the City of Puyallup. The parcel and all the proposed improvements are located within Zone X, which is considered out of the 100-year floodplain. A copy of the FIRM Panel 53053C0342E can be found in *Appendix "B"* of this report.

3. Off-site Analysis Report

A quarter mile downstream analysis is required by the City of Puyallup. The project site is located within two City delineated drainage basins Shaw Road which drains through Kodiak Estates Division III to the east and State Highway which flows to the north. Lots 1-8 and improvements to 19th Ave SE are fully dispersed to the north (State Highway Basin) onto parcel 0420353009. Lots 9-18 and improvements to 23rd St Pl SE are controlled with a detention pond located in Tract B. The pond outfalls to the onsite wetlands which are drained by a 6" culvert pipe that outfalls into Kodiak Estates Division III's closed conveyance system (Shaw Road basin). Offsite upland run-on is tributary to the onsite wetlands. The run-on flows through the wetlands and not the proposed improvements. No other significant run-on is tributary to the remainder of the project site. The following is a qualitative downstream drainage analysis for each basin.

State Highway Basin Downstream Analysis

The fully dispersed runoff flows through parcel 0420353009 through a native vegetation easement for the full ¼ mile. This drainage path consists of a variety of native vegetation including conifers and deciduous trees. Please refer to the downstream map in the Appendix B.

Shaw Road Basin Downstream Analysis

The runoff that drains towards the onsite wetlands ultimately discharges into Kodiak Estates Division III's closed conveyance system. This system is comprised of 12-inch, 15-inch and 18-inch circular pipe. The runoff from the project proceeds between Lots 26 and 27 in a 12-inch pipe where it proceeds into 19th Ave SE and combines with runoff from Brookmonte Dr SE approximately 480-feet downstream. The runoff then proceeds within Brookmonte Dr SE for another 150-feet where it turns east within an 18-inch pipe in 20th Ave Ct SE. The runoff proceeds downstream for another 450-feet within 18-inch pipe where it outfalls into the public stormwater facility within Tract A of Kodiak Estates Division III. The runoff concludes it's ¼ mile downstream path within this facility. Please refer to the downstream map in the Appendix B.

4. Permanent Stormwater Control Plan

Existing Site Hydrology

Section 2 of this report describes the existing site conditions in detail. The existing site is divided into three sub-basins: State Highway basin, Shaw Road basin and a pre-developed Wetland Recharge basin. The pre-developed State Highway basin is 1.681-acres (not including the native vegetation easement area), the Shaw Road basin is 5.444-acres, and the Wetland Recharge basin is 3.508-acres onsite and 8.542-acres offsite. All basins are modeled as a forested condition except the Wetland Recharge basin which is summarized as follows:

Sub-Basin	Description	WWHM Land-use	Area (ac)
Pre-Dev A	Buildings	Roof Flat	0.360
Pre-Dev B	Gravel Roadway	Roadway, Flat	0.104
Pre-Dev C	Concrete Walkways	Sidewalk, Flat	0.071
Pre-Dev D	Pastures	Pasture, Mod	2.973
Offsite A	Tracts B and E of Stonegate	Saturated, Forest, Flat	2.069
Offsite B	Offsite Yards (58% Pervious)	C, Lawn, Flat	3.754
Offsite C	Offsite Impervious (42% Imp.)	Rooftops, Flat	2.719
Total			**12.047**

Table 4.1– Pre-Developed Wetland Recharge Basin

The Pre-Developed Basin Maps can be found in Appendix B of this report.

Developed Site Hydrology

The project is divided into three post developed basins: State Highway basin, Shaw Road basin and the Wetland Recharge basin. The post developed State Highway basin is 2.579-acres (not including the native vegetation easement area), the Shaw Road basin is 4.464-acres, and the Wetland Recharge basin is 3.129-acres onsite and 8.542-acres offsite. The improvements to the State Highway basin are fully dispersed to a 10.740-acres native vegetation easement across parcel 0420353009. The Shaw Road basin is mitigated with a detention pond that discharges to the onsite wetland buffers. The Wetland Recharge basin is analyzed to meet Minimum Requirement #8. The recharge basin includes the Shaw Basin areas and offsite areas that are tributary to the onsite wetlands. The following is a summary of each post developed basin:

Sub-Basin	Description	WWHM Land-use	Area (ac)
Post Dev A	Yards	C, Pasture, Flat	1.087
Post Dev B	Roadway	Roadway, Flat	0.516
Post Dev C	Rooftops (40% Lot Coverage)	Roof, Flat	1.181
Post Dev D	Driveways	Driveway, Flat	0.184
Post Dev E	Pond	Pond	0.161
Bypass A	Bypass Gravel Road	Roadway, Flat	0.021
Bypass B	Rear Yards	C, Pasture, Steep	1.314
Total			**4.464**

Table 4.2 – Post-developed Shaw Road Basin

Sub-Basin	Description	WWHM Land-use	Area (ac)
Post Dev F	Yards	C, Pasture, Flat	1.077
Post Dev B	Roadway	Roadway, Flat	0.474
Post Dev C	4,600 per Lot	Roof, Flat	0.844
Post Dev D	1,000 per Lot	Driveway, Flat	0.184
Total			**2.579**

Table 4.3 – Post Developed State Highway Basin

Sub-Basin	Description	WWHM Land-use	Area (ac)
Post Dev A	Yards	C, Pasture, Flat	1.087
Post Dev B	Roadway	Roadway, Flat	0.516
Post Dev C	Rooftops (40% Lot Coverage)	Roof, Flat	1.181
Post Dev D	Driveway	Driveway, Flat	0.184
Post Dev E	Pond	Pond	0.161
Bypass A	Bypass Gravel Road	Roadway, Flat	0.021
Bypass B	Rear Yards	C, Pasture, Steep	0.787
Offsite A	Tracts B and E of Stonegate	Saturated, Forest, Flat	2.069
Offsite B	Offsite Yards (58% Pervious)	C, Lawn, Flat	3.754
Offsite C	Offsite Impervious (42% Imp.)	Rooftops, Flat	2.719
Total			**12.479**

Table 4.4– Post Developed Wetland Recharge Basin

The Post Developed Basin Maps can be found in Appendix B of this report.

Facility Sizing

The State Highway basin is fully dispersed to a 10.74-acre native vegetation easement in accordance with BMP T5.30 for roadway dispersion BMPs. The runoff from Lots 1-8, access tracts and 19th Avenue SE are collected within the roadway and dispersed with flow dispersal trenches to the native vegetation easement. A single dispersal trench is allowed to disperse 0.50-cfs of runoff. The basin's 100-year event is 1.38-cfs; therefore, three 50-foot long flow dispersal trenches are provided to fully disperse the runoff from the roadway's collection system. Using flow modeling credits the fully dispersed basin results in an increase of 0.05-cfs increase during

the 100-year reoccurrence interval. Sizing and capacity calculations will be provided as part of the final engineering submittal. WWHM Modeling results is provided in Appendix C.

The Shaw Road basin is controlled with a detention pond. Since the project proposes feasible LID BMPs from List #2 of minimum requirement #5 (soil amendments and perforated stub-outs) the pond is designed to release stormwater matching the Department of Ecology's Performance Standard (50 percent of 2-year storm event up to the 50-year storm event of the predeveloped site's condition). A discussion of each minimum requirement is provided in Section 5 of this report. The pond provides 6,260 sq.ft. of bottom area with a volume of 4,0500 cubic feet at the top of riser. As modelled by WWHM the pond meets the performance standard. The following is a summary of the modeling results and the require pond riser schedule:

Storm Event	Pre-Developed Flow Rate (cfs)	Mitigated Flow Rate (cfs)
2	0.124	0.095
5	0.192	0.148
10	0.232	0.194
25	0.275	0.268
50	0.302	0.337
100	0.326	0.420

Table 4.5 –Flow Rate Summary

An 18-inch open top flat riser with three orifices is provided to control the mitigated discharge rates from the detention pond. The following is a summary of the riser schedule:

Elevation	Type	Size.
374.50	Orifice	0.99-in
379.40	Weir	1.00-feet

Table 4.6 – Pond Riser Schedule

Computer modeling results are provided in Appendix C.

Water Quality System

A wetpond is proposed under the detention pond's live storage for runoff treatment. The pond is sized to provide the on-line facility volume, 0.197-acft, as computed by WWHM. The treatment basin includes the rooftops from the future lots. The wetpond provides 0.295-acft of storage between two cells; therefore, sufficient runoff treatment is provided.

Wetland Recharge

As mentioned in the Critical Areas Assessment prepared by Habitat Technologies, the onsite wetlands are created through previous development activities of Stream A that bisects the site. Since these wetlands are non-depressional. Minimum requirement #8 requires projects to comply with minimum requirements #6 and #7, and Guide Sheets #1 through #3 of Appendix I-D of the Manual. The wetlands are analyzed to determine the project's effects to the wetland hydrology. Guide #3 recommends that no single day exceed 20% of pre-developed volumes while no single month exceed 15% of the pre-developed volumes. It is difficult to meet flow control requirements and wetland protection requirements since a flow control facility are designed not to mitigate volumes to a wetland but to mitigate flows downstream to a pre-European land-use condition. The pre-developed and post developed wetland recharge basin is summarized in Tables 4.1 and 4.4 of this report. Basin maps delineating the areas onsite and off-site tributary to the wetland are provided in Appendix B. These basins were analyzed with WWHM to determine the volumes that will flow through the wetlands and downstream monthly. A summary of this analysis is provided in Table 4.7 below:

Month	Pre-developed Volume Summary (ac-ft)	Post Developed Volume Summary (ac-ft)	Percent
January	2.714	3.176	117.0
February	2.339	2.704	115.6
March	1.837	2.186	119.0
April	0.972	1.226	126.0
May	0.555	0.734	132.2
June	0.373	0.52	139.5
July	0.165	0.245	148.3
August	0.183	0.259	141.9
September	0.387	0.563	145.3
October	1.026	1.387	135.2
November	2.347	2.901	123.6
December	2.871	3.433	119.6

Table 4.7 – Wetland Recharge Summary

No single month meets the monthly standard, but some days do meet the daily standard. The WWHM computer results is included in Appendix C of this report.

5. Discussion of Minimum Requirements

The following is a summary of the minimum requirements as described in Chapter 2 of Volume I of the SMMWW. Each minimum requirement must be considered per Figure 2.4.1 flowchart.

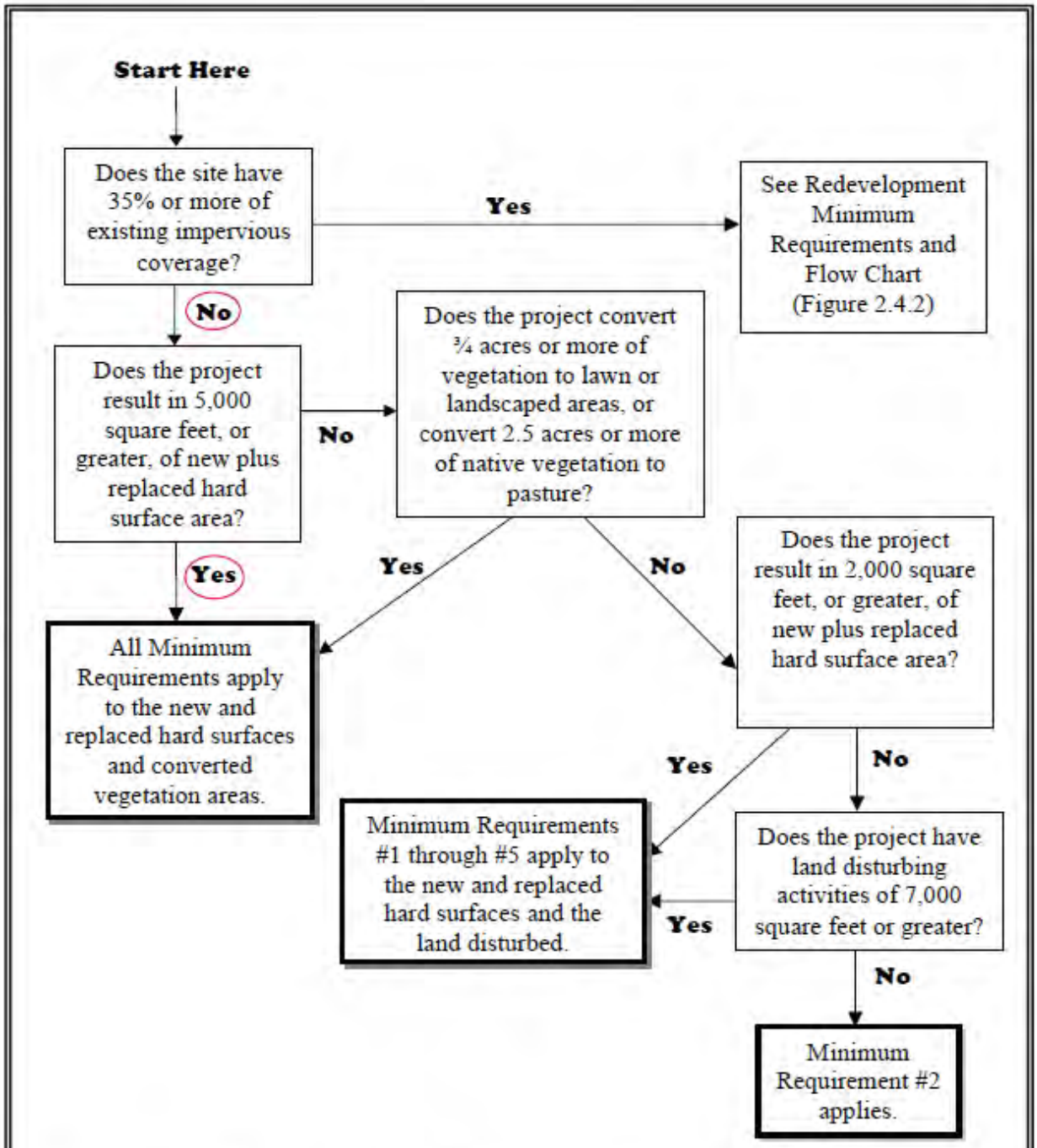


Figure 2.4.1 – Flow Chart for Determining Requirements for New Development

5.1 Minimum Requirement #1: Preparation of a Stormwater Site Plan

The Stormwater Site Plan is prepared per Chapter 3, Volume I of the SMMWW 2014. Each required Section and Appendix is provided in this document.

5.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP)

A SWPP Plan will be prepared for this project at the time of final engineer plan, and all thirteen (13) elements will be addressed in the document.

5.3 Minimum Requirement #3: Source Control of Pollution

Permanent source control BMPs are required for the development's daily operations, and the stormwater facilities must be maintained as described in the Operations and Maintenance Manual that will be prepared for this project during the final engineering submittal. Preliminary Maintenance Schedules can be found in Appendix E.

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

Projects are to maintain the natural drainage patterns and locations to the maximum extent possible. The project is located within two drainage basins, Shaw Road and State Highway, as delineated by the City of Puyallup each within their own threshold discharge area. The runoff in the Shaw Road basin discharges to the onsite wetlands which flows offsite towards the east through Kodiak Estates Division III. The project proposes a detention pond to mitigate and discharge runoff to the wetlands. The runoff in the State Highway basin discharges as sheet flow north across parcel 0420353009. The project proposes to fully disperse the improvements within this basin with the use of roadway dispersion BMPs. A downstream analysis is provided for each basin in Section 3 of this report. Facility sizing calculations is provided in Section 5 of this report.

5.5 Minimum Requirement #5: Onsite Stormwater Management

City requires projects to implement onsite stormwater management BMPs when feasible. This project must meet minimum requirement #1-11; therefore, it evaluates List #2 of the Manual for onsite stormwater management compliance. The site is separated into two drainage basins, the Shaw Road basin which flows through the Kodiak Estates Division III and the State Highway drainage basin which flows through parcel 0420353009. Soil amendments and perforated stub-outs are provided in the Shaw Road basins, and soil amendments and full dispersion is proposed in the State Highway basin. The BMPs in List #2 is discussed for each drainage basin as follows:

Shaw Road

Lawn and Landscape Areas

- Soil Preservation and Amendment (Ecology BMP T5.13)
  All disturbed pervious areas that are not converted to impervious surfaces will apply soil amendment per Ecology BMP T5.13.

Roof Areas

- Full dispersion of BMP T5.30 is deemed infeasible in this basin since there is not enough area available to accommodate the natural preservation requirements of this BMP.
- Downspout full infiltration was deemed infeasible since a 0-inch per hour infiltration rate was measured onsite with a small scale-PIT.
- Bioretention facility was deemed infeasible since a 0-inch per hour infiltration rate was measured onsite with a small scale-PIT.
- Downspout dispersion system was deemed infeasible onsite due to the lack of available dispersion flow paths under 15 percent slopes.
- Perforated Stub-out connections are deemed feasible and proposed for all lots within this basin.

Other Hard Surface

- Full dispersion of BMP T5.30 is deemed infeasible in this basin since there is not enough area available to accommodate the natural preservation requirements of this BMP.
- Permeable Pavement BMP was deemed infeasible since a 0-inch per hour infiltration rate was measured onsite with a small scale-PIT.
- Bioretention BMP was deemed infeasible since a 0-inch per hour infiltration rate was measured onsite with a small scale-PIT.
- Sheet Flow Dispersion was deemed infeasible for driveways since the flow path of 10-20 feet is not available to meet this requirement.

State Highway

Lawn and Landscape Areas

- Soil Preservation and Amendment (Ecology BMP T5.13)

All disturbed pervious areas that are not converted to impervious surfaces will apply soil amendment per Ecology BMP T5.13.

Roof Areas

- Full dispersion of BMP T5.30 is deemed feasible for this basin. Runoff will be dispersed to parcel 0420353009 with the used of roadway dispersion BMPs. Facility sizing calculations are provided in Section 4 of this report. Since this BMP is deemed feasible no other BMPs are required.

Other Hard Surface

- Full dispersion of BMP T5.30 is deemed feasible for this basin. Runoff will be dispersed to parcel 0420353009 with the used of roadway dispersion BMPs. Facility sizing calculations are provided in Section 4 of this report. Since this BMP is deemed feasible no other BMPs are required.

5.6 Minimum Requirement #6: Runoff Treatment

Runoff treatment is provided in the Shaw Road basin with the use of a wet pool located underneath the live storage of the detention pond. The pool is sized to provide the required on-line treatment volume as calculated with the WWHM computer program. Runoff treatment is not required in the State Highway basin since surfaces that are fully dispersed are not considered effective; therefore, runoff treatment thresholds are not exceeded in this threshold discharge area.

5.7 Minimum Requirement #7: Flow Control

For the Shaw Road basin, a detention pond located in Tract B is proposed to meet flow control requirements. Facility sizing calculations are provided in Section 4 of this report. Runoff is fully dispersed within the State Highway basin; therefore, this basin does not exceed flow control thresholds.

5.8 Minimum Requirement #8: Wetlands Protection

Projects that discharge to a wetland shall meeting this requirement in conjunction with minimum requirements #6 and #7. The Shaw Road basin discharges to onsite wetlands through the proposed detention pond. A hydrologic analysis has been prepared as discussed in Section 4 of this report.

Modeling results is provided in Appendix C. A Critical Areas Assessment Report has been prepared and can be found in Appendix D.

5.9 Minimum Requirement #9: Basin/Watershed Planning

The project is located within two drainage basins as delineated by the City of Puyallup: State Highway and Shaw Road basins. Due to the proposed flow control facilities and application of onsite BMPs the project will not adversely affect these two basins.

5.10 Minimum Requirement #10: Operation and Maintenance

An Operation and Maintenance Manual will be prepared as part of the final engineering submittal. Preliminary Maintenance Schedules can be found in *Appendix "E"*.

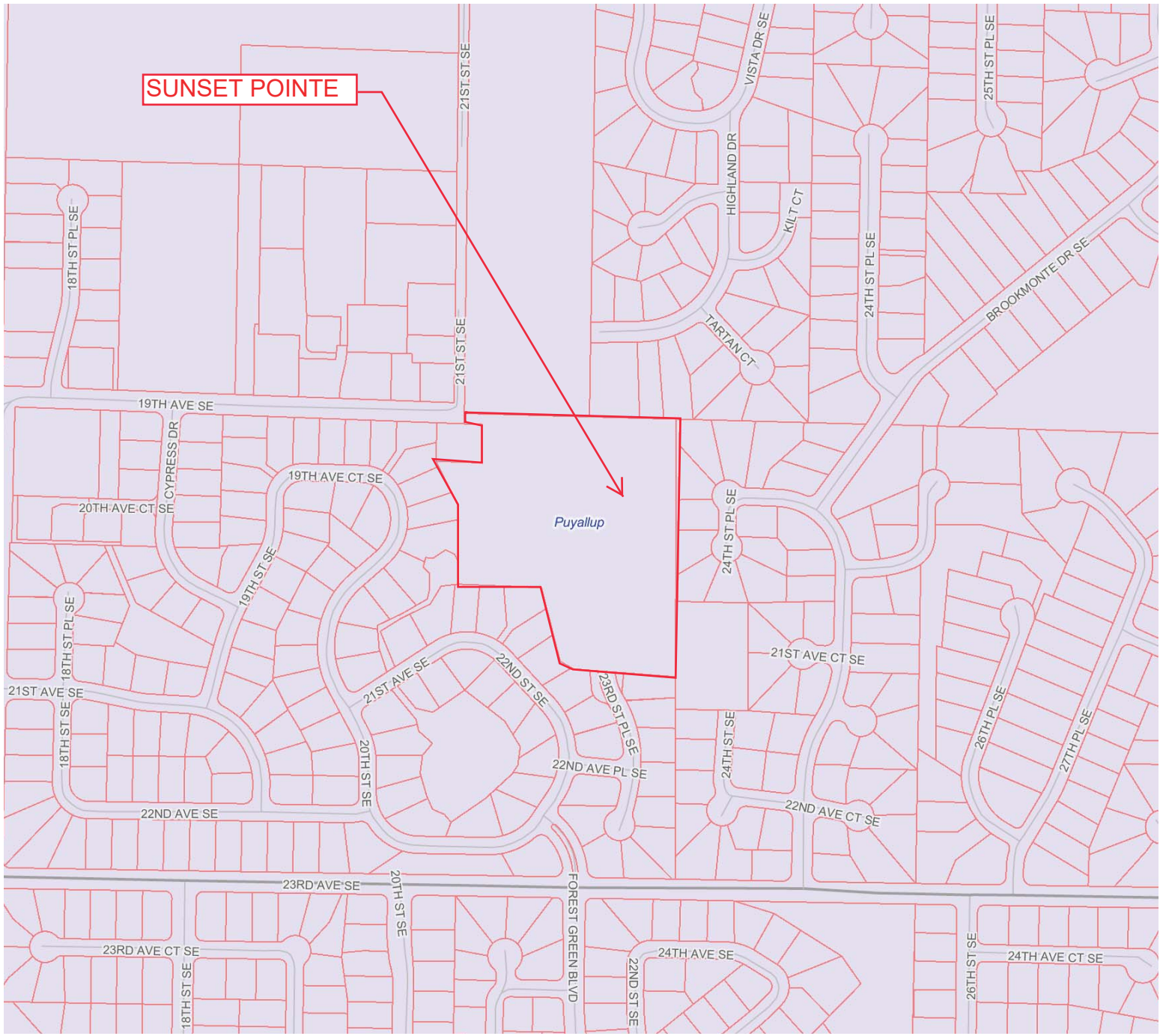
5.11 Minimum Requirement #11: Off-Site Analysis and Mitigation

An Offsite Analysis is prepared within this document and can be found in Section 3 of this report.

APPENDIX A

General Exhibits

VICINITY MAP



SUNSET POINTE

Vicinity Map

Legend

- Tax Parcels
- Base Parcel
- Condominium
- Other
- Roads
- Interstate
- Limited Access State Routes
- Other State Routes
- Ramps
- Major Arterial
- Collector
- Local Access
- Unknown
- Pierce County Basemap
- Unincorporated County
- Tacoma
- Lakewood, Edgewood, Bonney Lake, Buckley, South Prairie
- Steilacoom, Fircrest, Fife, Gig Harbor, Orting, Eatonville, Roy, Carbonado, Wilkeson, Mt Rainier
- University Place, Puyallup, Auburn
- DuPont, Milton, Sumner
- Fort Lewis, McChord, McNeil Island
- Water

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Scale 1:5,000

0 210 420 ft.

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SOILS MAP

Soil Map—Pierce County Area, Washington
(SUNSET POINTE)

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

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

SOIL DESCRIPTION

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 13, Feb 22, 2018

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

Date(s) aerial images were photographed: Jul 8, 2014—Jul 15, 2014

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1D	Alderwood gravelly sandy loam, 15 to 30 percent slopes	0.0	0.3%
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	5.4	55.7%
20B	Kitsap silt loam, 2 to 8 percent slopes	3.3	33.5%
20C	Kitsap silt loam, 8 to 15 percent slopes	1.0	9.9%
PITS	Pits	0.1	0.6%
Totals for Area of Interest		**9.8**	**100.0%**

Pierce County Area, Washington

1D—Alderwood gravelly sandy loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2t627
Elevation: 0 to 1,000 feet
Mean annual precipitation: 25 to 60 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 160 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Alderwood and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Alderwood

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Glacial drift and/or glacial outwash over dense glaciomarine deposits

Typical profile

A - 0 to 7 inches: gravelly sandy loam
Bw1 - 7 to 21 inches: very gravelly sandy loam
Bw2 - 21 to 30 inches: very gravelly sandy loam
Bg - 30 to 35 inches: very gravelly sandy loam
2Cd1 - 35 to 43 inches: very gravelly sandy loam
2Cd2 - 43 to 59 inches: very gravelly sandy loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 39 inches to densic material
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B

Forage suitability group: Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA), Limited Depth Soils (G002XS301WA)
Hydric soil rating: No

Minor Components

Everett
Percent of map unit: 5 percent
Landform: Kames, moraines, eskers
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Indianola
Percent of map unit: 5 percent
Landform: Eskers, kames, terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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

Norma
Percent of map unit: 2 percent
Landform: Depressions, drainageways
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 13, Feb 22, 2018

Pierce County Area, Washington

13B—Everett very gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2t629
Elevation: 30 to 900 feet
Mean annual precipitation: 35 to 91 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Everett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Everett

Setting

Landform: Kames, moraines, eskers
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest, interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glacial outwash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: very gravelly sandy loam
Bw - 3 to 24 inches: very gravelly sandy loam
C1 - 24 to 35 inches: very gravelly loamy sand
C2 - 35 to 60 inches: extremely cobbly coarse sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A

Forage suitability group: Droughty Soils (G002XN402WA), Droughty Soils (G002XF403WA), Droughty Soils (G002XS401WA)
Hydric soil rating: No

Minor Components

Alderwood
Percent of map unit: 10 percent
Landform: Hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Indianola
Percent of map unit: 10 percent
Landform: Terraces, eskers, kames
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 13, Feb 22, 2018

Pierce County Area, Washington

20B—Kitsap silt loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2hpt
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Glaciolacustrine deposits

Typical profile

H1 - 0 to 10 inches: ashy silt loam
H2 - 10 to 32 inches: silty clay loam
H3 - 32 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 16 to 23 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Forage suitability group: Soils with Few Limitations (G002XS501WA)
Hydric soil rating: No

Minor Components

Bellingham

Percent of map unit: 3 percent
Landform: Depressions

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 13, Feb 22, 2018

Pierce County Area, Washington

20C—Kitsap silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2hpv
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Glaciolacustrine deposits

Typical profile

H1 - 0 to 10 inches: ashy silt loam
H2 - 10 to 32 inches: silty clay loam
H3 - 32 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 16 to 23 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Forage suitability group: Soils with Moderate Limitations (G002XS601WA)
Hydric soil rating: No

Minor Components

Bellingham

Percent of map unit: 2 percent
Landform: Depressions

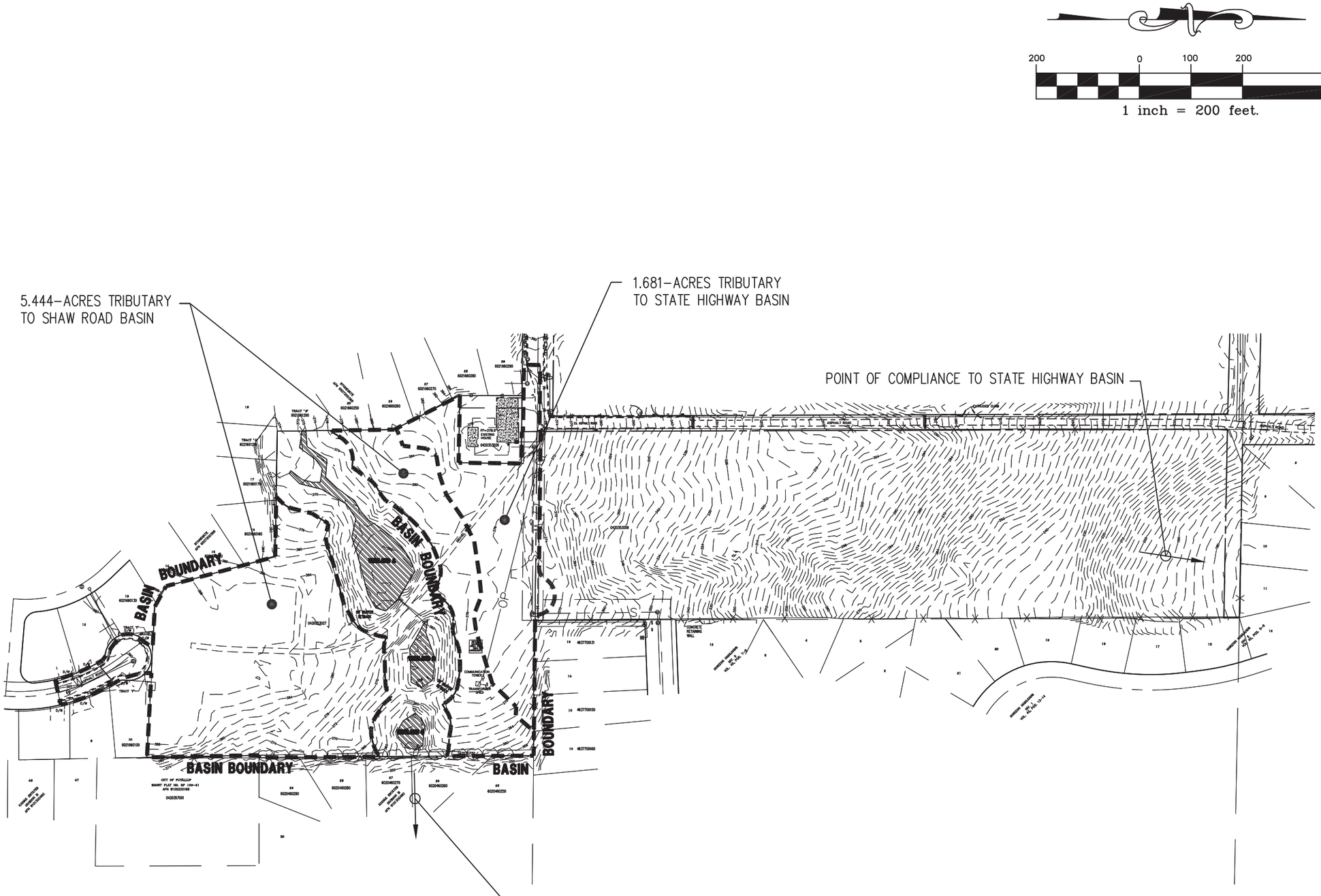
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 13, Feb 22, 2018

APPENDIX B

Basin Exhibits



C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING

429 – 29TH ST. NE, SUITE D Bus: (253) 848–4282
PUYALLUP, WA 98372

SUNSET POINTE
PRE-DEVELOPED BASIN MAP

Project:

Client: PETER Y CHEN AND BETH LIU
4709 MEMORY LANE WEST, UNIVERSITY PLACE, WA 98466

Designed:	FB
Drawn:	WYQ
Checked:	FB
Scale:	1"=100'
Date:	10.19.2020
Job No.:	04148.7

Sheet No.:
B-1
1 of 2 Sheets

Sub-Basin	Description	WWHM Land-use	Area (ac)
Post Dev A	Yards	C, Pasture, Flat	1.087
Post Dev B	Roadway	Roadway, Flat	0.516
Post Dev C	Rooftops (40% Lot Coverage)	Roof, Flat	1.181
Post Dev D	Driveways	Driveway, Flat	0.184
Post Dev E	Pond	Pond	0.161
Bypass A	Bypass Gravel Road	Roadway, Flat	0.021
Bypass B	Rear Yards	C, Pasture, Steep	1.314
Total			**4.464**

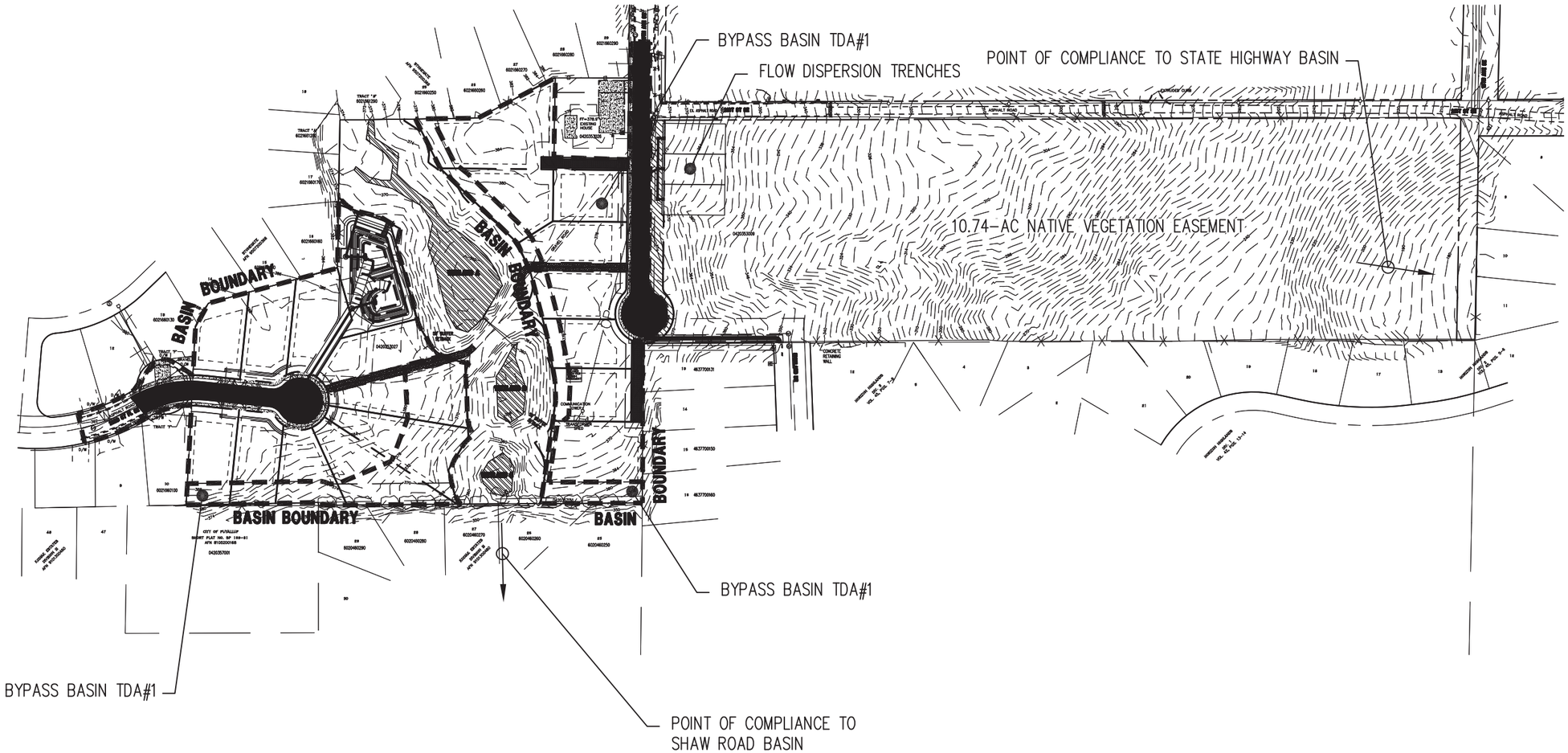
POST DEVELOPED SHAW ROAD BASIN

200 0 100 200 400

1 inch = 200 feet.

Sub-Basin	Description	WWHM Land-use	Area (ac)
Post Dev F	Yards	C, Pasture, Flat	1.077
Post Dev B	Roadway	Roadway, Flat	0.474
Post Dev C	4,600 per Lot	Roof, Flat	0.844
Post Dev D	1,000 per Lot	Driveway, Flat	0.184
Total			**2.579**

POST DEVELOPED STATE HIGHWAY BASIN



C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING
429 – 29TH ST. NE, SUITE D Bus: (253) 848-4282
PUYALLUP, WA 98372

Project:

SUNSET POINTE

POST DEVELOPED BASIN MAP

Client:

PETER Y CHEN AND BETH LIU

4709 MEMORY LANE WEST, UNIVERSITY PLACE, WA 98466

Designed:	FB
Drawn:	WYQ
Checked:	FB
Scale:	1"=100'
Date:	10.19.2020
Job No.:	04148.7

Sheet No.:

B-2

2 of 2 Sheets

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 10. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Pierce County GIS, WA DNR, WSDOT, USFWS, Washington State Department of Ecology, and Puget Sound Regional Council. This information was compiled at scales of 1:1,200 to 1:24,000 during the time period 1996-2012.

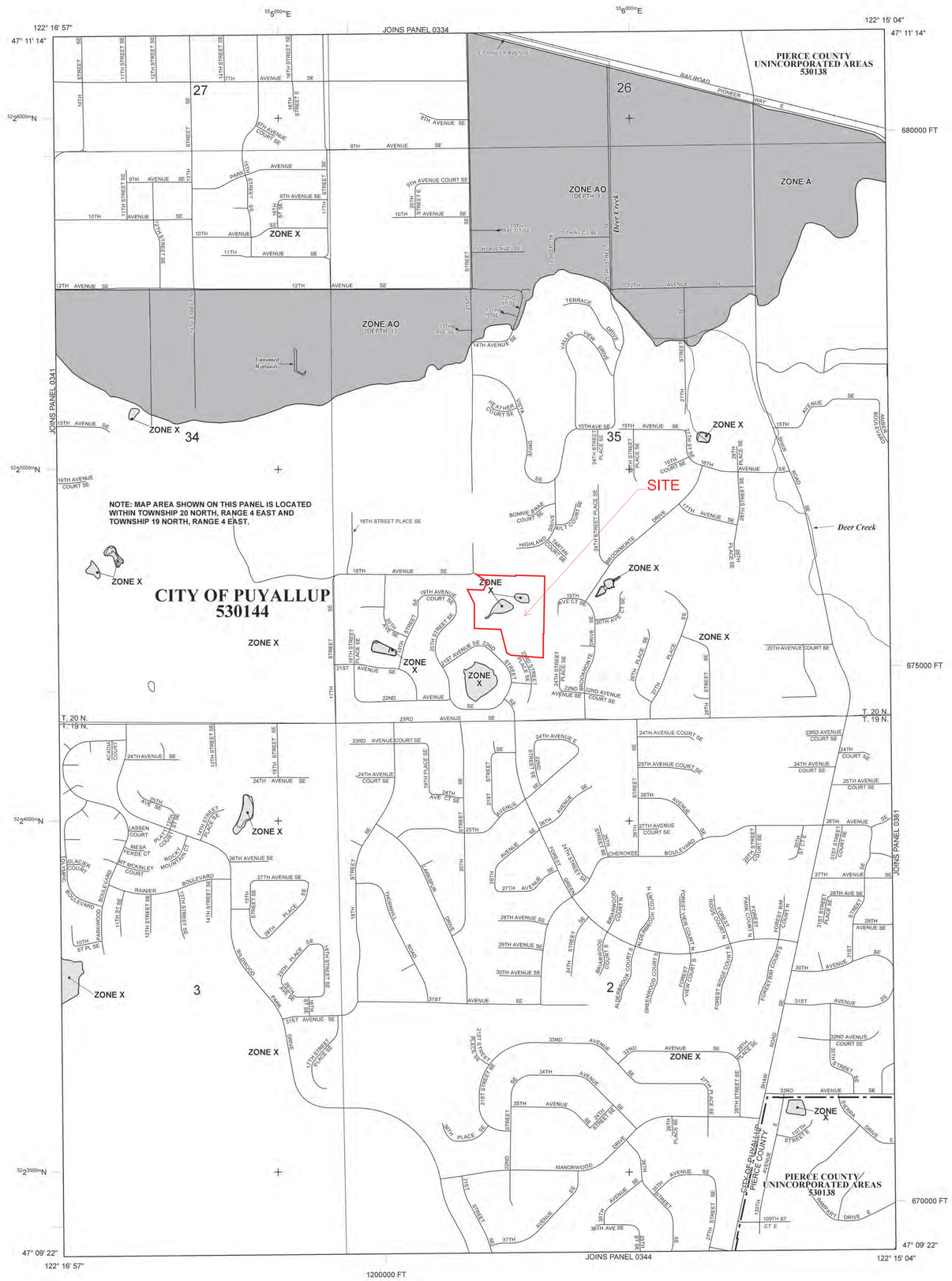
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 — 23	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000mN	1000-meter Universal Transverse Mercator grid values, zone 10
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
March 7, 2017

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0342E

FIRM

FLOOD INSURANCE RATE MAP

PIERCE COUNTY, WASHINGTON AND INCORPORATED AREAS

PANEL 342 OF 1375
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

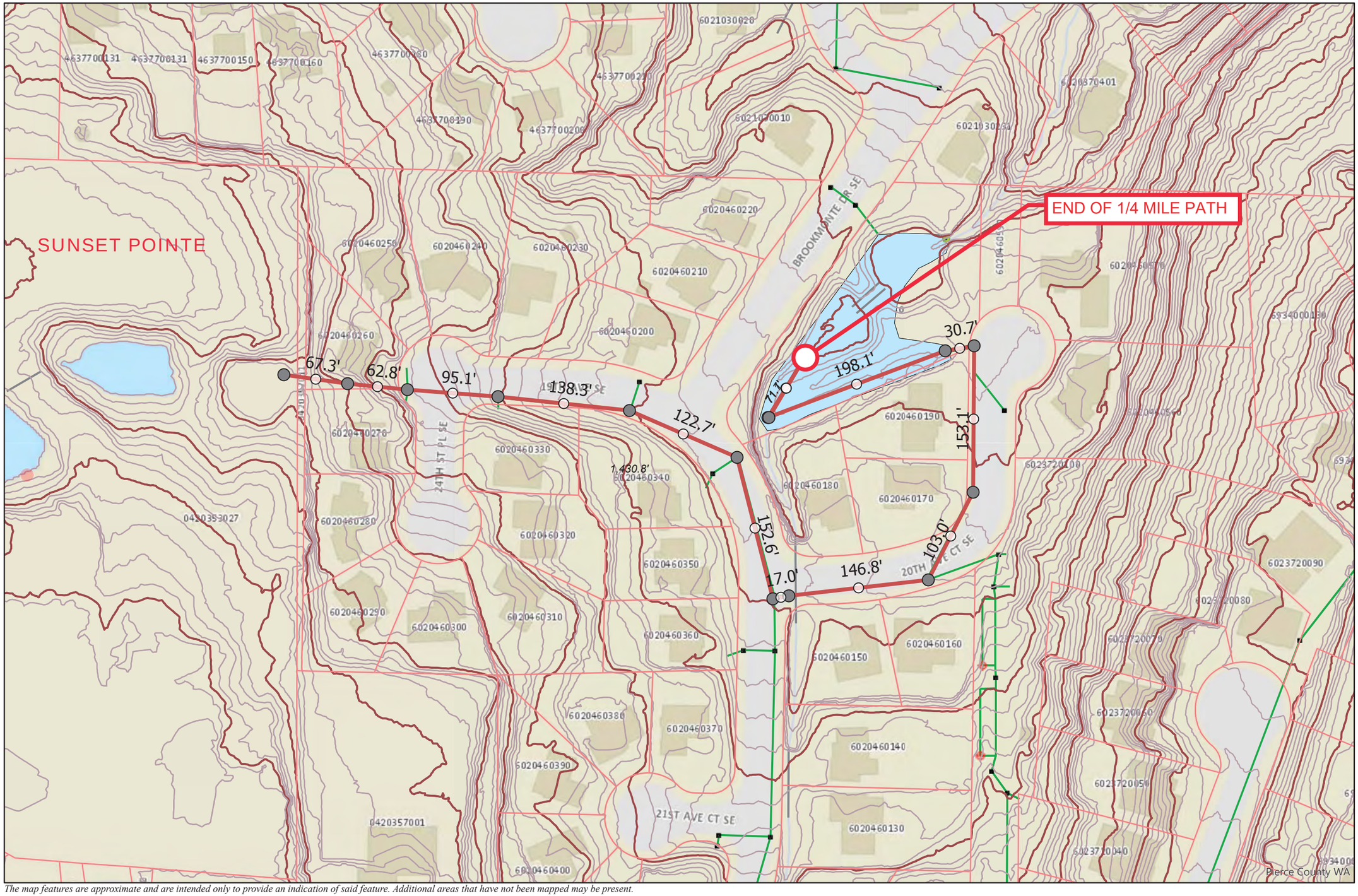
COMMUNITY	NUMBER	PANEL	SUFFIX
PIERCE COUNTY	530138	0342	E
PUYALLUP, CITY OF	530144	0342	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
53053C0342E
EFFECTIVE DATE
MARCH 7, 2017

Federal Emergency Management Agency

Shaw Road 1/4 Mile Path



Legend

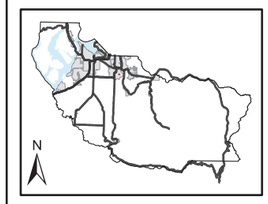
Tax Parcels

- Base Parcel

Contours - 2017

- 10' Contour Line
- 2' Contour Line

- Drainage - Control Structures - Puyallup
- Drainage - Manholes - Puyallup
- Drainage - Inlets - Puyallup
- Drainage - Culverts - Puyallup
- Drainage - Channels - Puyallup
- Drainage - Pipes - Puyallup
- Drainage - Stormwater Facilities - Puyallup

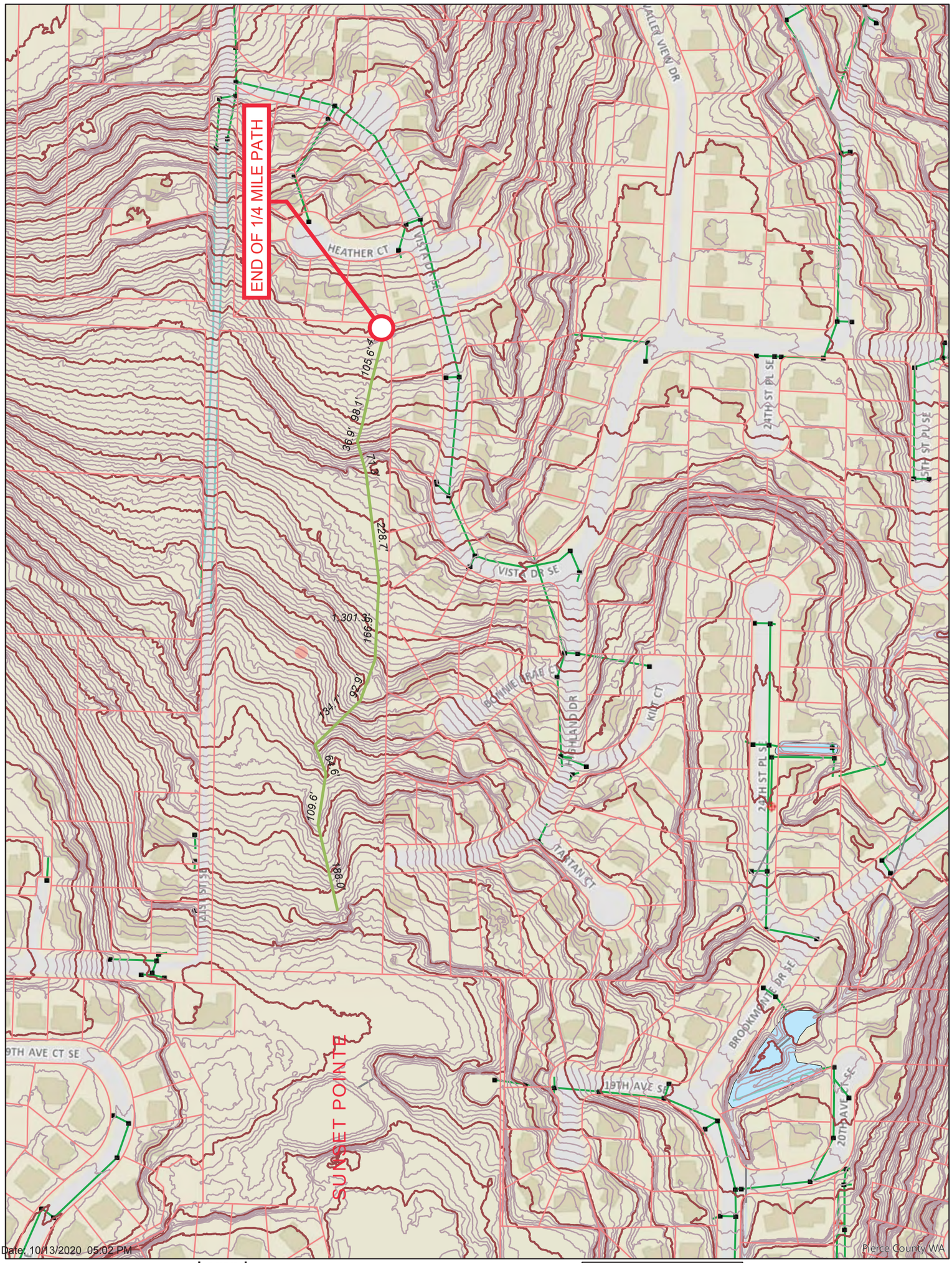


0 20 40 80
Feet

CES • NW
INCORPORATED
CIVIL ENGINEERING & SURVEYING
429 29th St NE, Suite D · Puyallup, WA 98372
PH: 253.848.4282
www.cesnwinc.com

Date: 10/13/2020 08:08 PM

State Highway 1/4 Mile Path



Legend

Tax Parcels
- Base Parcel

Contours - 2017
- 10' Contour Line
- 2' Contour Line

Drainage - Control Structures - Puyallup

Drainage - Manholes - Puyallup

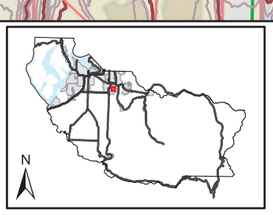
Drainage - Inlets - Puyallup

Drainage - Culverts - Puyallup

Drainage - Channels - Puyallup

Drainage - Pipes - Puyallup

Drainage - Stormwater Facilities - Puyallup



0 45 90 180 Feet

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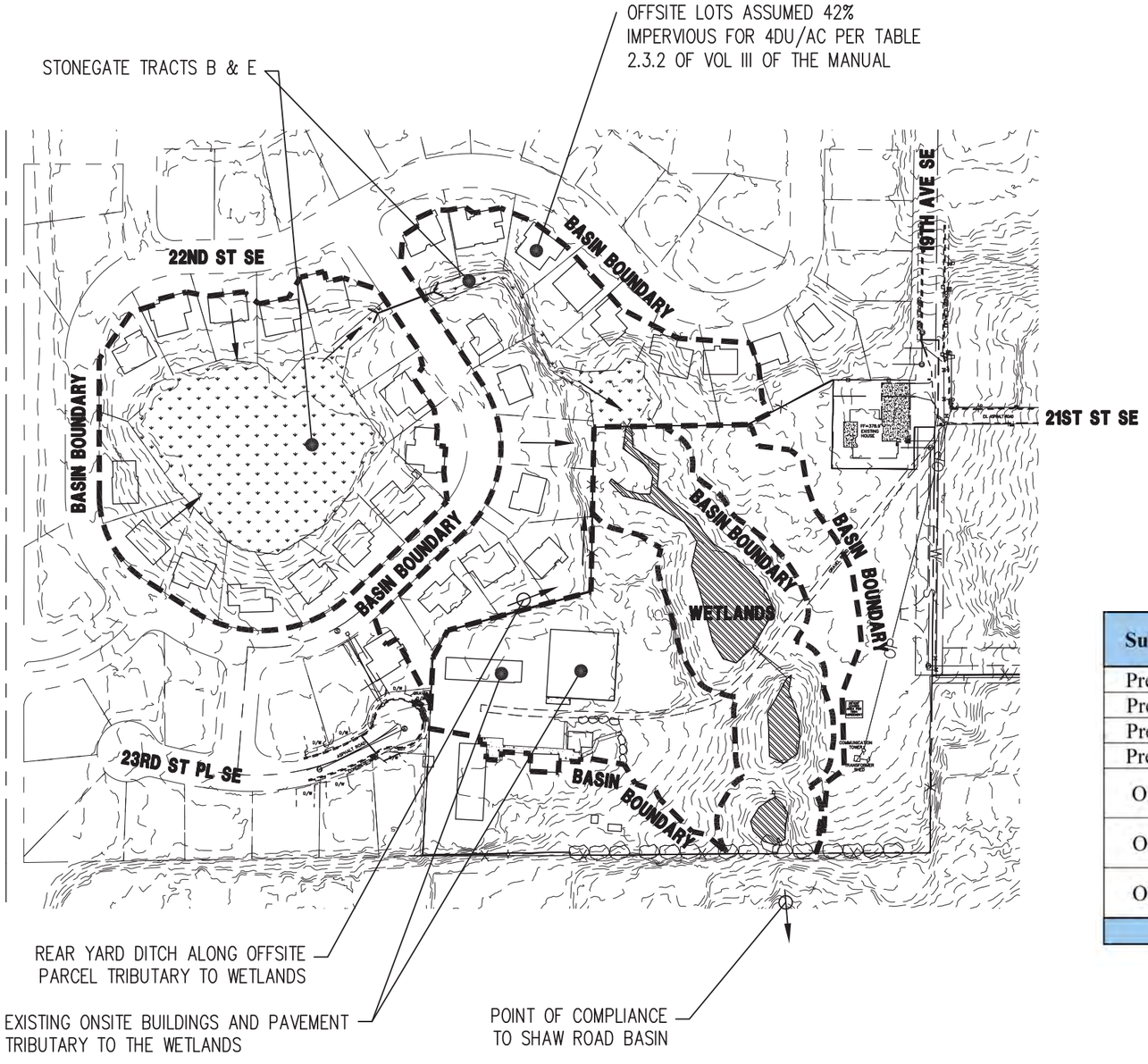
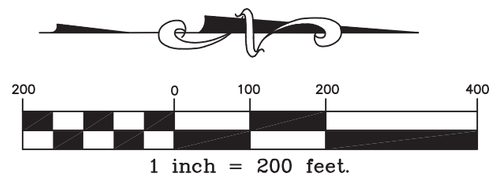
www.cesnwinc.com





Sub-Basin	Description	WWHM Land-use	Area (ac)
Pre-Dev A	Buildings	Roof Flat	0.360
Pre-Dev B	Gravel Roadway	Roadway, Flat	0.104
Pre-Dev C	Concrete Walkways	Sidewalk, Flat	0.071
Pre-Dev D	Pastures	Pasture, Mod	2.973
Offsite A	Tracts B and E of Stonegate	Saturated, Forest, Flat	2.069
Offsite B	Offsite Yards (58% Pervious)	C, Lawn, Flat	3.754
Offsite C	Offsite Impervious (42% Imp.)	Rooftops, Flat	2.719
Total			**12.047**

PRE-DEVELOPED WETLAND RECHARGE BASIN

C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING
429 – 29TH ST. NE, SUITE D Bus: (253) 848-4282
PUYALLUP, WA 98372

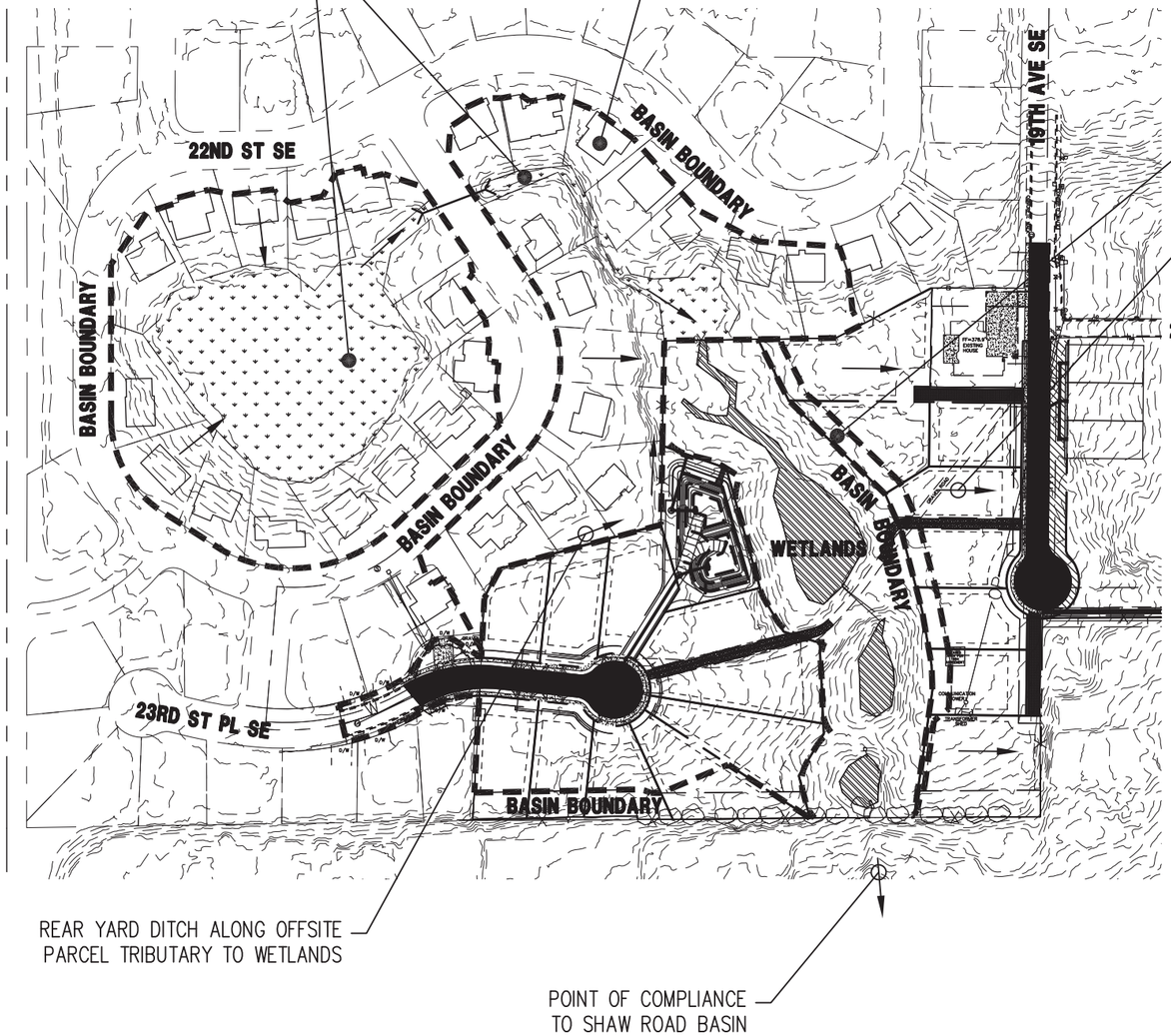
Project: **SUNSET POINTE**
PRE-DEVELOPED BASIN MAP

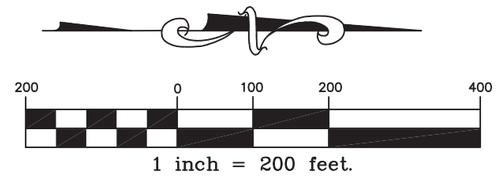
Client: **PETER Y CHEN AND BETH LIU**
4709 MEMORY LANE WEST, UNIVERSITY PLACE, WA 98466

Designed: FB
Drawn: WYQ
Checked: FB

Scale: 1"=100'
Date: 10.20.2020
Job No.: 04148.7

Sheet No.:
B-5a
1 of 2 Sheets





Sub-Basin	Description	WWHM Land-use	Area (ac)
Post Dev A	Yards	C, Pasture, Flat	1.087
Post Dev B	Roadway	Roadway, Flat	0.516
Post Dev C	Rooftops (40% Lot Coverage)	Roof, Flat	1.181
Post Dev D	Driveway	Driveway, Flat	0.184
Post Dev E	Pond	Pond	0.161
Bypass A	Bypass Gravel Road	Roadway, Flat	0.021
Bypass B	Rear Yards	C, Pasture, Steep	0.787
Offsite A	Tracts B and E of Stonegate	Saturated, Forest, Flat	2.069
Offsite B	Offsite Yards (58% Pervious)	C, Lawn, Flat	3.754
Offsite C	Offsite Impervious (42% Imp.)	Rooftops, Flat	2.719
Total			**12.479**

POST DEVELOPED WETLAND RECHARGE BASIN

C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING
429 – 29TH ST. NE, SUITE D Bus: (253) 848-4282
PUYALLUP, WA 98372

Project: **SUNSET POINTE**
POST DEVELOPED WETLAND BASIN MAP

Client: PETER Y CHEN AND BETH LIU
4709 MEMORY LANE WEST, UNIVERSITY PLACE, WA 98466

Designed: FB
Drawn: WYQ
Checked: FB

Scale: 1"=100'
Date: 10.20.2020
Job No.: 04148.7

Sheet No.:
B-5b
2 of 2 Sheets

APPENDIX C

Computer Printouts

WWHM2012
PROJECT REPORT

Project Name: 04148.7
Site Name: Sunset Pointe Pond Modeling
Site Address: 2301 23rd Street SE
City : Puyallup, WA
Report Date: 10/13/2020
Gage : 40 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Pre-Dev
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	5.444
Pervious Total	5.444

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.444

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.994
Pervious Total	0.994

Impervious Land Use	acre
ROADS FLAT	0.609
ROOF TOPS FLAT	1.181
DRIVEWAYS FLAT	0.184
POND	0.161
Impervious Total	2.135

Basin Total 3.129

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Name : Bypass
Bypass: Yes

GroundWater: No

Pervious Land Use	acre
C, Pasture, Steep	1.314
Pervious Total	1.314

Impervious Land Use	acre
ROADS FLAT	0.021
Impervious Total	0.021

Basin Total 1.335

Element Flows To:

Surface	Interflow	Groundwater

Name : Trapezoidal Pond 1
Bottom Length: 79.10 ft.
Bottom Width: 79.10 ft.
Depth: 6 ft.
Volume at riser head: 0.9310 acre-feet.
Side slope 1: 2.6 To 1
Side slope 2: 2 To 1

Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 1.000 ft.
Notch Height: 0.100 ft.
Orifice 1 Diameter: 0.99 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.143	0.000	0.000	0.000
0.0667	0.144	0.009	0.006	0.000
0.1333	0.145	0.019	0.009	0.000
0.2000	0.146	0.029	0.011	0.000
0.2667	0.147	0.038	0.013	0.000
0.3333	0.148	0.048	0.015	0.000
0.4000	0.150	0.058	0.016	0.000
0.4667	0.151	0.068	0.018	0.000
0.5333	0.152	0.078	0.019	0.000
0.6000	0.153	0.089	0.020	0.000
0.6667	0.154	0.099	0.021	0.000
0.7333	0.155	0.109	0.022	0.000
0.8000	0.156	0.120	0.023	0.000
0.8667	0.157	0.130	0.024	0.000
0.9333	0.158	0.141	0.025	0.000
1.0000	0.159	0.151	0.026	0.000
1.0667	0.160	0.162	0.027	0.000
1.1333	0.161	0.173	0.028	0.000
1.2000	0.163	0.183	0.029	0.000
1.2667	0.164	0.194	0.029	0.000
1.3333	0.165	0.205	0.030	0.000
1.4000	0.166	0.216	0.031	0.000
1.4667	0.167	0.227	0.032	0.000
1.5333	0.168	0.239	0.032	0.000
1.6000	0.169	0.250	0.033	0.000
1.6667	0.170	0.261	0.034	0.000
1.7333	0.172	0.273	0.035	0.000
1.8000	0.173	0.284	0.035	0.000
1.8667	0.174	0.296	0.036	0.000
1.9333	0.175	0.307	0.037	0.000
2.0000	0.176	0.319	0.037	0.000
2.0667	0.177	0.331	0.038	0.000
2.1333	0.178	0.343	0.038	0.000
2.2000	0.180	0.355	0.039	0.000
2.2667	0.181	0.367	0.040	0.000
2.3333	0.182	0.379	0.040	0.000
2.4000	0.183	0.391	0.041	0.000
2.4667	0.184	0.403	0.041	0.000

2.5333	0.185	0.416	0.042	0.000
2.6000	0.187	0.428	0.042	0.000
2.6667	0.188	0.441	0.043	0.000
2.7333	0.189	0.453	0.044	0.000
2.8000	0.190	0.466	0.044	0.000
2.8667	0.191	0.479	0.045	0.000
2.9333	0.193	0.492	0.045	0.000
3.0000	0.194	0.505	0.046	0.000
3.0667	0.195	0.518	0.046	0.000
3.1333	0.196	0.531	0.047	0.000
3.2000	0.197	0.544	0.047	0.000
3.2667	0.199	0.557	0.048	0.000
3.3333	0.200	0.570	0.048	0.000
3.4000	0.201	0.584	0.049	0.000
3.4667	0.202	0.597	0.049	0.000
3.5333	0.204	0.611	0.050	0.000
3.6000	0.205	0.624	0.050	0.000
3.6667	0.206	0.638	0.050	0.000
3.7333	0.207	0.652	0.051	0.000
3.8000	0.209	0.666	0.051	0.000
3.8667	0.210	0.680	0.052	0.000
3.9333	0.211	0.694	0.052	0.000
4.0000	0.212	0.708	0.053	0.000
4.0667	0.214	0.722	0.053	0.000
4.1333	0.215	0.737	0.054	0.000
4.2000	0.216	0.751	0.054	0.000
4.2667	0.218	0.765	0.054	0.000
4.3333	0.219	0.780	0.055	0.000
4.4000	0.220	0.795	0.055	0.000
4.4667	0.221	0.809	0.056	0.000
4.5333	0.223	0.824	0.056	0.000
4.6000	0.224	0.839	0.057	0.000
4.6667	0.225	0.854	0.057	0.000
4.7333	0.227	0.869	0.057	0.000
4.8000	0.228	0.884	0.058	0.000
4.8667	0.229	0.900	0.058	0.000
4.9333	0.231	0.915	0.079	0.000
5.0000	0.232	0.931	0.164	0.000
5.0667	0.233	0.946	0.438	0.000
5.1333	0.234	0.962	0.937	0.000
5.2000	0.236	0.977	1.570	0.000
5.2667	0.237	0.993	2.290	0.000
5.3333	0.238	1.009	3.049	0.000
5.4000	0.240	1.025	3.799	0.000
5.4667	0.241	1.041	4.493	0.000
5.5333	0.243	1.057	5.092	0.000
5.6000	0.244	1.074	5.569	0.000
5.6667	0.245	1.090	5.923	0.000
5.7333	0.247	1.106	6.183	0.000
5.8000	0.248	1.123	6.507	0.000
5.8667	0.249	1.139	6.767	0.000
5.9333	0.251	1.156	7.016	0.000
6.0000	0.252	1.173	7.257	0.000
6.0667	0.253	1.190	7.489	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:5.444
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:2.308
Total Impervious Area:2.156

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.124194
5 year	0.192286
10 year	0.231815
25 year	0.274738
50 year	0.302402
100 year	0.326435

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.095385
5 year	0.14774
10 year	0.193897
25 year	0.268149
50 year	0.337095
100 year	0.419666

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.100	0.086
1903	0.076	0.073
1904	0.153	0.147
1905	0.063	0.078
1906	0.033	0.042
1907	0.191	0.134
1908	0.137	0.095
1909	0.135	0.097
1910	0.190	0.129
1911	0.123	0.095
1912	0.473	0.333
1913	0.193	0.120
1914	0.050	0.074
1915	0.080	0.083
1916	0.122	0.089
1917	0.042	0.053
1918	0.131	0.098
1919	0.102	0.084

1920	0.125	0.095
1921	0.136	0.101
1922	0.137	0.106
1923	0.109	0.098
1924	0.053	0.070
1925	0.067	0.073
1926	0.122	0.093
1927	0.087	0.072
1928	0.094	0.083
1929	0.195	0.132
1930	0.122	0.089
1931	0.116	0.092
1932	0.088	0.083
1933	0.098	0.094
1934	0.253	0.267
1935	0.115	0.092
1936	0.104	0.079
1937	0.175	0.131
1938	0.102	0.086
1939	0.009	0.039
1940	0.113	0.093
1941	0.068	0.063
1942	0.169	0.298
1943	0.086	0.077
1944	0.188	0.180
1945	0.136	0.102
1946	0.087	0.080
1947	0.057	0.060
1948	0.262	0.158
1949	0.227	0.156
1950	0.066	0.071
1951	0.086	0.070
1952	0.343	0.218
1953	0.308	0.193
1954	0.109	0.089
1955	0.095	0.077
1956	0.050	0.055
1957	0.163	0.106
1958	0.327	0.517
1959	0.207	0.330
1960	0.060	0.071
1961	0.205	0.140
1962	0.111	0.095
1963	0.054	0.067
1964	0.056	0.142
1965	0.230	0.143
1966	0.067	0.065
1967	0.106	0.089
1968	0.108	0.103
1969	0.102	0.087
1970	0.158	0.115
1971	0.242	0.147
1972	0.159	0.160
1973	0.206	0.139
1974	0.123	0.093
1975	0.257	0.183
1976	0.137	0.119

1977	0.061	0.058
1978	0.226	0.148
1979	0.066	0.063
1980	0.132	0.093
1981	0.120	0.085
1982	0.058	0.061
1983	0.205	0.128
1984	0.093	0.098
1985	0.147	0.119
1986	0.123	0.094
1987	0.241	0.164
1988	0.146	0.100
1989	0.134	0.097
1990	0.154	0.106
1991	0.123	0.096
1992	0.160	0.103
1993	0.165	0.113
1994	0.243	0.152
1995	0.055	0.067
1996	0.271	0.293
1997	0.109	0.082
1998	0.131	0.110
1999	0.013	0.054
2000	0.098	0.084
2001	0.053	0.064
2002	0.198	0.152
2003	0.151	0.107
2004	0.136	0.102
2005	0.284	0.210
2006	0.078	0.067
2007	0.082	0.078
2008	0.131	0.095
2009	0.087	0.073
2010	0.075	0.084
2011	0.069	0.061
2012	0.103	0.121
2013	0.077	0.068
2014	0.054	0.059
2015	0.105	0.111
2016	0.043	0.053
2017	0.186	0.122
2018	0.338	0.674
2019	0.345	0.240
2020	0.104	0.087
2021	0.170	0.115
2022	0.070	0.066
2023	0.142	0.102
2024	0.359	0.272
2025	0.127	0.097
2026	0.203	0.135
2027	0.077	0.081
2028	0.067	0.068
2029	0.138	0.095
2030	0.252	0.155
2031	0.083	0.069
2032	0.049	0.058
2033	0.076	0.070

2034	0.074	0.081
2035	0.287	0.523
2036	0.153	0.108
2037	0.041	0.053
2038	0.136	0.117
2039	0.017	0.038
2040	0.072	0.076
2041	0.096	0.078
2042	0.294	0.423
2043	0.139	0.117
2044	0.185	0.116
2045	0.125	0.096
2046	0.145	0.112
2047	0.107	0.088
2048	0.142	0.104
2049	0.127	0.099
2050	0.091	0.084
2051	0.130	0.137
2052	0.077	0.068
2053	0.136	0.107
2054	0.169	0.175
2055	0.070	0.072
2056	0.061	0.061
2057	0.095	0.081
2058	0.114	0.084
2059	0.200	0.127

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.4730	0.6744
2	0.3586	0.5234
3	0.3453	0.5171
4	0.3431	0.4229
5	0.3380	0.3326
6	0.3268	0.3300
7	0.3082	0.2984
8	0.2940	0.2928
9	0.2870	0.2724
10	0.2842	0.2666
11	0.2708	0.2403
12	0.2617	0.2184
13	0.2566	0.2097
14	0.2526	0.1927
15	0.2519	0.1829
16	0.2432	0.1799
17	0.2420	0.1750
18	0.2408	0.1644
19	0.2298	0.1596
20	0.2274	0.1584
21	0.2261	0.1556
22	0.2070	0.1546
23	0.2061	0.1519
24	0.2049	0.1517
25	0.2048	0.1475
26	0.2029	0.1472

27	0.2000	0.1467
28	0.1982	0.1434
29	0.1949	0.1424
30	0.1926	0.1397
31	0.1906	0.1385
32	0.1902	0.1372
33	0.1882	0.1350
34	0.1865	0.1340
35	0.1848	0.1316
36	0.1749	0.1313
37	0.1699	0.1286
38	0.1695	0.1280
39	0.1691	0.1268
40	0.1653	0.1219
41	0.1629	0.1210
42	0.1601	0.1204
43	0.1589	0.1190
44	0.1581	0.1186
45	0.1536	0.1171
46	0.1529	0.1166
47	0.1528	0.1163
48	0.1508	0.1154
49	0.1465	0.1148
50	0.1463	0.1135
51	0.1449	0.1115
52	0.1425	0.1107
53	0.1422	0.1099
54	0.1388	0.1082
55	0.1377	0.1075
56	0.1374	0.1068
57	0.1374	0.1060
58	0.1372	0.1060
59	0.1364	0.1057
60	0.1361	0.1039
61	0.1359	0.1030
62	0.1357	0.1029
63	0.1355	0.1023
64	0.1346	0.1021
65	0.1343	0.1019
66	0.1318	0.1007
67	0.1311	0.0998
68	0.1309	0.0990
69	0.1309	0.0981
70	0.1296	0.0980
71	0.1274	0.0979
72	0.1268	0.0972
73	0.1251	0.0969
74	0.1246	0.0968
75	0.1234	0.0964
76	0.1233	0.0957
77	0.1232	0.0954
78	0.1226	0.0953
79	0.1223	0.0953
80	0.1222	0.0952
81	0.1218	0.0949
82	0.1203	0.0948
83	0.1158	0.0945

84	0.1155	0.0937
85	0.1136	0.0932
86	0.1126	0.0931
87	0.1110	0.0930
88	0.1092	0.0930
89	0.1091	0.0918
90	0.1085	0.0916
91	0.1081	0.0893
92	0.1074	0.0891
93	0.1059	0.0888
94	0.1048	0.0888
95	0.1042	0.0882
96	0.1040	0.0874
97	0.1029	0.0872
98	0.1025	0.0864
99	0.1022	0.0857
100	0.1020	0.0852
101	0.0997	0.0842
102	0.0981	0.0841
103	0.0978	0.0840
104	0.0962	0.0839
105	0.0955	0.0838
106	0.0953	0.0833
107	0.0938	0.0832
108	0.0929	0.0829
109	0.0907	0.0824
110	0.0884	0.0815
111	0.0873	0.0808
112	0.0868	0.0807
113	0.0868	0.0796
114	0.0857	0.0793
115	0.0856	0.0781
116	0.0832	0.0780
117	0.0819	0.0778
118	0.0804	0.0775
119	0.0775	0.0766
120	0.0773	0.0762
121	0.0771	0.0741
122	0.0769	0.0734
123	0.0759	0.0727
124	0.0759	0.0726
125	0.0755	0.0722
126	0.0741	0.0719
127	0.0721	0.0705
128	0.0701	0.0705
129	0.0700	0.0703
130	0.0687	0.0696
131	0.0683	0.0696
132	0.0671	0.0688
133	0.0671	0.0685
134	0.0666	0.0685
135	0.0664	0.0681
136	0.0661	0.0673
137	0.0630	0.0673
138	0.0613	0.0665
139	0.0609	0.0657
140	0.0601	0.0648

141	0.0576	0.0641
142	0.0567	0.0630
143	0.0562	0.0629
144	0.0553	0.0613
145	0.0541	0.0611
146	0.0536	0.0606
147	0.0534	0.0599
148	0.0532	0.0587
149	0.0503	0.0579
150	0.0498	0.0577
151	0.0493	0.0554
152	0.0428	0.0544
153	0.0418	0.0534
154	0.0409	0.0529
155	0.0327	0.0528
156	0.0168	0.0424
157	0.0133	0.0390
158	0.0086	0.0383

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0621	55678	56010	100	Pass
0.0645	51235	47384	92	Pass
0.0670	47163	40171	85	Pass
0.0694	43456	34177	78	Pass
0.0718	40105	29263	72	Pass
0.0742	37168	25135	67	Pass
0.0767	34420	21579	62	Pass
0.0791	31889	18642	58	Pass
0.0815	29523	16277	55	Pass
0.0839	27484	14210	51	Pass
0.0864	25628	12426	48	Pass
0.0888	23872	10892	45	Pass
0.0912	22288	9496	42	Pass
0.0937	20886	8310	39	Pass
0.0961	19551	7235	37	Pass
0.0985	18282	6393	34	Pass
0.1009	17102	5723	33	Pass
0.1034	15978	5131	32	Pass
0.1058	14930	4583	30	Pass
0.1082	13955	4138	29	Pass
0.1106	13080	3780	28	Pass
0.1131	12293	3444	28	Pass
0.1155	11545	3145	27	Pass
0.1179	10787	2844	26	Pass
0.1204	10094	2573	25	Pass
0.1228	9429	2369	25	Pass
0.1252	8792	2146	24	Pass
0.1276	8238	1970	23	Pass
0.1301	7739	1817	23	Pass
0.1325	7246	1657	22	Pass

0.1349	6781	1561	23	Pass
0.1373	6404	1482	23	Pass
0.1398	6105	1399	22	Pass
0.1422	5828	1303	22	Pass
0.1446	5513	1195	21	Pass
0.1471	5232	1098	20	Pass
0.1495	4968	998	20	Pass
0.1519	4734	922	19	Pass
0.1543	4486	858	19	Pass
0.1568	4303	797	18	Pass
0.1592	4106	758	18	Pass
0.1616	3869	712	18	Pass
0.1640	3649	672	18	Pass
0.1665	3477	627	18	Pass
0.1689	3316	584	17	Pass
0.1713	3165	546	17	Pass
0.1738	3022	505	16	Pass
0.1762	2917	475	16	Pass
0.1786	2789	443	15	Pass
0.1810	2680	421	15	Pass
0.1835	2528	397	15	Pass
0.1859	2415	380	15	Pass
0.1883	2303	363	15	Pass
0.1907	2200	346	15	Pass
0.1932	2097	329	15	Pass
0.1956	1981	319	16	Pass
0.1980	1875	303	16	Pass
0.2005	1768	296	16	Pass
0.2029	1686	286	16	Pass
0.2053	1594	278	17	Pass
0.2077	1525	266	17	Pass
0.2102	1460	260	17	Pass
0.2126	1382	249	18	Pass
0.2150	1306	242	18	Pass
0.2174	1249	229	18	Pass
0.2199	1192	220	18	Pass
0.2223	1135	212	18	Pass
0.2247	1083	208	19	Pass
0.2272	1032	204	19	Pass
0.2296	984	200	20	Pass
0.2320	929	192	20	Pass
0.2344	870	190	21	Pass
0.2369	819	185	22	Pass
0.2393	771	182	23	Pass
0.2417	709	175	24	Pass
0.2441	663	173	26	Pass
0.2466	627	171	27	Pass
0.2490	583	166	28	Pass
0.2514	539	163	30	Pass
0.2539	501	162	32	Pass
0.2563	458	156	34	Pass
0.2587	416	149	35	Pass
0.2611	380	145	38	Pass
0.2636	353	135	38	Pass
0.2660	319	133	41	Pass
0.2684	297	124	41	Pass
0.2708	277	119	42	Pass

0.2733	264	116	43	Pass
0.2757	246	113	45	Pass
0.2781	231	110	47	Pass
0.2806	217	110	50	Pass
0.2830	203	107	52	Pass
0.2854	180	107	59	Pass
0.2878	154	101	65	Pass
0.2903	142	99	69	Pass
0.2927	127	99	77	Pass
0.2951	112	98	87	Pass
0.2975	104	95	91	Pass
0.3000	99	92	92	Pass
0.3024	89	92	103	Pass

Perlnd and Implnd Changes

No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: 04148.7-65 10 Dispersion
Site Name: South Basin
Site Address: 2301 23rd Street SE
City : Puyallup, WA
Report Date: 10/16/2020
Gage : 40 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

Low Flow Threshold for POC 2 : 50 Percent of the 2 Year

High Flow Threshold for POC 2: 50 year

PREDEVELOPED LAND USE

Name : Pre-Dev 19th
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	1.681
Pervious Total	1.681

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.681

Element Flows To:

Surface	Interflow	Groundwater

Name : Pre-Dev 19th

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	1.681
Pervious Total	**1.681**

Impervious Land Use	acre
Impervious Total	**0**
Basin Total	**1.681**

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Post Dev Without Modeling Credits
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	1.077
Pervious Total	**1.077**

Impervious Land Use	acre
ROADS FLAT	0.474
ROOF TOPS FLAT	0.844
DRIVEWAYS FLAT	0.184
Impervious Total	**1.502**
Basin Total	**2.579**

Element Flows To:

Surface	Interflow	Groundwater

Name : Post Dev with Modelling Credits
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	2.579
Pervious Total	2.579

Impervious Land Use	acre
Impervious Total	0
Basin Total	2.579

Element Flows To:
Surface **Interflow** **Groundwater**

ANALYSIS RESULTS

Stream Protection Duration
Without Flow Modeling Credits

Predeveloped Landuse Totals for POC #1
Total Pervious Area:1.681
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:1.077
Total Impervious Area:1.502

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.038349
5 year	0.059374
10 year	0.07158
25 year	0.084834
50 year	0.093376
100 year	0.100796

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.552456
5 year	0.741577
10 year	0.879032
25 year	1.067157
50 year	1.218141
100 year	1.378714

Stream Protection Duration
With Flow Modeling Credits

Predeveloped Landuse Totals for POC #2
Total Pervious Area:1.681
Total Impervious Area:0

Mitigated Landuse Totals for POC #2
Total Pervious Area:2.579
Total Impervious Area:0

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.038349
5 year	0.059374
10 year	0.07158
25 year	0.084834
50 year	0.093376
100 year	0.100796

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0.058835
5 year	0.091092
10 year	0.109818
25 year	0.130153
50 year	0.143258
100 year	0.154643

Perlnd and Implnd Changes
No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: 04148.7-Treatment
Site Name: Sunset Pointe Pond Modeling
Site Address: 2301 23rd Street SE
City : Puyallup, WA
Report Date: 10/11/2020
Gage : 40 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Pre-Dev
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	5.444
Pervious Total	5.444

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.444

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.994
Pervious Total	0.994

Impervious Land Use	acre
ROADS FLAT	0.609
ROOF TOPS FLAT	1.181
DRIVEWAYS FLAT	0.184
POND	0.161
Impervious Total	2.135
Basin Total	3.129

Element Flows To:
Surface Interflow Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:5.444
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.994
Total Impervious Area:2.135

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.778253
5 year	1.044173
10 year	1.237373
25 year	1.501717
50 year	1.713815
100 year	1.939337

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.778253
5 year	1.044173
10 year	1.237373
25 year	1.501717

50 year	1.713815
100 year	1.939337

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.1968 **acre-feet**
On-line facility target flow: 0.1093 **cfs.**
Adjusted for 15 min: 0.1093 **cfs.**
Off-line facility target flow: 0.06 **cfs.**
Adjusted for 15 min: 0.06 **cfs.**

Perlnd and Implnd Changes

No changes have been made.

WWHM2012
PROJECT REPORT

Project Name: 04148.7 Wetland Recharge
Site Name: Sunset Pointe Pond Modeling
Site Address: 2301 23rd Street SE
City : Puyallup, WA
Report Date: 10/13/2020
Gage : 40 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2019/09/13
Version : 4.2.17

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Pre-Dev
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Mod	2.973
Pervious Total	2.973

Impervious Land Use	acre
ROADS FLAT	0.104
ROOF TOPS FLAT	0.36
SIDEWALKS FLAT	0.071
Impervious Total	0.535
Basin Total	3.508

Element Flows To:

Surface	Interflow	Groundwater

Name : Offsite Basin
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Lawn, Flat	3.754
SAT, Forest, Flat	2.069
Pervious Total	5.823

Impervious Land Use	acre
ROOF TOPS FLAT	2.719
Impervious Total	2.719

Basin Total 8.542

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.994
Pervious Total	0.994

Impervious Land Use	acre
ROADS FLAT	0.609
ROOF TOPS FLAT	1.181
DRIVEWAYS FLAT	0.184
POND	0.161
Impervious Total	2.135

Basin Total 3.129

Element Flows To:

Surface	Interflow	Groundwater
Trapezoidal Pond 1	Trapezoidal Pond 1	

Name : Onsite Bypass
Bypass: Yes

GroundWater: No

Pervious Land Use	acre
C, Pasture, Steep	.787
Pervious Total	**0.787**

Impervious Land Use	acre
ROADS FLAT	0.021
Impervious Total	**0.021**
Basin Total	**0.808**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : Trapezoidal Pond 1
Bottom Length: 79.10 ft.
Bottom Width: 79.10 ft.
Depth: 6 ft.
Volume at riser head: 0.9310 acre-feet.
Side slope 1: 2.6 To 1
Side slope 2: 2 To 1
Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 5 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 1.000 ft.
Notch Height: 0.100 ft.
Orifice 1 Diameter: 0.99 in. **Elevation:** 0 ft.

Element Flows To:
Outlet 1 **Outlet 2**

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.143	0.000	0.000	0.000
0.0667	0.144	0.009	0.006	0.000
0.1333	0.145	0.019	0.009	0.000
0.2000	0.146	0.029	0.011	0.000
0.2667	0.147	0.038	0.013	0.000
0.3333	0.148	0.048	0.015	0.000
0.4000	0.150	0.058	0.016	0.000
0.4667	0.151	0.068	0.018	0.000

0.5333	0.152	0.078	0.019	0.000
0.6000	0.153	0.089	0.020	0.000
0.6667	0.154	0.099	0.021	0.000
0.7333	0.155	0.109	0.022	0.000
0.8000	0.156	0.120	0.023	0.000
0.8667	0.157	0.130	0.024	0.000
0.9333	0.158	0.141	0.025	0.000
1.0000	0.159	0.151	0.026	0.000
1.0667	0.160	0.162	0.027	0.000
1.1333	0.161	0.173	0.028	0.000
1.2000	0.163	0.183	0.029	0.000
1.2667	0.164	0.194	0.029	0.000
1.3333	0.165	0.205	0.030	0.000
1.4000	0.166	0.216	0.031	0.000
1.4667	0.167	0.227	0.032	0.000
1.5333	0.168	0.239	0.032	0.000
1.6000	0.169	0.250	0.033	0.000
1.6667	0.170	0.261	0.034	0.000
1.7333	0.172	0.273	0.035	0.000
1.8000	0.173	0.284	0.035	0.000
1.8667	0.174	0.296	0.036	0.000
1.9333	0.175	0.307	0.037	0.000
2.0000	0.176	0.319	0.037	0.000
2.0667	0.177	0.331	0.038	0.000
2.1333	0.178	0.343	0.038	0.000
2.2000	0.180	0.355	0.039	0.000
2.2667	0.181	0.367	0.040	0.000
2.3333	0.182	0.379	0.040	0.000
2.4000	0.183	0.391	0.041	0.000
2.4667	0.184	0.403	0.041	0.000
2.5333	0.185	0.416	0.042	0.000
2.6000	0.187	0.428	0.042	0.000
2.6667	0.188	0.441	0.043	0.000
2.7333	0.189	0.453	0.044	0.000
2.8000	0.190	0.466	0.044	0.000
2.8667	0.191	0.479	0.045	0.000
2.9333	0.193	0.492	0.045	0.000
3.0000	0.194	0.505	0.046	0.000
3.0667	0.195	0.518	0.046	0.000
3.1333	0.196	0.531	0.047	0.000
3.2000	0.197	0.544	0.047	0.000
3.2667	0.199	0.557	0.048	0.000
3.3333	0.200	0.570	0.048	0.000
3.4000	0.201	0.584	0.049	0.000
3.4667	0.202	0.597	0.049	0.000
3.5333	0.204	0.611	0.050	0.000
3.6000	0.205	0.624	0.050	0.000
3.6667	0.206	0.638	0.050	0.000
3.7333	0.207	0.652	0.051	0.000
3.8000	0.209	0.666	0.051	0.000
3.8667	0.210	0.680	0.052	0.000
3.9333	0.211	0.694	0.052	0.000
4.0000	0.212	0.708	0.053	0.000
4.0667	0.214	0.722	0.053	0.000
4.1333	0.215	0.737	0.054	0.000
4.2000	0.216	0.751	0.054	0.000
4.2667	0.218	0.765	0.054	0.000

4.3333	0.219	0.780	0.055	0.000
4.4000	0.220	0.795	0.055	0.000
4.4667	0.221	0.809	0.056	0.000
4.5333	0.223	0.824	0.056	0.000
4.6000	0.224	0.839	0.057	0.000
4.6667	0.225	0.854	0.057	0.000
4.7333	0.227	0.869	0.057	0.000
4.8000	0.228	0.884	0.058	0.000
4.8667	0.229	0.900	0.058	0.000
4.9333	0.231	0.915	0.079	0.000
5.0000	0.232	0.931	0.164	0.000
5.0667	0.233	0.946	0.438	0.000
5.1333	0.234	0.962	0.937	0.000
5.2000	0.236	0.977	1.570	0.000
5.2667	0.237	0.993	2.290	0.000
5.3333	0.238	1.009	3.049	0.000
5.4000	0.240	1.025	3.799	0.000
5.4667	0.241	1.041	4.493	0.000
5.5333	0.243	1.057	5.092	0.000
5.6000	0.244	1.074	5.569	0.000
5.6667	0.245	1.090	5.923	0.000
5.7333	0.247	1.106	6.183	0.000
5.8000	0.248	1.123	6.507	0.000
5.8667	0.249	1.139	6.767	0.000
5.9333	0.251	1.156	7.016	0.000
6.0000	0.252	1.173	7.257	0.000
6.0667	0.253	1.190	7.489	0.000

Name : Offsite Basin
Bypass: Yes

GroundWater: No

Pervious Land Use	**acre**
C, Lawn, Flat	**3.754**
SAT, Forest, Flat	**2.069**
Pervious Total	**5.823**

Impervious Land Use	**acre**
ROOF TOPS FLAT	**2.719**
Impervious Total	**2.719**

Basin Total **8.542**

Element Flows To:
Surface **Interflow** **Groundwater**

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:8.796
Total Impervious Area:3.254

Mitigated Landuse Totals for POC #1
Total Pervious Area:7.604
Total Impervious Area:4.875

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	1.396334
5 year	1.97942
10 year	2.421414
25 year	3.047182
50 year	3.564638
100 year	4.128155

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	1.216809
5 year	1.727496
10 year	2.115053
25 year	2.664257
50 year	3.118771
100 year	3.614063

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	1.392	1.194
1903	1.560	1.340
1904	2.603	2.237
1905	0.869	0.770
1906	0.900	0.771
1907	1.629	1.419
1908	1.140	0.992
1909	1.187	1.033
1910	1.806	1.605
1911	1.583	1.378
1912	4.407	3.791
1913	0.927	0.820
1914	4.978	4.393
1915	0.927	0.816
1916	1.490	1.290
1917	0.595	0.528
1918	1.173	1.012
1919	0.886	0.778

1920	1.272	1.115
1921	1.093	0.957
1922	1.866	1.620
1923	1.215	1.067
1924	1.733	1.481
1925	0.843	0.740
1926	1.382	1.183
1927	1.206	1.035
1928	1.025	0.894
1929	2.035	1.807
1930	1.856	1.602
1931	1.007	0.885
1932	1.090	0.950
1933	1.123	0.976
1934	2.184	1.895
1935	0.821	0.718
1936	1.284	1.124
1937	1.757	1.538
1938	0.940	0.820
1939	1.007	0.883
1940	1.852	1.590
1941	1.953	1.663
1942	1.775	1.550
1943	1.508	1.320
1944	2.385	2.118
1945	1.529	1.333
1946	1.476	1.292
1947	0.903	0.798
1948	1.397	1.203
1949	1.844	1.587
1950	0.997	0.847
1951	1.540	1.306
1952	3.068	2.686
1953	2.631	2.304
1954	1.127	0.980
1955	0.898	0.779
1956	0.823	0.706
1957	1.060	0.923
1958	2.186	1.943
1959	1.912	1.702
1960	1.011	0.879
1961	3.224	2.838
1962	1.264	1.101
1963	0.847	0.731
1964	3.200	2.838
1965	1.587	1.408
1966	1.047	0.910
1967	1.785	1.555
1968	1.257	1.090
1969	1.182	1.027
1970	1.572	1.369
1971	1.696	1.507
1972	4.608	4.106
1973	2.084	1.788
1974	1.814	1.572
1975	2.611	2.298
1976	2.371	2.052

1977	0.761	0.677
1978	2.056	1.830
1979	1.584	1.411
1980	1.736	1.522
1981	1.297	1.134
1982	1.066	0.937
1983	1.678	1.470
1984	1.638	1.434
1985	2.102	1.838
1986	0.950	0.827
1987	1.718	1.484
1988	0.962	0.843
1989	0.904	0.786
1990	1.209	1.045
1991	1.731	1.536
1992	1.400	1.236
1993	1.523	1.303
1994	1.579	1.396
1995	0.930	0.821
1996	1.651	1.441
1997	1.139	0.990
1998	1.576	1.370
1999	1.349	1.154
2000	1.311	1.144
2001	0.932	0.813
2002	2.618	2.273
2003	1.134	0.988
2004	1.532	1.331
2005	3.058	2.639
2006	1.289	1.107
2007	1.676	1.480
2008	1.277	1.102
2009	0.932	0.811
2010	1.258	1.116
2011	1.182	1.006
2012	1.306	1.138
2013	1.357	1.191
2014	1.120	0.975
2015	2.591	2.261
2016	1.110	0.954
2017	1.852	1.626
2018	2.021	2.119
2019	2.519	2.157
2020	1.694	1.475
2021	1.340	1.172
2022	1.895	1.643
2023	2.225	1.905
2024	3.934	3.310
2025	1.147	0.976
2026	1.313	1.115
2027	1.442	1.242
2028	0.550	0.479
2029	1.165	1.013
2030	2.031	1.747
2031	0.649	0.564
2032	0.965	0.830
2033	1.206	1.031

2034	0.923	0.794
2035	1.749	1.521
2036	1.084	0.952
2037	1.270	1.089
2038	1.888	1.667
2039	2.428	2.068
2040	1.114	0.972
2041	1.382	1.216
2042	1.747	1.525
2043	1.572	1.344
2044	1.482	1.335
2045	1.147	1.011
2046	1.222	1.077
2047	1.169	1.006
2048	0.965	0.844
2049	1.438	1.234
2050	1.321	1.151
2051	2.147	1.881
2052	1.154	0.988
2053	0.990	0.864
2054	3.051	2.708
2055	1.238	1.073
2056	1.565	1.337
2057	0.849	0.743
2058	1.438	1.222
2059	2.126	1.847

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	4.9784	4.3926
2	4.6077	4.1059
3	4.4073	3.7909
4	3.9340	3.3097
5	3.2244	2.8380
6	3.1996	2.8378
7	3.0676	2.7079
8	3.0578	2.6857
9	3.0514	2.6391
10	2.6308	2.3044
11	2.6176	2.2983
12	2.6106	2.2732
13	2.6028	2.2614
14	2.5907	2.2368
15	2.5191	2.1572
16	2.4281	2.1190
17	2.3852	2.1178
18	2.3712	2.0684
19	2.2254	2.0519
20	2.1857	1.9432
21	2.1835	1.9046
22	2.1467	1.8950
23	2.1255	1.8810
24	2.1024	1.8472
25	2.0842	1.8378
26	2.0559	1.8305

27	2.0350	1.8072
28	2.0307	1.7879
29	2.0211	1.7473
30	1.9528	1.7025
31	1.9121	1.6670
32	1.8953	1.6633
33	1.8884	1.6427
34	1.8663	1.6259
35	1.8557	1.6202
36	1.8516	1.6052
37	1.8515	1.6024
38	1.8437	1.5904
39	1.8135	1.5868
40	1.8057	1.5716
41	1.7847	1.5549
42	1.7746	1.5504
43	1.7569	1.5380
44	1.7486	1.5361
45	1.7474	1.5246
46	1.7359	1.5224
47	1.7326	1.5213
48	1.7315	1.5065
49	1.7178	1.4838
50	1.6955	1.4811
51	1.6940	1.4802
52	1.6779	1.4748
53	1.6763	1.4700
54	1.6515	1.4407
55	1.6383	1.4337
56	1.6289	1.4194
57	1.5866	1.4107
58	1.5843	1.4077
59	1.5832	1.3963
60	1.5793	1.3784
61	1.5758	1.3704
62	1.5725	1.3693
63	1.5718	1.3435
64	1.5654	1.3396
65	1.5601	1.3372
66	1.5404	1.3348
67	1.5325	1.3329
68	1.5291	1.3308
69	1.5233	1.3199
70	1.5084	1.3064
71	1.4902	1.3031
72	1.4821	1.2924
73	1.4755	1.2898
74	1.4425	1.2415
75	1.4384	1.2361
76	1.4380	1.2340
77	1.3999	1.2223
78	1.3972	1.2161
79	1.3922	1.2033
80	1.3825	1.1939
81	1.3820	1.1910
82	1.3571	1.1825
83	1.3487	1.1715

84	1.3400	1.1539
85	1.3211	1.1514
86	1.3134	1.1442
87	1.3108	1.1377
88	1.3060	1.1338
89	1.2974	1.1243
90	1.2893	1.1157
91	1.2839	1.1149
92	1.2767	1.1146
93	1.2716	1.1069
94	1.2703	1.1020
95	1.2640	1.1007
96	1.2577	1.0900
97	1.2572	1.0895
98	1.2385	1.0772
99	1.2224	1.0729
100	1.2147	1.0667
101	1.2093	1.0447
102	1.2062	1.0347
103	1.2059	1.0327
104	1.1868	1.0309
105	1.1816	1.0269
106	1.1816	1.0134
107	1.1727	1.0119
108	1.1691	1.0111
109	1.1646	1.0056
110	1.1542	1.0056
111	1.1470	0.9920
112	1.1467	0.9899
113	1.1398	0.9882
114	1.1386	0.9875
115	1.1341	0.9796
116	1.1275	0.9764
117	1.1229	0.9758
118	1.1199	0.9748
119	1.1141	0.9724
120	1.1102	0.9566
121	1.0934	0.9537
122	1.0896	0.9522
123	1.0836	0.9501
124	1.0661	0.9365
125	1.0596	0.9230
126	1.0470	0.9098
127	1.0246	0.8941
128	1.0110	0.8850
129	1.0069	0.8831
130	1.0068	0.8790
131	0.9966	0.8644
132	0.9902	0.8475
133	0.9652	0.8437
134	0.9649	0.8430
135	0.9615	0.8295
136	0.9498	0.8272
137	0.9404	0.8205
138	0.9324	0.8205
139	0.9322	0.8197
140	0.9298	0.8156

141	0.9274	0.8128
142	0.9268	0.8105
143	0.9226	0.7979
144	0.9040	0.7938
145	0.9033	0.7864
146	0.9001	0.7793
147	0.8981	0.7777
148	0.8859	0.7711
149	0.8695	0.7696
150	0.8485	0.7428
151	0.8474	0.7403
152	0.8425	0.7307
153	0.8229	0.7182
154	0.8207	0.7056
155	0.7611	0.6768
156	0.6485	0.5641
157	0.5947	0.5278
158	0.5501	0.4790

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.6982	5134	3254	63	Pass
0.7271	4417	2808	63	Pass
0.7561	3822	2455	64	Pass
0.7850	3334	2147	64	Pass
0.8140	2940	1890	64	Pass
0.8429	2608	1659	63	Pass
0.8719	2331	1474	63	Pass
0.9008	2065	1313	63	Pass
0.9298	1865	1167	62	Pass
0.9588	1652	1038	62	Pass
0.9877	1488	924	62	Pass
1.0167	1333	819	61	Pass
1.0456	1206	726	60	Pass
1.0746	1095	653	59	Pass
1.1035	988	575	58	Pass
1.1325	886	510	57	Pass
1.1614	797	464	58	Pass
1.1904	705	414	58	Pass
1.2193	650	374	57	Pass
1.2483	588	331	56	Pass
1.2773	531	308	58	Pass
1.3062	477	281	58	Pass
1.3352	429	255	59	Pass
1.3641	401	240	59	Pass
1.3931	361	221	61	Pass
1.4220	326	210	64	Pass
1.4510	304	195	64	Pass
1.4799	284	181	63	Pass
1.5089	259	162	62	Pass
1.5378	246	149	60	Pass

1.5668	229	137	59	Pass
1.5957	208	129	62	Pass
1.6247	200	123	61	Pass
1.6537	189	110	58	Pass
1.6826	174	104	59	Pass
1.7116	164	96	58	Pass
1.7405	149	95	63	Pass
1.7695	136	87	63	Pass
1.7984	133	80	60	Pass
1.8274	123	74	60	Pass
1.8563	113	65	57	Pass
1.8853	105	61	58	Pass
1.9142	96	57	59	Pass
1.9432	92	53	57	Pass
1.9722	87	49	56	Pass
2.0011	83	46	55	Pass
2.0301	79	45	56	Pass
2.0590	69	42	60	Pass
2.0880	68	39	57	Pass
2.1169	63	38	60	Pass
2.1459	59	36	61	Pass
2.1748	56	34	60	Pass
2.2038	50	33	66	Pass
2.2327	47	33	70	Pass
2.2617	47	31	65	Pass
2.2907	45	29	64	Pass
2.3196	45	27	60	Pass
2.3486	42	26	61	Pass
2.3775	39	26	66	Pass
2.4065	37	26	70	Pass
2.4354	36	26	72	Pass
2.4644	36	26	72	Pass
2.4933	34	26	76	Pass
2.5223	33	25	75	Pass
2.5512	32	25	78	Pass
2.5802	32	23	71	Pass
2.6091	30	23	76	Pass
2.6381	26	22	84	Pass
2.6671	26	20	76	Pass
2.6960	26	19	73	Pass
2.7250	26	18	69	Pass
2.7539	26	18	69	Pass
2.7829	26	17	65	Pass
2.8118	26	17	65	Pass
2.8408	26	14	53	Pass
2.8697	26	14	53	Pass
2.8987	25	14	56	Pass
2.9276	25	13	52	Pass
2.9566	24	13	54	Pass
2.9856	23	13	56	Pass
3.0145	22	13	59	Pass
3.0435	21	12	57	Pass
3.0724	18	11	61	Pass
3.1014	17	11	64	Pass
3.1303	17	11	64	Pass
3.1593	17	10	58	Pass
3.1882	17	9	52	Pass

3.2172	15	9	60	Pass
3.2461	14	9	64	Pass
3.2751	14	9	64	Pass
3.3040	14	8	57	Pass
3.3330	14	7	50	Pass
3.3620	14	7	50	Pass
3.3909	14	6	42	Pass
3.4199	14	6	42	Pass
3.4488	13	6	46	Pass
3.4778	13	5	38	Pass
3.5067	13	5	38	Pass
3.5357	13	5	38	Pass
3.5646	13	4	30	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.2178 **acre-feet**
On-line facility target flow: 0.2341 **cfs.**
Adjusted for 15 min: 0.2341 **cfs.**
Off-line facility target flow: 0.134 **cfs.**
Adjusted for 15 min: 0.134 **cfs.**

Wetlands Input Volume
Average Annual Volume (acft)
Series 1: 501 POC 1 Predeveloped flow
Series 2: 801 POC 1 Mitigated flow

Month	Series 1	Series 2	Percent	Pass/Fail
Jan	2.7139	3.1756	117.0	Fail
Feb	2.3393	2.7039	115.6	Fail
Mar	1.8368	2.1861	119.0	Fail
Apr	0.9724	1.2257	126.0	Fail
May	0.5554	0.7341	132.2	Fail
Jun	0.3728	0.5201	139.5	Fail
Jul	0.1649	0.2446	148.3	Fail
Aug	0.1827	0.2591	141.9	Fail
Sep	0.3872	0.5626	145.3	Fail
Oct	1.0255	1.3866	135.2	Fail
Nov	2.3474	2.9013	123.6	Fail
Dec	2.8709	3.4327	119.6	Fail

Day	Series 1	Series 2	Percent	Pass/Fail
Jan1	0.0759	0.0928	122.2	Fail
2	0.0959	0.1095	114.1	Pass
3	0.0988	0.1122	113.5	Pass
4	0.0781	0.0942	120.6	Fail
5	0.0825	0.0973	117.9	Pass
6	0.0876	0.1014	115.8	Pass
7	0.0859	0.1011	117.7	Pass
8	0.0784	0.0953	121.6	Fail
9	0.0878	0.1034	117.8	Pass
10	0.0866	0.1020	117.7	Pass
11	0.0873	0.1026	117.6	Pass
12	0.0799	0.0957	119.7	Pass
13	0.1032	0.1160	112.4	Pass

14	0.1100	0.1227	111.5	Pass
15	0.0968	0.1114	115.0	Pass
16	0.0958	0.1110	115.9	Pass
17	0.0942	0.1085	115.1	Pass
18	0.1084	0.1203	111.0	Pass
19	0.1033	0.1158	112.1	Pass
20	0.0842	0.0985	116.9	Pass
21	0.0750	0.0910	121.3	Fail
22	0.0923	0.1068	115.7	Pass
23	0.0994	0.1136	114.3	Pass
24	0.0912	0.1068	117.1	Pass
25	0.0775	0.0943	121.7	Fail
26	0.0879	0.1031	117.3	Pass
27	0.0785	0.0941	119.9	Pass
28	0.0681	0.0846	124.3	Fail
29	0.0615	0.0782	127.1	Fail
30	0.0806	0.0941	116.8	Pass
31	0.0913	0.1039	113.9	Pass
Feb1	0.0910	0.1034	113.7	Pass
2	0.0774	0.0916	118.3	Pass
3	0.0727	0.0873	120.1	Fail
4	0.0660	0.0809	122.4	Fail
5	0.0977	0.1077	110.3	Pass
6	0.0760	0.0898	118.1	Pass
7	0.0874	0.0998	114.2	Pass
8	0.0770	0.0905	117.6	Pass
9	0.0691	0.0824	119.1	Pass
10	0.0697	0.0823	118.1	Pass
11	0.0796	0.0912	114.6	Pass
12	0.0811	0.0943	116.3	Pass
13	0.0852	0.0983	115.4	Pass
14	0.0733	0.0881	120.3	Fail
15	0.0842	0.0966	114.7	Pass
16	0.1131	0.1220	107.9	Pass
17	0.1121	0.1226	109.3	Pass
18	0.1113	0.1219	109.6	Pass
19	0.0916	0.1047	114.3	Pass
20	0.0749	0.0901	120.2	Fail
21	0.0756	0.0895	118.4	Pass
22	0.0714	0.0854	119.6	Pass
23	0.0653	0.0800	122.5	Fail
24	0.0874	0.0992	113.5	Pass
25	0.0750	0.0895	119.3	Pass
26	0.0868	0.0987	113.7	Pass
27	0.0788	0.0917	116.3	Pass
28	0.0720	0.0850	118.0	Pass
29	0.0596	0.0748	125.5	Fail
Mar1	0.0657	0.0801	121.9	Fail
2	0.0650	0.0785	120.7	Fail
3	0.0669	0.0803	119.9	Pass
4	0.0625	0.0764	122.2	Fail
5	0.0702	0.0820	116.9	Pass
6	0.0530	0.0672	126.8	Fail
7	0.0599	0.0727	121.4	Fail
8	0.0746	0.0852	114.2	Pass
9	0.0640	0.0756	118.2	Pass
10	0.0602	0.0722	119.8	Pass

11	0.0651	0.0766	117.7	Pass
12	0.0689	0.0802	116.4	Pass
13	0.0589	0.0704	119.6	Pass
14	0.0629	0.0731	116.3	Pass
15	0.0556	0.0672	120.9	Fail
16	0.0488	0.0608	124.6	Fail
17	0.0497	0.0607	122.2	Fail
18	0.0414	0.0526	127.0	Fail
19	0.0467	0.0559	119.7	Pass
20	0.0472	0.0558	118.4	Pass
21	0.0531	0.0619	116.6	Pass
22	0.0750	0.0821	109.5	Pass
23	0.0587	0.0697	118.8	Pass
24	0.0574	0.0682	118.7	Pass
25	0.0518	0.0627	121.0	Fail
26	0.0641	0.0734	114.5	Pass
27	0.0542	0.0650	120.0	Fail
28	0.0589	0.0686	116.6	Pass
29	0.0637	0.0732	115.0	Pass
30	0.0539	0.0636	117.9	Pass
31	0.0497	0.0597	120.1	Fail
Apr1	0.0373	0.0491	131.7	Fail
2	0.0321	0.0442	137.6	Fail
3	0.0371	0.0472	127.2	Fail
4	0.0445	0.0525	117.9	Pass
5	0.0397	0.0484	121.7	Fail
6	0.0347	0.0426	122.9	Fail
7	0.0397	0.0471	118.8	Pass
8	0.0480	0.0552	115.0	Pass
9	0.0444	0.0532	119.9	Pass
10	0.0377	0.0475	126.0	Fail
11	0.0429	0.0526	122.7	Fail
12	0.0357	0.0465	130.1	Fail
13	0.0263	0.0376	142.9	Fail
14	0.0259	0.0355	136.8	Fail
15	0.0196	0.0291	148.0	Fail
16	0.0287	0.0360	125.7	Fail
17	0.0221	0.0294	133.3	Fail
18	0.0245	0.0308	125.8	Fail
19	0.0388	0.0438	113.0	Pass
20	0.0289	0.0360	124.5	Fail
21	0.0262	0.0329	125.8	Fail
22	0.0313	0.0375	119.6	Pass
23	0.0411	0.0481	117.2	Pass
24	0.0289	0.0380	131.6	Fail
25	0.0174	0.0263	151.3	Fail
26	0.0278	0.0347	125.0	Fail
27	0.0214	0.0292	136.8	Fail
28	0.0208	0.0283	136.3	Fail
29	0.0198	0.0270	136.2	Fail
30	0.0262	0.0322	122.9	Fail
May1	0.0361	0.0412	114.1	Pass
2	0.0263	0.0335	127.5	Fail
3	0.0239	0.0313	130.8	Fail
4	0.0302	0.0367	121.6	Fail
5	0.0268	0.0343	128.2	Fail
6	0.0207	0.0283	137.1	Fail

7	0.0188	0.0262	139.0	Fail
8	0.0158	0.0228	144.2	Fail
9	0.0106	0.0169	159.2	Fail
10	0.0141	0.0198	140.7	Fail
11	0.0155	0.0208	134.6	Fail
12	0.0162	0.0213	131.1	Fail
13	0.0199	0.0251	126.0	Fail
14	0.0126	0.0189	149.9	Fail
15	0.0136	0.0189	138.5	Fail
16	0.0208	0.0256	123.0	Fail
17	0.0146	0.0198	135.5	Fail
18	0.0129	0.0181	140.1	Fail
19	0.0156	0.0205	131.7	Fail
20	0.0148	0.0205	138.1	Fail
21	0.0129	0.0184	142.1	Fail
22	0.0135	0.0184	136.5	Fail
23	0.0160	0.0205	127.7	Fail
24	0.0136	0.0188	138.3	Fail
25	0.0158	0.0212	133.8	Fail
26	0.0162	0.0215	132.3	Fail
27	0.0132	0.0190	143.4	Fail
28	0.0154	0.0204	132.6	Fail
29	0.0188	0.0236	125.6	Fail
30	0.0142	0.0203	142.5	Fail
31	0.0185	0.0248	133.8	Fail
Jun1	0.0194	0.0255	131.3	Fail
2	0.0134	0.0195	145.5	Fail
3	0.0126	0.0177	140.3	Fail
4	0.0171	0.0225	131.5	Fail
5	0.0158	0.0212	134.5	Fail
6	0.0161	0.0218	135.6	Fail
7	0.0157	0.0212	135.4	Fail
8	0.0166	0.0219	131.4	Fail
9	0.0185	0.0240	130.1	Fail
10	0.0121	0.0179	148.8	Fail
11	0.0137	0.0191	139.9	Fail
12	0.0103	0.0163	159.0	Fail
13	0.0095	0.0150	157.8	Fail
14	0.0142	0.0184	129.8	Fail
15	0.0110	0.0157	143.4	Fail
16	0.0136	0.0185	135.7	Fail
17	0.0086	0.0140	162.7	Fail
18	0.0087	0.0133	151.9	Fail
19	0.0073	0.0114	155.9	Fail
20	0.0126	0.0160	127.0	Fail
21	0.0089	0.0131	146.7	Fail
22	0.0054	0.0095	175.9	Fail
23	0.0182	0.0215	117.7	Pass
24	0.0090	0.0139	154.9	Fail
25	0.0094	0.0142	151.0	Fail
26	0.0083	0.0128	153.2	Fail
27	0.0077	0.0119	153.3	Fail
28	0.0073	0.0107	147.4	Fail
29	0.0133	0.0167	125.7	Fail
30	0.0096	0.0136	142.4	Fail
Jul1	0.0099	0.0140	142.2	Fail
2	0.0083	0.0126	151.3	Fail

3	0.0056	0.0095	171.3	Fail
4	0.0066	0.0100	151.8	Fail
5	0.0087	0.0120	137.5	Fail
6	0.0033	0.0066	196.7	Fail
7	0.0111	0.0136	122.6	Fail
8	0.0087	0.0125	143.3	Fail
9	0.0036	0.0079	222.3	Fail
10	0.0057	0.0087	151.4	Fail
11	0.0054	0.0079	146.3	Fail
12	0.0117	0.0135	115.4	Pass
13	0.0049	0.0074	151.4	Fail
14	0.0079	0.0102	128.8	Fail
15	0.0072	0.0099	138.0	Fail
16	0.0058	0.0093	159.2	Fail
17	0.0071	0.0101	142.1	Fail
18	0.0046	0.0079	171.1	Fail
19	0.0034	0.0061	180.5	Fail
20	0.0040	0.0063	158.4	Fail
21	0.0030	0.0049	166.0	Fail
22	0.0010	0.0026	248.9	Fail
23	0.0015	0.0027	174.7	Fail
24	0.0018	0.0028	153.9	Fail
25	0.0049	0.0058	118.9	Pass
26	0.0037	0.0050	135.9	Fail
27	0.0031	0.0047	151.7	Fail
28	0.0015	0.0032	213.3	Fail
29	0.0007	0.0019	265.1	Fail
30	0.0006	0.0013	236.4	Fail
31	0.0016	0.0021	132.1	Fail
Aug1	0.0019	0.0027	139.3	Fail
2	0.0046	0.0056	121.0	Fail
3	0.0050	0.0063	124.8	Fail
4	0.0021	0.0039	188.4	Fail
5	0.0033	0.0047	144.1	Fail
6	0.0035	0.0050	145.2	Fail
7	0.0039	0.0056	141.2	Fail
8	0.0034	0.0052	153.2	Fail
9	0.0016	0.0032	204.9	Fail
10	0.0045	0.0057	127.3	Fail
11	0.0018	0.0034	191.8	Fail
12	0.0051	0.0067	132.1	Fail
13	0.0034	0.0052	154.1	Fail
14	0.0075	0.0090	120.5	Fail
15	0.0061	0.0086	139.8	Fail
16	0.0078	0.0106	136.3	Fail
17	0.0077	0.0109	141.2	Fail
18	0.0028	0.0064	225.7	Fail
19	0.0060	0.0086	142.6	Fail
20	0.0045	0.0072	161.5	Fail
21	0.0059	0.0083	139.8	Fail
22	0.0051	0.0077	152.0	Fail
23	0.0120	0.0142	117.9	Pass
24	0.0091	0.0127	139.5	Fail
25	0.0087	0.0124	142.5	Fail
26	0.0123	0.0160	130.3	Fail
27	0.0115	0.0158	137.4	Fail
28	0.0145	0.0196	135.2	Fail

29	0.0064	0.0123	191.9	Fail
30	0.0092	0.0138	149.0	Fail
31	0.0185	0.0221	119.4	Pass
Sep1	0.0168	0.0219	130.5	Fail
2	0.0127	0.0185	145.5	Fail
3	0.0069	0.0132	192.0	Fail
4	0.0119	0.0176	147.4	Fail
5	0.0090	0.0147	163.3	Fail
6	0.0057	0.0114	199.4	Fail
7	0.0083	0.0130	157.3	Fail
8	0.0090	0.0136	151.0	Fail
9	0.0121	0.0162	133.5	Fail
10	0.0096	0.0149	155.6	Fail
11	0.0050	0.0099	199.9	Fail
12	0.0081	0.0117	144.3	Fail
13	0.0079	0.0115	145.3	Fail
14	0.0166	0.0204	123.2	Fail
15	0.0142	0.0196	137.8	Fail
16	0.0138	0.0195	141.3	Fail
17	0.0222	0.0281	126.5	Fail
18	0.0129	0.0206	159.7	Fail
19	0.0187	0.0257	137.3	Fail
20	0.0138	0.0213	154.8	Fail
21	0.0153	0.0225	147.1	Fail
22	0.0176	0.0242	138.0	Fail
23	0.0204	0.0265	129.6	Fail
24	0.0124	0.0198	159.5	Fail
25	0.0086	0.0159	185.4	Fail
26	0.0177	0.0237	133.3	Fail
27	0.0197	0.0269	136.9	Fail
28	0.0133	0.0215	162.0	Fail
29	0.0088	0.0164	185.5	Fail
30	0.0201	0.0260	129.5	Fail
Oct1	0.0188	0.0250	133.0	Fail
2	0.0169	0.0238	141.3	Fail
3	0.0142	0.0214	151.4	Fail
4	0.0210	0.0283	134.6	Fail
5	0.0197	0.0278	141.2	Fail
6	0.0386	0.0455	118.0	Pass
7	0.0296	0.0389	131.6	Fail
8	0.0308	0.0409	132.7	Fail
9	0.0300	0.0399	132.8	Fail
10	0.0282	0.0404	143.3	Fail
11	0.0242	0.0361	149.3	Fail
12	0.0232	0.0354	152.4	Fail
13	0.0240	0.0365	151.8	Fail
14	0.0245	0.0361	147.5	Fail
15	0.0211	0.0319	151.1	Fail
16	0.0259	0.0356	137.8	Fail
17	0.0336	0.0423	125.7	Fail
18	0.0358	0.0456	127.3	Fail
19	0.0374	0.0492	131.5	Fail
20	0.0484	0.0607	125.5	Fail
21	0.0383	0.0537	140.3	Fail
22	0.0323	0.0478	147.8	Fail
23	0.0418	0.0565	135.0	Fail
24	0.0429	0.0580	135.3	Fail

25	0.0458	0.0615	134.4	Fail
26	0.0591	0.0738	124.8	Fail
27	0.0536	0.0701	130.8	Fail
28	0.0496	0.0673	135.5	Fail
29	0.0437	0.0618	141.3	Fail
30	0.0529	0.0692	130.9	Fail
31	0.0525	0.0687	130.9	Fail
Nov1	0.0532	0.0690	129.6	Fail
2	0.0615	0.0771	125.4	Fail
3	0.0637	0.0808	126.8	Fail
4	0.0549	0.0750	136.7	Fail
5	0.0504	0.0708	140.3	Fail
6	0.0609	0.0790	129.9	Fail
7	0.0474	0.0672	141.8	Fail
8	0.0604	0.0775	128.2	Fail
9	0.0640	0.0811	126.7	Fail
10	0.0792	0.0954	120.5	Fail
11	0.0732	0.0918	125.3	Fail
12	0.0761	0.0941	123.7	Fail
13	0.0809	0.0992	122.6	Fail
14	0.0709	0.0903	127.3	Fail
15	0.0766	0.0955	124.7	Fail
16	0.0878	0.1059	120.6	Fail
17	0.0822	0.1021	124.3	Fail
18	0.0813	0.1016	124.9	Fail
19	0.0938	0.1121	119.5	Pass
20	0.0765	0.0959	125.4	Fail
21	0.0929	0.1098	118.2	Pass
22	0.0930	0.1113	119.6	Pass
23	0.1237	0.1386	112.1	Pass
24	0.1206	0.1382	114.6	Pass
25	0.1137	0.1325	116.6	Pass
26	0.0861	0.1083	125.8	Fail
27	0.0867	0.1085	125.2	Fail
28	0.0795	0.1016	127.8	Fail
29	0.1044	0.1229	117.7	Pass
30	0.0977	0.1180	120.8	Fail
Dec1	0.1026	0.1234	120.3	Fail
2	0.1123	0.1325	118.0	Pass
3	0.1047	0.1256	119.9	Pass
4	0.1077	0.1284	119.2	Pass
5	0.1033	0.1252	121.1	Fail
6	0.0932	0.1165	125.0	Fail
7	0.0920	0.1143	124.3	Fail
8	0.0782	0.1016	130.0	Fail
9	0.0876	0.1081	123.4	Fail
10	0.0957	0.1146	119.8	Pass
11	0.1003	0.1179	117.5	Pass
12	0.0819	0.1017	124.3	Fail
13	0.0933	0.1103	118.2	Pass
14	0.0920	0.1085	117.9	Pass
15	0.0898	0.1056	117.6	Pass
16	0.0976	0.1127	115.5	Pass
17	0.0832	0.1014	121.9	Fail
18	0.0756	0.0939	124.2	Fail
19	0.0973	0.1118	114.9	Pass
20	0.0982	0.1138	115.9	Pass

21	0.1011	0.1174	116.2	Pass
22	0.0887	0.1059	119.5	Pass
23	0.0830	0.1010	121.7	Fail
24	0.0811	0.0988	121.9	Fail
25	0.0925	0.1072	115.9	Pass
26	0.0975	0.1108	113.7	Pass
27	0.0843	0.0999	118.4	Pass
28	0.0887	0.1035	116.7	Pass
29	0.0993	0.1136	114.4	Pass
30	0.0712	0.0893	125.4	Fail
31	0.0822	0.0982	119.5	Pass

Perlnd and Implnd Changes

No changes have been made.

APPENDIX D

Reports

GEOTECHNICAL ENGINEER'S REPORT

Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

October 23, 2020
ES-5559.03

Mr. Peter Chen
4709 Memory Lane West
University Place, Washington 98488

Subject: **Geotechnical Addendum – Response to Comments**
Proposed Sunset Pointe Residential Development
2301 – 23rd Street Southeast
Puyallup, Washington

Reference: Earth Solutions NW, LLC
Geotechnical Engineering Study
ES-5559, updated June 24, 2019

Earth Solutions NW, LLC
Response to Development Review Team Letter
ES-5559.01, dated October 31, 2018

CES NW, Inc.
Slope Exhibit

City of Puyallup Development Review Team (DRT) Letter
Dated November 21, 2019

Greetings, Mr. Chen:

At the request of CES NW, Inc., Earth Solutions NW, LLC (ESNW), has prepared this geotechnical addendum for the subject project. Our scope of services included project team discussions, subsurface exploration, infiltration testing, document review, and geotechnical engineering, of which were completed to address jurisdictional comments provided in the referenced DRT letter. This addendum letter has been structured to provide updated information with respect to project intentions and subsurface soil and groundwater conditions. Following this introductory narrative are ESNW response to the DRT letter comments.

Project Description

The site consists of one tax parcel (Pierce County Parcel No. 0420353027) totaling about 9.09 acres. The approximate site location is depicted on Plate 1 (Vicinity Map). Overall site topography consists of a central low area that trends roughly north to south, which likely represents a former, post-glacial drainage channel or similar geomorphological feature. We understand the project is pursing construction of a residential plat that will consist of 18 home building sites and infrastructure improvements. The lots will be located within the topographically higher areas, where gradients are gentler. Infiltration is considered infeasible from a geotechnical standpoint based on the conditions encountered during our various subsurface explorations and recent in-situ infiltration testing, and therefore, will not be pursued. As such, detention and targeted dispersion will likely be pursued for stormwater management.

Surface

The subject site was previously developed to some degree; as evidenced by remnant foundation elements and rubble fill present within the southern site area. The fill encountered across the site also suggests historic grade modifications which altered the natural topography. Current topographic conditions vary across the site, with some areas being relatively level (Lots 1 – 7 and 15 – 18). The remaining lots either partially or fully contain some slope features. Three pond areas which have been designated as wetlands (A-C) are present within the central low area of the site, effectively separating Lots 1 through 8 from the rest of the development. In total, about 30 feet of elevation change occurs within the confines of the property. However, no proposed lot area contains more than 22 feet of elevation change. The site is heavily vegetated with grass, brush, brambles, and tree growth.

Subsurface

ESNW previously performed three separate subsurface investigations at the site. The site investigations were performed on October 24, 2017, May 15, 2019, and January 22, 2020. Each exploration was conducted using equipment and an operator retained by our firm and completed to both classify soil and groundwater conditions as well as perform in-situ infiltration testing. Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

It should be noted that TP-14 through TP-18 were performed in an area that is no longer included in the proposed development. As such, subsurface soil and groundwater conditions encountered at these locations are not directly relevant to the proposed development area.

Topsoil and Fill

Topsoil was encountered in the upper approximately 1 to 18 inches of existing grades. The topsoil was characterized by a dark brown color, the presence of fine organic material, and small root intrusions. Fill was observed at nine test pit locations and generally consisted of silty sand (with or without gravel), silt, and silt with sand. Near surface fill consisting of crushed to clean rock was encountered at TP-1, -2, and -202. Encountered fill was characterized as loose to medium dense and moist to wet condition extending in exposure depths from about 0.5 to 13 feet below the existing ground surface (bgs). We did not fully penetrate the fill at test pit locations TP-3 and TP-103.

Native Soil

Underlying topsoil and fill, the encountered native soils were generally considered representative of glacial drift deposits. In our opinion, the predominate native soil type should be considered silty sand with or without gravel and silt with varying fines percentages (USCS: SM and ML, respectively). However, areas and depositional lenses of poorly graded sand (USCS: SP) should be anticipated across the site. The native soils were typically encountered in a medium dense to dense and moist to wet condition extending to a maximum exploration depth of about 16 feet bgs.

Groundwater

Perched groundwater seepage was encountered at TP-4 during our fieldwork completed on October 24, 2017, and was exposed at a depth of about four feet bgs. The seepage flow was characterized as heavy at that time. Groundwater seepage was not encountered during our May 2019 or January 2020 exploration. Groundwater seepage zones are common within glacial deposits and may develop within permeable lens or atop denser deposits. Seepage rates and elevations can be influenced by precipitation duration/amounts, the time of year, and soil conditions.

Geologically Hazardous Areas

In preparation of this report, we reviewed applicable city of Puyallup mapping and geologically hazardous area code section 21.06. Our evaluation is as follows.

Landslide Hazard

As defined in Puyallup Municipal Code (PMC) 21.06.1210, landslide and erosion hazard areas include those identified by the U.S. Department of Agriculture Natural Resources Conservation Service as having a moderate to severe, severe, or very severe erosion hazard because of natural characteristics, including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or human-induced changes to natural characteristics. Landslide and erosion hazard areas include areas with the following characteristics:

- Areas that have shown mass movement during the Holocene epoch (from 10,000 years ago to the present) or that are underlain or covered by mass wastage debris of that epoch;

- Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials;

- Slopes having gradients steeper than 80 percent subject to rock fall during seismic shaking;

- Areas potentially unstable because of stream incision or stream bank erosion;

- Areas located in a canyon, ravine, or on an active alluvial fan, presently or potentially subject to inundation by debris flows or flooding;

- Any area with a slope of 40 percent or steeper and a vertical relief of 10 or more feet, except areas composed of consolidated rock and properly engineered manmade slopes/retained fill. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least 10 feet of vertical relief;

- Areas with a severe limitation for building development because of slope conditions, according to the Natural Resource Conservations Service, and;

- Areas meeting all three of the following criteria: (A) slopes steeper than 15 percent, except that slopes of less than 15 percent may be considered erosion hazard areas if they have certain unstable soil and drainage characteristics; (B) hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and (C) wet season springs or ground water seepage.

Based on the conditions encountered during our subsurface explorations, review of available topographic information, and review of the referenced slope schematic, it appears that the majority of the proposed home building sites do not contain a landslide hazard, as defined by the PMC. Although there are areas onsite which do contain slope gradients of 40 percent or more, these are generally less than 10 feet in height and therefore do not meet the definition of a landslide hazard per PMC code. Slopes which do extend above 10 feet in elevation change appear to primarily be within tract areas. However, it does appear that Lots 10 and 15 either partially contain, or are directly adjacent to, a slope which may be characterized as a landslide hazard.

PMC 21.06.1240.1a.iii, suggests that a buffer equal to the height of the slope (H) divided by 2 be applied for slopes with a vertical elevation of more than 10 feet but less than 25 feet, regardless of slope percent provided that no other factors are present that pose a slope stability risk. Based on our review of the referenced scope schematic, this code consideration would be applicable to Lots 10 and 15. However, this code section does acknowledge the buffer may be waived for isolated slopes that are limited in extent and predominately less than 10 feet in height. Given the limited and isolated occurrences of the sloping areas that meet the PMC definition of a landslide hazard area (40 percent gradient), it is our opinion these slopes not be considered a regulated hazard and meet the criteria for an exemption, as allowed within PMC 21.06.1240.1a.iii. Although lot grading plans have yet to be developed, it is our opinion that general mass grading will allow for the removal of unsuitable soil (native or fill) and restoration with suitable structural fill, where necessary. In our opinion, the proposed development provides an opportunity for general improvements to soil stability and the site hydrologic regime. Although the PMC suggests that minimizing alterations to existing slope features is preferred over mass grading, it may be considered advantageous for both structural support and soil stability characteristics to alter areas/slopes that contain unsuitable soils and install improved drainage measures. Slope fills (placed in accordance with this report) as well as the use of retaining walls to achieve design grades may also be considered feasible from a geotechnical standpoint.

The PMC also characterizes landslide hazards as areas that have a combination of slopes more than 15 percent, that have permeable soils overlying impermeable soils, and wet season springs and groundwater seepage. The majority of the proposed development area is relatively level to gently sloping. There are areas of the site that do exceed 15 percent, however, based on our exploration, the majority of these areas do not meet the additional soil and groundwater requisite conditions to be considered a landslide hazard.

One area of seepage was identified during our subsurface explorations (TP-4, October 24, 2017). In this respect, the seepage zone is considered isolated, rather than a pervasive or chronic site condition. It is possible for groundwater seepage zones to develop elsewhere on site but will likely be seasonal and a result of yearly rainfall totals. From a stability standpoint, the development of a seepage zone is not considered a direct indication of instability, but rather the natural lateral migration of subsurface water. We understand stormwater flows will be managed with a detention vault in conjunction with individual lot dispersion devices, where feasible. In this regard, surface water and erosion that may impact adjacent properties either during or post construction will be adequately mitigated. Where encountered during construction, seepage zones can adequately be mitigated via passive drainage elements and Best Management Practice (BMPs) measures.

In general, the development areas of the site do not contain a landslide hazard. Although some sites area may meet the PMC criteria for landslide hazard, they are isolated and limited occurrence, which meets the requirements for an exemption per PMC 21.06.1240.1a.iii. In our opinion, the site does not contain a hazard that would preclude successful development. However, remediation of unsuitable existing soils and groundwater drainage improvements will likely be necessary to assist in maintaining or improving post-construction soil stability. As such, ESNW should be present during construction activities to help identify areas of unsuitable soil and groundwater seepage and provide such mitigation recommendations. From a geotechnical standpoint, provided the recommendations of the referenced report and those contained within this letter are incorporated into the project designs, it is our opinion, based on our understanding of the current scope, the project can be developed as is currently proposed.

Erosion Hazard

As delineated in Puyallup Municipal Code (PMC) 21.06.1210, erosion hazard areas include those identified by the U.S. Department of Agriculture Natural Resources Conservation Service as having a moderate to severe, severe, or very severe erosion hazard because of natural characteristics, including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or human-induced changes to natural characteristics.

Site soils are considered to have moderate to severe erosion potential when exposed to precipitation. In our opinion, provided appropriate temporary and permanent erosion and sediment control (ESC) measures are incorporated into final designs, the potential for erosion will remain low both during and after construction. Site BMPs and other means of sediment and surface flow control measures should be actively maintained during construction to ensure proper performance and functions.

Provided the above recommendations and considerations are include with the construction plan and sequence, it is our opinion that the proposed development will not adversely affect soil stability on adjacent properties.

Please note that our evaluation and corresponding lot recommendations are based on plans and site layouts made available to ESNW during report preparation. If site layout plans change, ESNW should be notified to provide updated recommendations.

Response to Comments

As requested, ESNW has prepared the following sections in response to the referenced DRT letter issued by the City of Puyallup.

Planning Review – Page 2 of 11

City Comment 5 – In a separate memo from your Geotech, please address the site development and the standards of PMC 21.06.1230.2(A-F).

PMC 21.06.1230.2.a. The proposed development shall not decrease the factor of safety for landslide occurrences below the limits of 1.5 for static conditions and 1.2 for dynamic conditions. Analysis of dynamic conditions shall be based on a minimum horizontal acceleration as established by the current version of the International Building Code.

ESNW Response – We understand that grading plans for the proposed roadway have been developed; however, mass/lot grading plans will not be completed until the time of construction. ESNW can provide stability analyses once plans have been developed. However, as stated above in our landslide hazard evaluation, the proposed development provides an opportunity for general improvements to soil stability and the site hydrologic regime through removal or unsuitable soils, engineered fills, and drainage improvements. In general, these are considered advantageous for soil stability.

PMC 21.06.1230.2.b. The alteration will not increase the threat of the geological hazard to the project site or adjacent properties beyond predevelopment conditions, nor shall it result in the need for increased buffers on neighboring properties.

ESNW Response – As with similar residential developments, the proposed construction will include drainage improvements, stormwater management systems, and earthwork activities, will likely include engineered slope and structural fill placement and compaction. As such, it is our opinion that site stability characteristics will not be adversely affected by the proposed project. Additionally, it is our opinion the proposed project will not result in the need for increased buffers on adjacent properties.

PMC 21.06.1230.2.c. The development will not increase or concentrate surface water discharge or sedimentation to adjacent sites beyond predevelopment conditions.

ESNW Response – Temporary erosion control measures and best management practices (BMPs) will be used during construction. Provided they are adequately maintained, they should provide sufficient mitigation for control of surface water flows and potential sediment migration. Post construction, the stormwater management system will provide surface water flow control while permanent landscaping will help prevent sediment migration.

PMC 21.06.1230.2.d. Structures and improvements shall be located to minimize alterations to the natural contour of the slope and foundations shall be tiered where possible to conform to existing topography.

ESNW Response – Where feasible, foundations should be stepped to follow existing contours to minimize alteration to the existing topography. It is also our opinion that the use of engineered retaining walls and fill slopes (constructed in accordance with our referenced report) are also a feasible means of establishing design grades.

PMC 21.06.1230.2.e. The use of engineered retaining walls that allow the maintenance of existing natural slope area is preferred over graded artificial slopes. Engineered retaining walls shall not exceed 15 feet in height and preferably should be less than eight feet in height. Riprap retaining walls should not exceed eight feet in height. Wherever possible, retaining walls should be designed as structural elements of the building foundation.

ESNW Response – The use of mechanically stabilized earth (MSE) walls are considered feasible for the project. ESNW can provide MSE wall designs and supporting calculations, upon request.

PMC 21.06.1230.2.f. Development shall be designed to minimize impervious lot coverage. Use of common access drives and utility corridors is encouraged.

ESNW Response – Geotechnical response not applicable.

Engineering Review – Page 4 of 11

City Comment 2 – The city will require the applicant to depict the toe of the slope on the Kodiac estates. If site access cannot be grained, Lidar contours may be used to supplement survey information. The critical area report must individually address performance standards from PMC 21.06.1230. As part of this, the geotechnical engineer must specifically address impacts to adjacent properties.

ESNW Response – We have provided a response to the comment (PMC 21.06.1230.2) in the above section. The response was prepared using information and site design available to us.

City Comment 5 – Small-scale PIT tests and continuous seasonal high groundwater monitoring in accordance with the 2014 DOE manual will be required prior to approval of the preliminary plat.

ESNW Response – ESNW performed two small-scale PIT tests on January 22, 2020. The locations of the PITs are depicted on the attached Plate 2 and are denoted as TP-201 and TP-202. The testing was intended to provide a general determination of site infiltration feasibility given that our previous recommendation that the site not pursue infiltration. The PITs were performed at a depth of about four feet bgs within undisturbed native soils. At this depth silt (USCS: ML) was encountered at each testing location. At the time of our testing, a measured rate of zero (0) inches per hour (iph) was recorded during the soak.

In accordance with our previous evaluations, infiltration is not considered feasible for the proposed project. Although areas of sand were locally encountered, they are not prevalent enough to be considered a feasible targeted media that would facilitate infiltration. In addition, the measured rate of 0 iph from our January 2020 testing further suggests the infeasibly of site soils to be used for infiltration purposes. As such, infiltration is not considered feasible from a geotechnical standpoint.

Geotechnical/Critical Areas Assessment/Stormwater Report Review – Page 5 of 11

City Comment 1 – The 06/2019 geotechnical report appears to have a different lot numbering than the civil plans. Please update so that both the plans and report have the same lot numbering. Further, the body of the geotechnical report appears to be referencing a different lot numbering than the report exhibit. Specifically, the updated geotechnical report states that lots 9, 10, and 15 meet the landslide hazard criteria of having slopes greater than 40 percent with at least 10 feet of vertical elevation relief, yet these lots do not appear to meet that criteria. Please verify.

ESNW Response – The attached Plate 2 reflects the current site layout designs and lot numbering. The reference slope schematic provided to us had been generated to display slopes of 40 percent or greater located on site. In general, slopes of 40 percent or greater are confined within wetland or tract areas and will largely not be disturbed as part of site development activities. However, minor areas of 40 percent or greater slopes that extend 10 or more vertical feet have been shown to be partially within or extend onto Lots 10 and 15. However, given the limited extent and isolated occurrence, it is our opinion these areas may pursue an exemption in accordance with PMC 21.06.1240.1a.iii.

City Comment 2 – The geotechnical study does not include any infiltration testing to support its claim that infiltration is infeasible. In addition, other than the heavy perched groundwater seepage observed in TP-4, the report offers little discussion on the expected groundwater conditions. Evidence of iron oxide staining in many test pits along with Habitat Technologies observation of "numerous groundwater seeps" and fully "fully saturated conditions" in their site reconnaissance suggests that there is more to elaborate on with regards to groundwater. Prior to preliminary plat approval, we weather infiltration and groundwater testing in accordance with the 2012 SWMMWW will be require to support stormwater feasibility/infeasibility.

ESNW Response – ESNW performed two small PIT tests on January 22, 2020. The locations of the PITs are depicted on the attached Plate 2 and are denoted as TP-201 and TP-202. Because infiltration has not been proposed and no designs were produced, the testing was intended to provide a general determination of site infiltration feasibility. The PITs were performed at a depth of about four feet bgs within undisturbed native soil. Silt (USCS: ML) was encountered at the testing depth at each location. At the time of our testing, a measured rate of zero (0) inches per hour (iph) was recorded during the soak. At that time the testing was terminated, given the measured rate of 0 iph.

In accordance with our previous evaluations, infiltration is not considered feasible for the proposed project. Although areas of sand were locally encountered, they are not prevalent enough to be considered representative of the overall site conditions or a feasible targeted media that would facilitate infiltration. In addition, the measured rate of 0 iph from our January 2020 testing further indicates the infeasibly of site soils to be used for infiltration purposes. As such, infiltration is not considered feasible from a geotechnical standpoint.

Groundwater seepage was only encountered at TP-4 during our October 2017 exploration. Perched groundwater seepage is common within glacially deposited sediments. The presence and flow rate of a perched seepage zone can depend precipitation duration and amounts, the time of year, and soil types present within the substratum. In this respect, it can be difficult to determine when and where a perched seepage may develop. Although iron oxide staining was encountered at various test pit locations, the presence is not a clear and accurate indication of current site groundwater conditions.

City Comment 3 – The geotechnical study does not address the presence of wetland and perennial streams on-site. Please include a brief description of these features and their impacts on the site soils, if applicable.

ESNW Response – Three wetland areas have been identified on site (by others) and largely occupy the entire central site area within a local depression. Because these areas are largely outside the proposed development envelope, we do not anticipate they will have an impact on site soils within the proposed development envelope.

City Comment 5 – The landslide hazard discussion for lots 12 and 13 appear to be commenting on the existing slope and not the proposed 2:1, 20 foot plus slope at the southern sides of lots 13 through 17, 7, and 8. Further, the discussion does not address the heavy perched groundwater found near TP-4 near proposed lot 14 or the presence of loose to medium dense soils atop dense silts and the impact of development on these soils. Applicant will not be permitted to increase the height and slopes of the landslide hazard area as currently depicted.

ESNW Response – The above comment appears to be in reference to a different site layout than what has been currently provided to ESNW. In any respect, 2H:1V engineered slopes are considered feasible if constructed in accordance with the recommendations provided in the referenced report and as recommended by ESNW at the time of construction. Where significant groundwater seepage is encountered during slopes construction, additional drainage measures may be recommended at that time. Areas of existing fill may require reworking (e.g. removal and replacement) to establish competent conditions for foundation or fill slope construction.

ESNW should have an opportunity to review final project plans with respect to the geotechnical recommendations provided in this letter. ESNW should also be retained to provide testing, observation, and other consultation services during construction.

We trust this addendum meets your current needs. If you have any questions regarding the content of this letter, or require additional information, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

10/23/2020

Chase G. Halsen

Chase G. Halsen, L.G.
Project Geologist

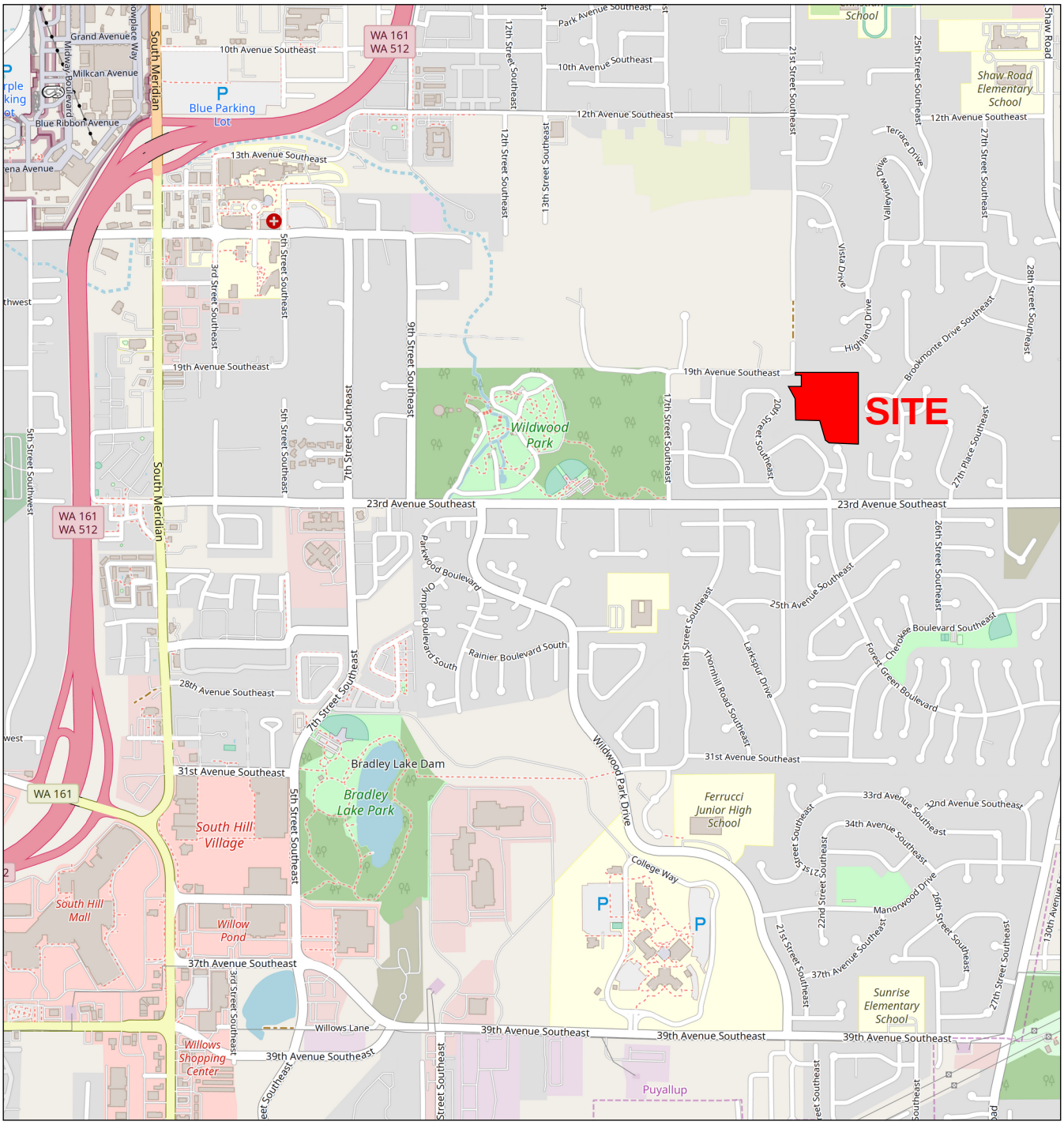
Scott S. Riegel, L.G., L.E.G.
Senior Project Manager

10/23/2020

Raymond A. Coglas, P.E.
Principal Engineer

Attachments: Plate 1 – Vicinity Map
Plate 2 – Test Pit Location Plan
Test Pit Logs
Grain Size Distribution

cc: CES NW, Inc.
Attention: Mr. Fred Brown, P.E. (Email only)



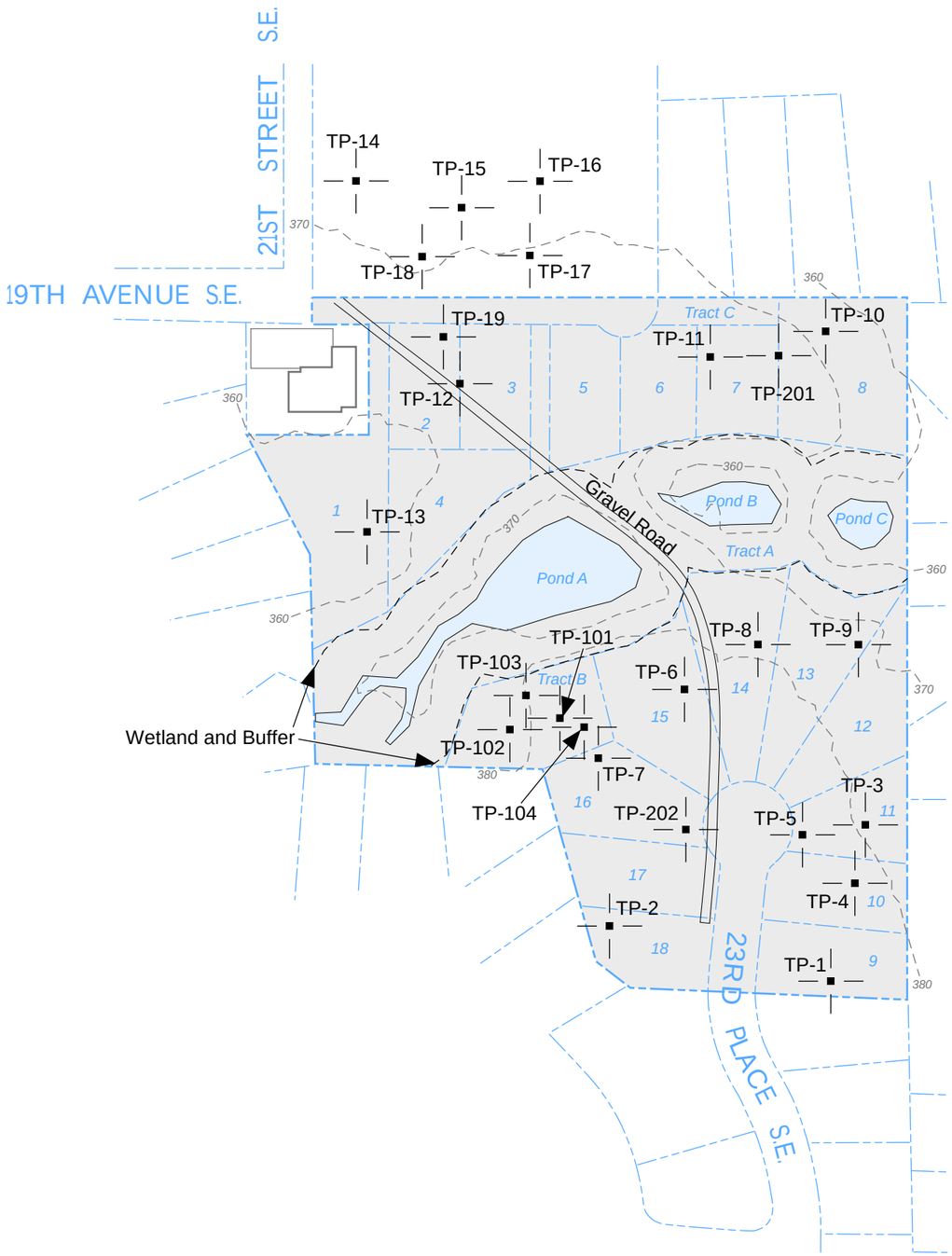
Reference:
Pierce County, Washington
OpenStreetMap.org

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Sunset Pointe
Puyallup, Washington

Drwn. CAM	Date 02/21/2020	Proj. No. 5559.03
Checked CGH	Date Feb. 2020	Plate 1



LEGEND

TP-201 — Approximate Location of ESNW Test Pit, Proj. No. ES-5559.03, Jan. 2020

TP-101 — Approximate Location of ESNW Test Pit, Proj. No. ES-5559, May 2019

TP-1 — Approximate Location of ESNW Test Pit, Proj No. ES-5559, Oct. 2017

Subject Site

Existing Building

10 — Proposed Lot Number

NORTH

0 75 150

1"=150'

Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

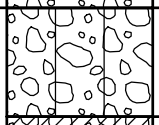
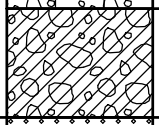
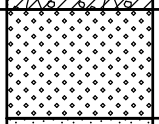
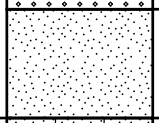
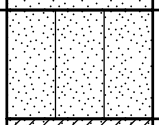
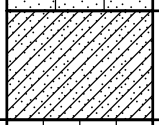
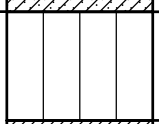
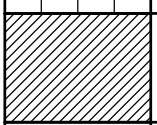
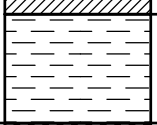
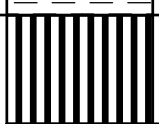
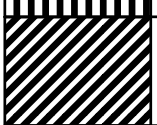
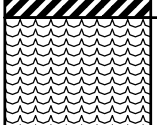
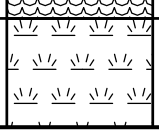
Test Pit Location Plan
Sunset Pointe
Puyallup, Washington

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Drwn. By	CAM
Checked By	CGH
Date	02/21/2020
Proj. No.	5559.03
Plate	2

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

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TEST PIT NUMBER TP-201

PROJECT NUMBER ES-5559.03 **PROJECT NAME** Sunset Pointe

DATE STARTED 1/22/20 **COMPLETED** 1/22/20 **GROUND ELEVATION** 374 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION	
0			TPSL		0.5	Dark brown TOPSOIL, root intrusions to 1'	373.5
		MC = 20.7%	ML			Tan SILT, medium dense, moist to wet -mottled texture	
		MC = 32.6% Fines = 88.9%			4.5	[USDA Classification: LOAM]	369.5
5		MC = 15.1%	SP		6.0	Gray poorly graded SAND, dense, moist to wet -heavy iron oxide staining at contact, light groundwater seepage at 6'	368.0
		MC = 30.7%	ML			Gray SILT with sand, dense, moist to wet -minor iron oxide staining throughout	
		MC = 30.5% Fines = 78.7%			8.0	[USDA Classification: slightly gravelly LOAM]	366.0
						Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 6.0 feet during excavation. No caving observed.	

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TEST PIT NUMBER TP-202

PROJECT NUMBER ES-5559.03 **PROJECT NAME** Sunset Pointe

DATE STARTED 1/22/20 **COMPLETED** 1/22/20 **GROUND ELEVATION** 388 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION	
0			TPSL		0.5	Dark brown TOPSOIL, root intrusions to 6"	387.5
			FILL		1.5	Crushed rock (Fill) -light perched groundwater seepage	386.5
		MC = 31.9%	SM		2.7	Tan silty SAND, medium dense, moist ~<8" sand lens	385.3
		MC = 19.4% Fines = 58.7% MC = 31.8%	ML		4.5	Tan sandy SILT, dense, moist -becomes gray [USDA Classification: slightly gravelly LOAM]	383.5
5			SM			Gray silty SAND, dense, moist -light iron oxide staining -increased sand content	
		MC = 13.3% Fines = 39.9%			8.0	[USDA Classification: slightly gravelly fine sandy LOAM]	380.0

Test pit terminated at 8.0 feet below existing grade. Groundwater seepage encountered at 1.0 foot during excavation. No caving observed.

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TEST PIT NUMBER TP-101

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/19/19 **GROUND ELEVATION** 383 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": heavy bramble **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 12"	
					1.0	382.0
					Gray silty SAND with gravel, dense, moist (Fill)	
		MC = 13.8%	SM			
5					-sand lens ~12" thick	
		MC = 20.0%			5.5	377.5
					Gray SILT, medium dense, moist (Fill)	
			ML			
10		MC = 27.3% Fines = 90.0%			-becomes brown, increased fines [USDA Classification: slightly gravelly LOAM]	
					13.0	370.0
					Tan SILT, medium dense, wet	
		MC = 31.9% Fines = 95.8%	ML		[USDA Classification: LOAM]	
15					15.0	368.0
					Tan silty SAND, medium dense, wet to saturated	
		MC = 35.3%	SM		-minor iron oxide staining	
					-sand lens 6"- 12" thick	
		MC = 28.5%			18.0	365.0
					Test pit terminated at 18.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.	

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TEST PIT NUMBER TP-102

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 376 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": heavy bramble **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 2.25'	
				1.0		375.0
			SM		Brown silty SAND, loose, moist	
				2.5		373.5
		MC = 25.4% Fines = 98.3%			Gray SILT, dense, moist [USDA Classification: LOAM] -heavy iron oxide staining	
5						
		MC = 32.0% Fines = 92.5%	ML		-becomes brown, wet [USDA Classification: LOAM]	
					-becomes wet to saturated	
		MC = 35.2%		9.5		366.5
					Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.	

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TEST PIT NUMBER TP-103

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 384 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 8": heavy bush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 6.25' (Fill)	
				0.6		383.4
					Gray silty SAND with gravel, medium dense to dense, moist (Fill)	
					-asphalt debris	
		MC = 11.3%				
5			SM			
		MC = 10.4%				
					-increased sand content	
					-erratic silt interbeds	
		MC = 11.7%				
10						
		MC = 20.2%		11.0		373.0

Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-104

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 383 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 8": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 12"	
				0.6		382.4
					Gray silty SAND with gravel, medium dense to dense, moist	
		MC = 19.9%	SM		-becomes brown -becomes gray	
5		MC = 23.5%		5.0	-heavy iron oxide staining	378.0
					Gray SILT, loose, moist to wet	
			ML		-becomes brown, wet	
10						
		MC = 29.8% Fines = 93.5%		11.0	[USDA Classification: LOAM]	372.0
					Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.	

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TEST PIT NUMBER TP-1

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil &Sod 1"- 3": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION
0			Rock		0.5	Crushed Rock (Fill)
			ML		1.0	Brown SILT, loose, moist
						Brown poorly graded SAND with silt, medium dense, moist
		MC = 7.4% Fines = 6.2%				[USDA Classification: slightly gravelly SAND]
						-increased gravel content
5			SP-SM			-becomes medium dense to dense
		MC = 4.4%				
						-increased cobbles
		MC = 7.4%			9.0	

Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-2

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		0.3 Dark brown TOPSOIL (Fill), root intrusions to 7'
			Fill		1.0 Clean washed ROCK (Fill)
					Brown/tan sandy SILT, medium dense, moist
					-light iron oxide staining 2'- 4'
		MC = 21.6%	ML		
5					5.0
			SP		Gray poorly graded SAND, medium dense to dense, moist
		MC = 9.5%			6.5
			ML		Tan sandy SILT, dense, moist
					8.0
			SP		Gray poorly graded SAND with gravel, dense, moist
		MC = 4.8%			9.0 -caving caused by excavation activities

Test pit terminated at 9.0 feet below existing grade. No groundwater seepage encountered during excavation. Caving observed from 6.0 to 6.5 feet and 8.0 feet to BOH.

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TEST PIT NUMBER TP-3

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 18": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL (Fill), intrusions to 7'
					1.5
					Gray silty SAND with gravel, medium dense, moist (Fill)
		MC = 8.9%			-clean washed rock ~4" thick
					-becomes brown dense
			SM		
5		MC = 8.1% Fines = 15.9%			[USDA Classification: very gravelly loamy SAND]
					7.0
					Gray SILT with sand, medium dense, moist (Fill)
			ML		
		MC = 19.2%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe
DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**
EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---
LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---
NOTES Depth of Topsoil & Sod 2": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, loose to medium dense, moist (Fill)
					-root intrusions to 9'
5					-heavy perched groundwater seepage
		MC = 12.3%			7.0
			ML		Gray SILT with sand, loose to medium dense, wet (Fill)
					-trace organics
					-light iron oxide staining
10		MC = 19.3%			
		MC = 22.1%			12.0
			ML		Brown sandy SILT, dense, moist
					-light iron oxide staining
15		MC = 27.4%			15.0
					Test pit terminated at 15.0 feet below existing grade. Groundwater encountered seepage encountered at 4.0 feet during excavation. Caving observed from 0.0 to 9.0 feet.

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TEST PIT NUMBER TP-5

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
				1.0	Brown silty SAND, medium dense, moist
		MC = 7.2%			-becomes tan, damp to moist
5			SM		
					-becomes dense
		MC = 20.9%			-light iron oxide staining
					-becomes gray, very dense
					-moderate cementation, light iron oxide staining
		MC = 12.4%		9.5	
					Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-6

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe
DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____
EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**
EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---
LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---
NOTES Depth of Topsoil & Sod 2"- 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					
			SM		Brown silty SAND, medium dense, moist (Fill)
					-root intrusions to 7'
				2.0	
					Relic TOPSOIL Horizon
				2.5	
					Brown sandy SILT, medium dense, moist (Fill)
					-minor brick debris
		MC = 20.5%			
					-becomes gray
5			ML		
				8.0	
					Brown poorly graded SAND, dense, moist
		MC = 10.0%			-light iron oxide staining
10			SP		
					-becomes wet to saturated
		MC = 31.7%		12.0	
					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-7

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6"- 8": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL	0.5	Dark brown TOPSOIL, root intrusions to 7'
					Brown silty SAND, loose to medium dense, moist
		MC = 9.5%			-light to moderate iron staining
					-becomes gray, very dense
5			SM		
				9.0	-becomes wet
		MC = 18.0%			Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-8

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 5'
				0.5	Brown silty SAND, medium dense, moist
		MC = 16.3%	SM		
5					-becomes gray, dense
		MC = 17.8%			
				8.0	
			SP		Gray poorly graded SAND, dense, moist
		MC = 3.2%		9.0	

Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-9

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
				0.5	Brown SILT with sand, medium dense to dense, moist
		MC = 21.7% Fines = 81.2%	ML		[USDA Classification: LOAM] -becomes gray -light iron oxide staining
5				6.0	
			SP	6.5	Gray poorly graded SAND, dense, moist
		MC = 3.9%			Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-10

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Gray silty SAND, medium dense, moist (Fill)
					-root intrusions to 3.5'
				2.0	
			TPSL	2.5	Relic TOPSOIL Horizon
		MC = 12.4%			Brown silty SAND, medium dense, moist
					-becomes gray, dense
5			SM		
		MC = 18.7%			
		MC = 8.9%		9.0	

Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-11

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 4'
0.5					Tan silty SAND, medium dense, moist
					-moderate iron oxide staining to 4'
		MC = 21.1%			
5		MC = 20.1%	SM		-intermittent light iron oxide staining
					-becomes dense
10		MC = 16.0%			
10.0					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-12

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, medium dense, moist
					-root intrusions to 3'
			ML		-becomes gray
		MC = 15.2% Fines = 60.2%			[USDA Classification: LOAM]
5					
		MC = 17.3%			6.0

Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-13

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, loose to medium dense, moist
		MC = 27.3%			
5			ML		-becomes gray
		MC = 23.9%			
					9.5
10		MC = 16.0%	SP		10.0 Gray poorly graded SAND with gravel, dense, wet

Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-14

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6"- 8": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL	0.5	Dark brown TOPSOIL, root intrusions to 3'
					Brown silty SAND, loose to medium dense, moist
		MC = 15.2%			
			SM		-becomes gray, medium dense -light iron oxide staining
5					
		MC = 7.1%		7.0	
					Gray poorly graded SAND, dense, moist
			SP		
10		MC = 12.5%		10.0	
					Brown silty SAND, dense, moist
			SM		
		MC = 9.0%		12.0	
					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-15

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Surface Conditions: brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, moist (Fill)
					-trace to moderate organics throughout
					-root intrusions to 12'
		MC = 18.9%			
5					
			SM		
10					
		MC = 91.3% Fines = 79.0%			[USDA Classification: gravelly loamy coarse SAND]
					-becomes wet
15					
					15.5
			ML		16.0 Gray sandy SILT, medium dense, moist
		MC = 28.6%			

Test pit terminated at 16.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-16

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Surface Conditions: brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Dark brown silty SAND, loose, wet
					-root intrusions to 3'
		MC = 30.8%	SM		
5		MC = 16.5%			-becomes brown, medium dense, moist
		MC = 7.9%		6.0	-becomes gray
					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-17

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, wet (Fill)
					-root intrusions to 7'
		MC = 24.1%	SM		
5					
					7.0
			SM		Tan silty SAND, medium dense, moist
		MC = 6.3%			7.5
					Test pit terminated at 7.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-18

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2"- 3": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, moist (Fill)
					-root intrusions to 3'
		MC = 14.9%	SM		
					-wire debris
5				5.0	
			SM		Tan silty SAND, medium dense, moist
		MC = 6.3%		6.0	

Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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TEST PIT NUMBER TP-19

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 10": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 2'
				1.0	
			SM		Gray silty SAND, medium dense, moist
		MC = 13.0%			
					-becomes dense
5		MC = 15.4%		5.0	
					Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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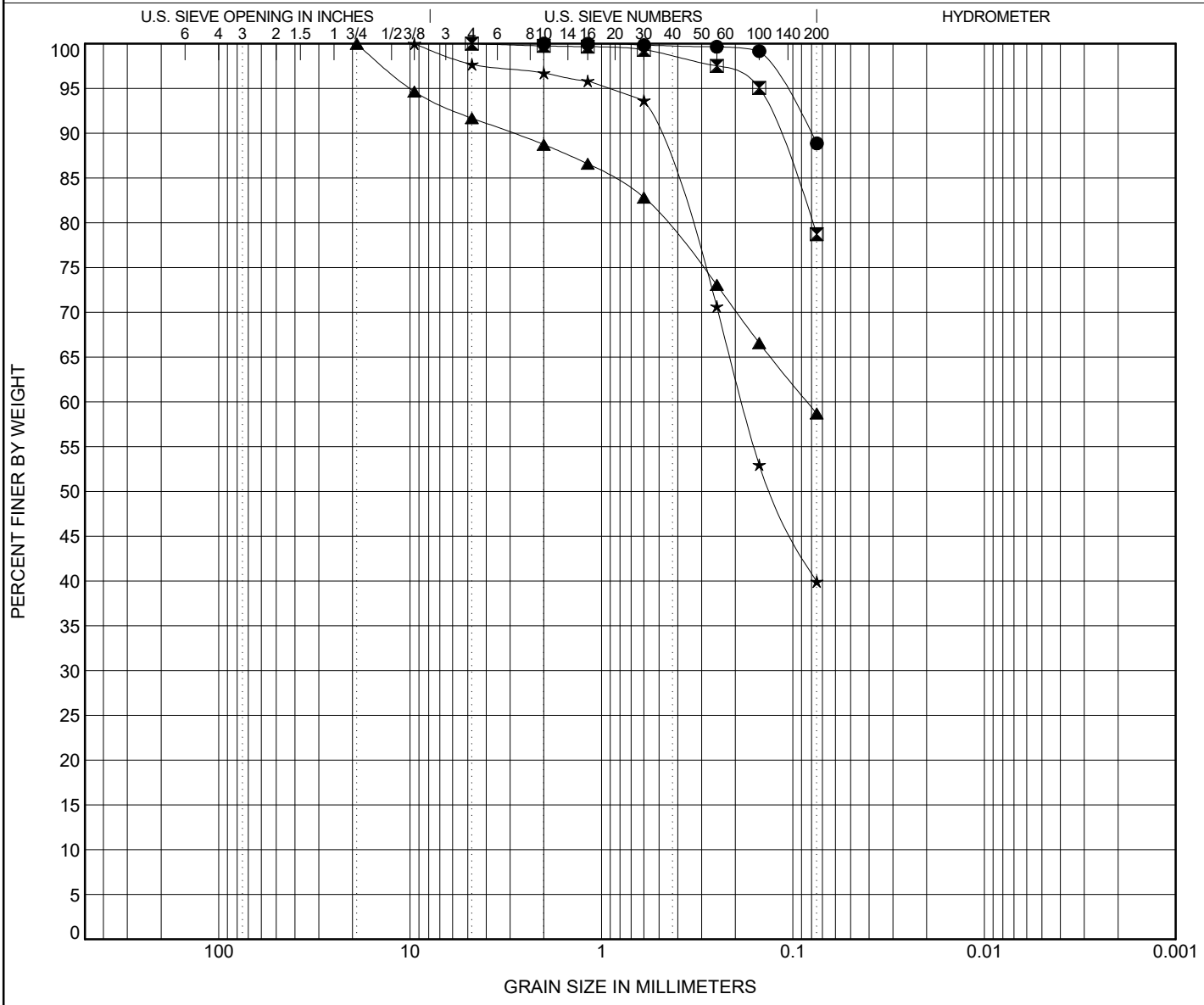
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-5559.03 **PROJECT NAME** Sunset Pointe



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	Cc	Cu
●	**TP-201**	**4.00ft.**	**USDA: Tan Loam. USCS: ML.**		
⧓	**TP-201**	**8.00ft.**	**USDA: Gray Slightly Gravelly Loam. USCS: ML with Sand.**		
▲	**TP-202**	**4.00ft.**	**USDA: Tan Slightly Gravelly Loam. USCS: Sandy ML.**		
★	**TP-202**	**8.00ft.**	**USDA: Gray Slightly Gravelly Fine Sandy Loam. USCS: SM.**		

Specimen Identification			D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**TP-201**	**4.0ft.**	**2**							**88.9**	
⧓	**TP-201**	**8.0ft.**	**4.75**							**78.7**	
▲	**TP-202**	**4.0ft.**	**19**	**0.084**						**58.7**	
★	**TP-202**	**8.0ft.**	**9.5**	**0.184**						**39.9**	

GRAIN SIZE USDA ES-5559.03 SUNSET POINTE.GPJ GINT US LAB.GDT 2/12/20

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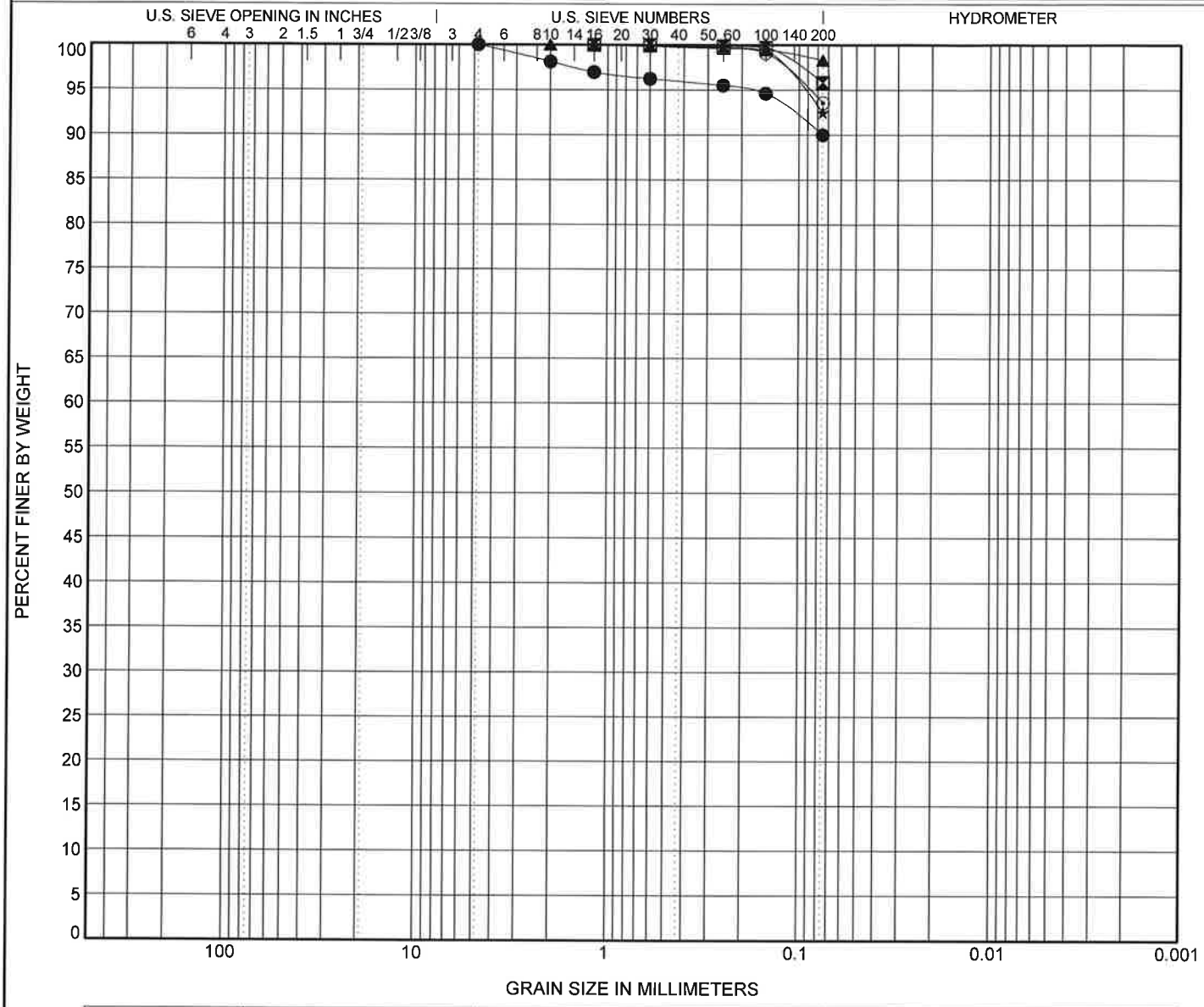
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-101	10.00ft.	USDA: Gray Slightly Gravelly Loam. USCS: ML.		
⊠ TP-101	14.00ft.	USDA: Tan Loam. USCS: ML.		
▲ TP-102	3.00ft.	USDA: Gray Loam. USCS: ML.		
★ TP-102	6.00ft.	USDA Brown Loam. USCS: ML.		
⊙ TP-104	11.00ft.	USDA: Brown Loam. USCS: ML.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-101	10.0ft.	4.75							90.0	
⊠ TP-101	14.0ft.	1.18							95.8	
▲ TP-102	3.0ft.	2							98.3	
★ TP-102	6.0ft.	1.18							92.5	
⊙ TP-104	11.0ft.	1.18							93.5	

GRAIN SIZE USDA ES-5559 SUNSET POINTE.GPJ GINT US LAB.GDT 6/24/19

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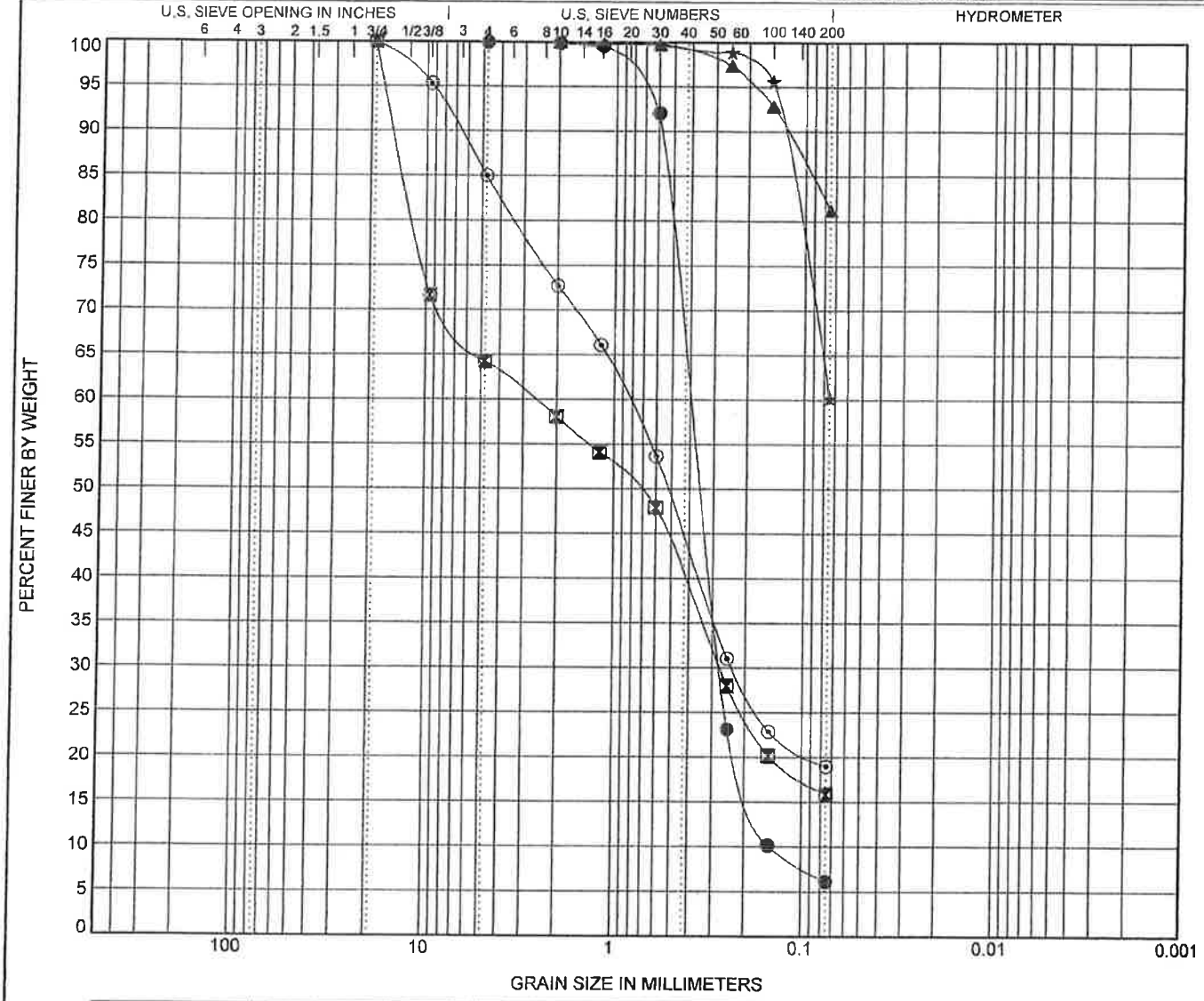
GRAIN SIZE DISTRIBUTION

CLIENT Peter Chen **PROJECT NAME** Sunset Pointe

PROJECT NUMBER ES-5559 **PROJECT LOCATION** Puyallup, Washington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
TP-01	3.00ft.	USDA: Brown Slightly Gravelly Sand. USCS: SP-SM.	1.28	2.74
TP-03	5.00ft.	USDA: Brown Very Gravelly Loamy Sand. USCS: SM with Gravel.		
TP-09	2.50ft.	USDA: Gray Loam. USCS: ML with Sand.		
TP-12	4.00ft.	USDA: Brown Loam. USCS: Sandy ML.		
TP-15	10.50ft.	USDA: Brown Gravelly Loamy Coarse Sand. USCS: SM with Gravel.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
TP-01	3.0ft.	4.75	0.399	0.273	0.146				6.2	
TP-03	5.0ft.	19	2.638	0.273					15.9	
TP-09	2.5ft.	2							81.2	
TP-12	4.0ft.	2							60.2	
TP-15	10.5ft.	19	0.847	0.234					19.0	

Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

GEOTECHNICAL ENGINEERING STUDY
SUNSET POINTE
2301 – 23RD STREET SOUTHEAST
PUYALLUP, WASHINGTON

ES-5559

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PREPARED FOR

MR. PETER CHEN

January 11, 2018
Updated June 24, 2019

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6/25/19

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GEOTECHNICAL ENGINEERING STUDY
SUNSET POINTE
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Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you —* should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

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Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

January 11, 2018
Updated June 24, 2019
ES-5559

Mr. Peter Chen
4709 Memory Lane West
University Place, Washington 98488

Dear Mr. Chen:

Earth Solutions NW, LLC (ESNW) is pleased to present this report titled "Geotechnical Engineering Study, Sunset Pointe, 23rd Street Southeast, Puyallup, Washington". Based on the results of our investigation, the proposed residential plat is feasible from a geotechnical standpoint. Our study indicates the site is underlain primarily by fill atop native Vashon drift glacial deposits. Fill was encountered at various locations within the site and will be discussed later in this report. Heavy perched groundwater seepage was encountered at one test pit location at a depth of approximately four feet below the existing ground surface elevation during our October 2017 and May 2019 subsurface explorations. As such, it is our opinion the contractor should anticipate, and be prepared to manage zones of perched groundwater seepage during construction.

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, recompacted existing fill, or suitable structural fill placed directly on competent native soils. In general, native soils suitable for foundation support are anticipated to be encountered at approximate depths of two to five feet below the existing ground surface elevation. Areas underlain by existing fill may require additional preparation efforts in order to establish suitable and uniform bearing conditions. Additional preparation activities will likely involve overexcavating unsuitable existing fill and restoring grades with suitable structural fill. Re-working and re-compacting the in-place fill may be feasible in areas where the fill is devoid of organic and deleterious material but must be evaluated by ESNW during grading. Areas of deeper fill may require additional or complete over excavation and restoration or alternative foundation support implementations. In general, where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material, will be necessary.

We understand that a stormwater detention vault will be used for stormwater management. Based on the conditions encountered during our October 2017 and May 2019 explorations, it is our opinion that infiltration be considered infeasible on this site. A detailed description and justification on the infeasibility of site infiltration will be provided within the body of this report.

Recommendations for foundation design, site preparation, drainage, and other pertinent development aspects are provided in this study. We appreciate the opportunity to be of service to you on this project. If you have questions regarding the content of this geotechnical engineering study, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Chase G. Halsen
Senior Staff Geologist

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Cont'd

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GEOTECHNICAL ENGINEERING STUDY
SUNSET POINTE
2301 – 23rd STREET SOUTHEAST
PUYALLUP, WASHINGTON

ES-5559

INTRODUCTION

General

This geotechnical engineering study (study) was prepared for the proposed residential plat to be completed at 2301 – 23rd Street Southeast in Puyallup, Washington. The purpose of this study was to provide geotechnical recommendations for currently proposed development plans. Our scope of services for completing this study included the following:

- Completion of test pits for purposes of characterizing site soils;
- Completion of laboratory testing of soil samples collected at the test pit locations;
- Conduction of engineering analyses, and;
- Preparation of this report.

The following documents and maps were reviewed as part of our study preparation:

- Preliminary Plat Utility Plan, prepared by CES NW, Inc., dated April 17, 2019;
- Puyallup Municipal Code Chapter 21.06;
- Development Review Team Letter, prepared by the City of Puyallup, dated February 5, 2019;
- Online Web Soil Survey (WSS) resource, maintained by the Natural Resources Conservation Service under the United States Department of Agriculture;
- Liquefaction Susceptibility for Pierce County incorporating data from the Washington State Department of Natural Resources, dated September 2004, and;
- Geologic Map of the South Half of the Tacoma Quadrangle, Washington, by Timothy J. Walsh, 1987.

Project Description

Originally completed in January 2018, this report has been updated to reflect the current proposal. The current proposal includes removing the northern parcel form the proposed site and reducing the number of building sites. As such, Test Pits 14 – 18 are no longer within the subject site and are no longer included within this report evaluation.

We understand the site will be developed into a residential plat consisting of 15 residential lots and general site improvements. We presume that stormwater runoff will be managed by a detention vault (vault). At the time of report submission, building load plans were not available for review; however, based on our experience with similar developments, the proposed residential structures will likely be two to three stories in height and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads of about 1 to 2 kips per lineal foot (klf) are expected. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf).

We presume that cuts and/or fills up to about 10 to 15 feet will be required to establish the building pads. Stepped foundations or split-level pads may also be incorporated into the design to reduce grading requirements. Deeper excavations will likely be required to construct the stormwater facility (vault). Rockeries or mechanically stabilized earth walls (MSEWs) may be used to facilitate grade changes between adjacent lots.

If the above design assumptions are incorrect or change, ESNW should be contacted to review the recommendations provided in this report. ESNW should review final designs to confirm that appropriate geotechnical recommendations have been incorporated into the plans.

SITE CONDITIONS

Surface

The subject site is located east of the intersection between 19th Avenue Southeast and 21st Street Southeast in Puyallup, Washington. The approximate location of the subject site is depicted on Plate 1 (Vicinity Map). The irregular-shaped property is comprised of two adjoining tax parcels (Pierce County Parcel Nos. 042035-3027) totaling approximately 9.09 acres.

The site is bordered on all sides primarily by existing residential development. A sewer and water easement is present on site, trending east to west along the entire northern edge of the development area. A relay station is present within the east-central site area as well. Multiple barn and storage structures appear to have been present within the southern site area, but had been demolished prior to our fieldwork. Based on our field observations, it appears that the land has been previously modified through the placement of fill material. It appears that the fill had been placed to establish an access pathway to the southern site area, to level out sloping areas, and fill an existing natural trough area. Based on site observations, it is our opinion the site modification was likely not associated with recent development. Current topography varies across the site, however, maintains an overall northerly/northeasterly declivity. Approximately 30 to 35 feet of total elevation change occurs within the proposed development area. Three existing ponds (A-C) are present within the central site area.

Subsurface

An ESNW representative observed, logged, and sampled 19 test pits, excavated within accessible areas of the proposed development area, on October 24, 2017 using a trackhoe and operator retained by our firm. Four additional test pits were completed on May 15, 2019 within the proposed stormwater tract area. Three shallow groundwater piezometers were installed within the stormwater tract area during our May 2019 exploration. The test pits were completed to assess and classify subsurface soil and groundwater conditions across the site. The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in accordance with the Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil and Fill

Topsoil was encountered generally within the upper 2 to 18 inches of existing grades at the test pit locations. The topsoil was characterized by dark brown color, the presence of fine organic material, and small root intrusions.

Fill was observed at the majority of the test pit locations, ranging in approximate depths from 1 to 13 feet below the existing ground surface (bgs). The fill was observed to be variable in nature, typically a silty sand to sandy silt, encountered in a loose to medium dense and moist condition. In general, the majority of the fill was observed to be free of debris, with the exception of isolated areas of brick and wire debris. However, the debris is not considered to be deleterious. Due to the highly variability in texture of the fill soils, ESNW should be retained to evaluate the suitability of fill encountered during construction.

Native Soil

Underlying topsoil and fill, native soils were encountered consisting soils associated with and representative of glacial drift deposits. In general, the predominate native soil type should be considered silty sand with or without gravel (USCS: SM). However, localized areas and depositional lenses of poorly graded sand and silt (USCS: SP and ML, respectively) should be anticipated across the site. The native soils were typically encountered in a medium dense and moist condition.

Geologic Setting

The referenced geologic map resource identifies Vashon undifferentiated drift (Qdv) across the site and surrounding areas. Although not specifically characterized within the geologic map resource, Vashon drift typically consists of glacial till, glaciofluvial, and glaciolacustrine sediments. The reference WSS resource indicates soils of the Everett very gravelly sandy loam, Indianola loamy sand and Kitsap silt loam (Map Unit Symbols: 13B, 18C, 20B, and 20C, respectively). These soil groups are typically associated with moraines, eskers, kames and terrace landforms, derived from glacial outwash and glaciolacustrine material. The variability in makeup of the native soils are generally consistent with that of Vashon drift.

Groundwater

During our subsurface exploration completed on October 24, 2017, heavy, perched groundwater seepage was encountered at a depth of approximately four feet bgs at TP-4. Groundwater seepage was not encountered during our May 2019 subsurface exploration. In our opinion, the contractor should anticipate and be prepared to respond to zones of perched groundwater seepage during construction, especially within deeper excavations. Groundwater seepage is common within glacial sediments, particularly within relatively permeable lenses and/or atop dense to very dense, unweathered deposits. Seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the wetter, winter months.

Geologically Hazardous Areas

In preparation of this report, we reviewed applicable city of Puyallup mapping and geologically hazardous area code section 21.06. Our evaluation is as follows.

Landslide and Erosion Hazards

As delineated in Puyallup Municipal Code (PMC) 21.06.1210, landslide and erosion hazard areas include those identified by the U.S. Department of Agriculture Natural Resources Conservation Service as having a moderate to severe, severe, or very severe erosion hazard because of natural characteristics, including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or human-induced changes to natural characteristics. Landslide and erosion hazard areas include areas with the following characteristics:

- Areas that have shown mass movement during the Holocene epoch (from 10,000 years ago to the present) or that are underlain or covered by mass wastage debris of that epoch;
- Slopes that are parallel or subparallel to planes of weakness (such as bedding planes, joint systems, and fault planes) in subsurface materials;
- Slopes having gradients steeper than 80 percent subject to rock fall during seismic shaking;
- Areas potentially unstable because of stream incision or stream bank erosion;
- Areas located in a canyon, ravine, or on an active alluvial fan, presently or potentially subject to inundation by debris flows or flooding;
- Any area with a slope of 40 percent or steeper and a vertical relief of 10 or more feet, except areas composed of consolidated rock and properly engineered manmade slopes/retained fill. A slope is delineated by establishing its toe and top and measured by averaging the inclination over at least 10 feet of vertical relief;
- Areas with a severe limitation for building development because of slope conditions, according to the Natural Resource Conservations Service, and;
- Areas meeting all three of the following criteria: (A) slopes steeper than 15 percent, except that slopes of less than 15 percent may be considered erosion hazard areas if they have certain unstable soil and drainage characteristics; (B) hillsides intersecting geologic contacts with a relatively permeable sediment overlying a relatively impermeable sediment or bedrock; and (C) wet season springs or ground water seepage.

Based on the results of subsurface exploration and review of available topographic information, the majority of the development is not located within a landslide hazard area. However, the eastern most edge of Lots 9 and 10 and northern edge of Lot 15 meet the code criteria for a landslide hazard based on the presence of gradients in excess of 40 percent and a vertical elevation change of at least 10 feet.

On Lots 9 and 10, this sloping feature appears to be relatively minor, decreasing in overall inclination either at, or just beyond, the property lines, having a total slope height of approximately 10 to 15 feet. On Lot 15, the slope appears to be associated with the existing pond area and is considered to be isolated in extent and height. PMC 21.06.1240.1a.iii, allows for a buffer to be equal to the height of the slope (H) divided by 2 for slopes with a vertical elevation of more than 10 feet but less than 25 feet, regardless of slope percent provided that no other factors that are present that pose a slope stability risk. This buffer should be applied to the top of the slope. Provided that the recommendations relating to building pad preparation and structural fill are incorporated into the construction sequence, in our opinion, a buffer equal to H/2 can be applied to Lots 9, 10, and 15. Per Puyallup code requirements, as referenced in the attached review letter, minimizing alterations to existing slope features is preferred over mass grading. As such, stepping of foundations should be considered to maintain existing topographic slopes, where applicable. From a geotechnical standpoint, constructing foundations in such a manor is considered feasible provided they can adequately offset from any slope face as to not impose additional surcharges. For these lots, slope fills (placed in accordance with this report) as well as the use of retaining walls to achieve design grades may also be considered feasible from a geotechnical standpoint.

Landslide hazards may also be designated as areas that have a combination of slopes more than 15 percent, that have permeable soils overlying impermeable soils, and wet season springs and groundwater seepage. The majority of the proposed development areas is relatively flat. However, lots aligned along the eastern site edge (Lots 8 – 14) do contain slopes greater than 15 percent, either within the confines of the lot boundaries or directly adjacent. However, based on our exploration in the area, these lots (with the exception of Lot 9 and 10, as discussed above) do not meet all three code defining requirements to be a landslide hazard.

One area of seepage was identified during our subsurface explorations (TP-4, October 24, 2017). In this respect, the seepage zone is considered isolated, rather than a pervasive chronic site condition. It is possible for groundwater seepage zones to develop elsewhere on site but will likely be seasonal and a result of yearly rainfall totals. From a stability standpoint, the development of a seepage zone is not considered a direct indication of instability, but rather the natural lateral migration of subsurface water. We understand stormwater flows will be managed with a detention vault in conjunction with individual lot dispersions, where feasible. In this regard, we do not anticipate increased surface water runoff flows or amounts that may impact adjacent properties either during or post construction. Where encountered during construction, subsurface seepage zones can adequately be mitigated via passive drainage elements and Best Management Practice (BMPs) measures.

As delineated in Puyallup Municipal Code (PMC) 21.06.1210, erosion hazard areas include those identified by the U.S. Department of Agriculture Natural Resources Conservation Service as having a moderate to severe, severe, or very severe erosion hazard because of natural characteristics, including vegetative cover, soil texture, slope, gradient, and rainfall patterns, or human-induced changes to natural characteristics.

Site soils are considered to have moderate to severe erosion potential. In our opinion, provided appropriate temporary and permanent erosion and sediment control (ESC) measures are incorporated into final designs, the potential for erosion will remain low both during and after construction. Site BMPs and other means of sediment and surface flow control measures should be actively maintained during construction to upkeep proper performance.

Provided the above recommendations and considerations are include with the construction plan and sequence, it is our opinion that the proposed development will not adversely affect soil stability on adjacent properties.

Please note that our evaluation and corresponding lot recommendations are based on plans and site layouts made available to ESNW during report preparation. If site layout plans change, ESNW should be notified to provide updated recommendations.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed residential development is feasible from a geotechnical standpoint. The primary geotechnical considerations associated with the proposed development include foundation support, slab-on-grade subgrade support, the suitability of using on-site soils as structural fill, and construction of the stormwater facility(s).

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, recompacted existing fill, or suitable structural fill placed directly on competent native soils. In general, native soils suitable for foundation support are anticipated to be encountered at approximate depths of two to five feet below the existing ground surface elevation. Areas underlain by existing fill may require additional preparation efforts in order to establish suitable bearing conditions, such as overexcavating unsuitable fill and restoring grades with suitable structural fill. Re-working and re-compacting the in-place fill may be feasible in areas where the fill is devoid of organic and deleterious material but must be evaluated by ESNW during grading. Areas of deeper fill may require additional or complete over excavation and restoration or alternative foundation support implementations. In general, where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material, will be necessary.

We understand that a stormwater detention vault will be used for stormwater management. Based on the conditions encountered during our October 2017 and May 2019 explorations, it is our opinion that infiltration be considered infeasible from a geotechnical standpoint. A detailed description and justification on the infeasibility of site infiltration will be provided within the body of this

This study has been prepared for the exclusive use of Mr. Peter Chen and his representatives. No warranty, expressed or implied, is made. This study has been prepared in a manner consistent with the level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and performing clearing and site stripping. Subsequent earthwork activities will involve mass site grading and related infrastructure improvements.

Erosion Control

The following temporary erosion control measures are offered:

- Temporary construction entrances and drive lanes, consisting of at least six inches of quarry spalls, should be considered to both minimize off-site soil tracking and provide a stable access entrance surface. Placement of a geotextile fabric beneath the quarry spalls will provide greater stability, if needed. Existing asphalt/gravel drive lanes can be considered for use as a temporary construction entrance and should be observed by ESNW prior to construction.

- Silt fencing should be placed around the site perimeter.

- When not in use, soil stockpiles should be covered or otherwise protected.

- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.

- Dry soils disturbed during construction should be wetted to minimize dust.

- When appropriate, permanent planting or hydroseeding will help to stabilize site soils.

Additional BMPs, as specified by the project civil engineer and indicated on the plans, should be incorporated into construction activities. Temporary erosion control measures should be continually maintained and improved to provide proper function over the course of construction.

Final erosion cultural measures should conform to the approved civil and/or landscape architecture plans. The following permanent erosion control measures are offered:

- Stabilize exposed soils with suitable vegetation immediately after final earthwork activities have taken place.

- Install permanent interceptor trenches/swales or other surface water flow controls, where necessary. ESNW can assist in identifying areas that may require such installments during mass grading activities.

Stripping

Topsoil was encountered generally within the upper 2 to 18 inches of existing grades at the test pit locations. ESNW should be retained to observe site stripping activities at the time of construction so that the degree of required stripping may be assessed. Over-stripping should be avoided, as it is unnecessary and may result in increased project development costs. Topsoil and organic-rich soil is neither suitable for foundation support nor for use as structural fill. Topsoil and organic-rich soil may be used in non-structural areas, if desired.

In-situ and Imported Soils

On-site soils are moisture sensitive, therefore, successful use as structural fill largely being dictated by the moisture content at the time of placement and compaction. Remedial measures, such as soil aeration and/or cement treatment (where allowed by the local jurisdiction or utility district), may be necessary as part of site grading and earthwork activities. Existing fill soils to be used within structural applications must be free of deleterious debris, especially with respect to construction-like debris and organic material. If the on-site soils cannot be successfully compacted, the use of an imported soil may be necessary. In our opinion, a contingency should be provided in the project budget for export of soil that cannot be successfully compacted as structural fill if grading activities take place during periods of extended rainfall activity. Soils with fines contents greater than 5 percent typically degrade rapidly when exposed to periods of rainfall.

Imported soil intended for use as structural fill should consist of a well-graded, granular soil with a moisture content that is at (or slightly above) the optimum level. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Subgrade Preparation

Following site stripping, cuts and fills will be completed to establish proposed subgrade elevations across the site. To establish a suitable subgrade for structural elements, re-working of existing fill soils will likely be necessary in some areas. Due to the variable thickness and extent of the existing fill, it is our opinion that structural elements within the deeper fill areas be underlain by at least four feet of (reworked) structural fill. It may be possible to rework and reuse existing fill provided that it is free of deleterious material and contain a workable moisture content and approved by ESNW at the time of construction.

Subgrades founded in competent native soils can likely be compacted in-situ with mechanical equipment until a firm and unyielding state is achieved. The uniform, mechanical compaction of the foundation and slab subgrade areas will establish a relatively consistent subgrade condition below the foundation and slab elements. ESNW should observe the subgrade(s) during initial site preparation activities to confirm soil conditions are as anticipated and to provide supplementary recommendations for subgrade preparation, as necessary.

Please note, the above considerations are based on current site layout plans available to ESNW, as depicted on the Test Pit Location Plan attached to this report. Should site layout designs change, ESNW should be informed and allowed to reevaluate necessary preparation efforts in relation to corresponding Lot numbers.

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. Soils placed in structural areas should be placed in loose lifts of 12 inches or less and compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by the Modified Proctor Method (ASTM D1557). Soils intended for use as structural fill should be generally free of organic and deleterious material. For soil placed in utility trenches underlying structural areas, compaction requirements are dictated by the local city, county, or utility district, and are typically specified to a relative compaction of at least 95 percent.

Slope Fill

Structural fill placed within sloping areas should be include a bench configuration, as depicted on Plate 3 (Slope Fill Detail). The base bench must be "keyed" into the slope using excavating equipment, and subsequently filled and compacted with suitable structural fill before continuing to the next bench. Finish grades that are to be sloped should be "overbuilt" using a bench style fill and cut to the appropriate gradient to ensure that a compacted slope face is maintained. ESNW should be present on-site during structural fill placement to observed subgrade conditions as well as provide additional drainage recommendations, as necessary.

Excavations and Slopes

Excavation activities will likely expose loose to medium dense fill and native weathered soils as well as medium dense to dense native soils at depth. Based on the soil conditions observed at the test pit locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) soil classifications are also provided:

- Loose to medium dense native and fill soil — 1.5H:1V (Type C)
- Areas containing groundwater seepage — 1.5H:1V (Type C)
- Dense to very dense native soil — 0.75H:1V (Type A)

Steeper temporary slope inclinations within undisturbed, very dense native deposits may be feasible based on the soil and groundwater conditions exposed within the excavations. Steeper inclinations may be considered, and must be subsequently approved, by ESNW at the time of construction.

Permanent slopes should be planted with vegetation to enhance stability and to minimize erosion, and should maintain a gradient of 2H:1V or flatter. The presence of perched groundwater may cause localized sloughing of temporary slopes due to excess seepage forces. An ESNW representative should observe temporary and permanent slopes to confirm the slope inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations.

Foundations

In our opinion, the proposed residential structures may be constructed on conventional continuous and spread footing foundations bearing upon competent native soil, recompacted native soil, recompacted existing fill, or suitable structural fill placed directly on competent native soils. In general, native soils competent for foundation support are anticipated to be encountered at approximate depths of two to five feet below the existing ground surface elevation. Areas underlain by existing fill may require additional preparation efforts in order to establish suitable and uniform bearing conditions, such as overexcavating unsuitable existing fill and restoring grades with suitable structural fill. Re-working and re-compacting the in-place fill may be feasible in areas where the fill is devoid of organic and deleterious material but must be evaluated by ESNW during grading. Areas of deeper fill may require additional or complete over excavation and restoration or alternative foundation support implementations (see Subgrade Preparation section of report). In general, where loose or unsuitable soil conditions are exposed at foundation subgrade elevations, compaction of soils to the specifications of structural fill, or overexcavation and replacement with a suitable structural fill material, will be necessary.

Provided the foundations will be supported as described above, the following parameters may be used for design:

- Allowable soil bearing capacity — 2,500 psf
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factor-of-safety of 1.5. With structural loading as expected, total settlement in the range of one inch and differential settlement of about one-half inch is anticipated. The majority of the settlements should occur during construction, as dead loads are applied.

Seismic Design

The 2015 International Building Code recognizes the American Society of Civil Engineers (ASCE) for seismic site class definitions. In accordance with Table 20.3-1 of the ASCE Minimum Design Loads for Buildings and Other Structures manual, Site Class D should be used for design.

The referenced liquefaction susceptibility map indicates the subject site maintains very low to moderate liquefaction susceptibility. In our opinion, site susceptibility to liquefaction may be considered negligible. The relatively consistent densities of the native soils and the absence of a uniformly established, shallow groundwater table were the primary bases for this consideration.

As part of this report preparation, we preliminarily evaluated the potential for a landslide induced from seismic activity. In our opinion, site susceptibility to a seismically induced landslide may be considered low. This consideration is primarily based on the fact that site grading, compaction, and preparation pad preparation efforts for structural areas will result in a general increase in site stability.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed residential structures should be supported on a well-compacted, firm and unyielding subgrade. Where feasible, competent native soil exposed at the slab-on-grade subgrade level can likely be compacted in situ to the specifications of structural fill. Unstable or yielding areas of the subgrade should be recompacted, or overexcavated and replaced with suitable structural fill, prior to construction of the slab.

A capillary break consisting of a minimum of four inches of free-draining crushed rock or gravel should be placed below the slab. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below the slab should be considered. If a vapor barrier is to be utilized, it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

- Active earth pressure (yielding condition) — 35 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 55 pcf
- Traffic surcharge (passenger vehicles) — 70 psf (rectangular distribution)*
- Passive earth pressure — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40
- Seismic surcharge — 6H psf**

* *Where applicable*
** *Where H equals the retained height (in feet)*

The above design parameters are based on a level backfill condition and level grade at the wall toe. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 4. If drainage is not provided, hydrostatic pressures should be included in the wall design.

We understand that mechanically stabilized earth (MSE) walls may be used to facilitate grade changes created as part of the proposed development. Upon request, ESNW can provide recommendations and design notes for the proposed MSE walls, as necessary.

Drainage

Based on our field observations, isolated zones of perched groundwater seepage should be anticipated within site excavations. Temporary measures to control surface water runoff and groundwater seepage during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading to identify areas of seepage and provide recommendations to reduce the potential for instability related to seepage effects.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures or slopes. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 5.

Infiltration Feasibility Evaluation

Site subsurface conditions were initially explored in October 2017 and indicated variability with respect to soil types present and grain size distribution across the site. Per USDA testing methods and procedures, native soils are also classified as slightly gravelly sand, gravelly loamy coarse sand, very gravelly loamy sand, and loam. Fines contents were about 6 percent within the sands, 26 to 27 percent within the sandy loam, and 60 to 81 percent within the loam, as indicated by sieve results of representative samples. ESNW returned to the site in May 2019 to further evaluate soils within the proposed stormwater facility area (Tract A) to complete a targeted infiltration evaluation in the area. Native soils were characterized as silt in a moist to wet condition within the explored area of Tract A. Per USDA testing methods and procedure, the native silts are also classified as loam with fines contents ranging between about 92 and 96 percent.

In our opinion, the site is not a feasible candidate for successful use of infiltration. Native soils are representative of glacial drift deposits, which by their nature, depositional environment, and geomorphological history, can vary greatly with respect to soil types and grain size distribution over relatively short distances. This variation can become even more pronounced within areas of changing topography. Such conditions appear to be present across the subject site, as evident through the various soil types encountered during our explorations. Although sands were encountered at some test pit locations, they did not appear to be present in a uniform and continuous manner across the site. Conversely, other native soil types (silty sand, sandy silt, and silt) encountered during our explorations are considered as having an extremely poor infiltration potential and will not adequately support the implementation of any infiltration system, full or limited. The restraining factor of these soils potential for infiltration is the appreciable fines contents that constitutes the majority of the soil.

Preliminary Detention Vault Design

We presume a vault will be constructed on-site for means of stormwater management. We anticipate cuts of about 10 feet will be necessary to reach design subgrade elevation of the vault foundation. Based on our field observations, grade cuts for the vault are likely to expose very dense, undisturbed Vashon drift deposits.

The vault foundation should be supported directly on dense undisturbed native soil subgrade. Should overexcavation be necessary at the vault foundation subgrade, quarry spalls should be used to restore grades. Perimeter drains should be installed around the vault and conveyed to an approved discharge point. Discrete zones of perched groundwater seepage may be encountered within the vault excavation; however, buoyancy is not expected to influence the vault structure.

The following preliminary design parameters may be used for the vault:

- Allowable soil bearing capacity — 5,000 psf (dense native soil)
- Active earth pressure (unrestrained) — 35 pcf
- Active earth pressure (unrestrained, hydrostatic) — 80 pcf
- At-rest earth pressure (restrained) — 50 pcf
- At-rest earth pressure (restrained, hydrostatic) — 95 pcf
- Coefficient of friction — 0.40
- Passive earth pressure — 350 pcf
- Seismic surcharge — 6H psf*

* *Where H equals the retained height (in feet)*

Vault retaining walls should be backfilled with free-draining material or suitable sheet drainage that extends along the height of the walls. The upper one foot of the wall backfill may consist of a less permeable soil, if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. If the elevation of the vault bottom is such that gravity flow to an outlet is not possible, the portions of the vault below the drain should be designed to include hydrostatic pressure.

The final vault design must incorporate adequate buffer space from property boundaries such that temporary excavations to construct the vault structure may be successfully completed. Temporary shoring or a grading easement will likely be required where adequate slope setbacks cannot be achieved. Once available, ESNW should review the proposed vault grading plans to preliminarily assess possible excavation restraints and provide additional recommendations.

ESNW should observe grading operations for the vault and subgrade conditions prior to concrete forming and pouring. If the soil conditions encountered during construction differ from those anticipated, supplementary recommendations may be provided. ESNW should be contacted to review the final vault design to confirm that appropriate geotechnical parameters have been incorporated.

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as over-excavation and/or placement of thicker crushed rock or structural fill sections, prior to pavement.

We anticipate new pavement sections will be subjected primarily to passenger vehicle traffic. For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

- A minimum of two inches of hot mix asphalt (HMA) placed over four inches of crushed rock base (CRB), or;
- A minimum of two inches of HMA placed over three inches of asphalt treated base (ATB).

For heavy loaded pavement areas such as main access roads and areas subject to large commercial vehicles, the following preliminary pavement sections may be considered:

- Three inches of HMA placed over six inches of CRB, or;
- Three inches of HMA placed over three inches of ATB.

The HMA, ATB and CRB materials should conform to WSDOT specifications. All soil base material should be compacted to a relative compaction of 95 percent, based on the laboratory maximum dry density as determined by a modified proctor test (ASTM D1557). Final pavement design recommendations, including recommendations for heavy traffic areas, access roads, and frontage improvement areas, can be provided once final traffic loading has been determined. Road standards utilized by the governing jurisdiction may supersede the recommendations provided in this report.

Utility Support and Trench Backfill

In our opinion, on-site soils will generally be suitable for support of utilities. Remedial measures may be necessary in some areas to provide support for utilities, such as overexcavation and replacement with structural fill and/or placement of geotextile fabric. Groundwater seepage may be encountered within utility excavations, and caving of trench walls may occur where groundwater is encountered. Depending on the time of year and conditions encountered, dewatering, as well as temporary trench shoring, may be necessary during utility excavation and installation.

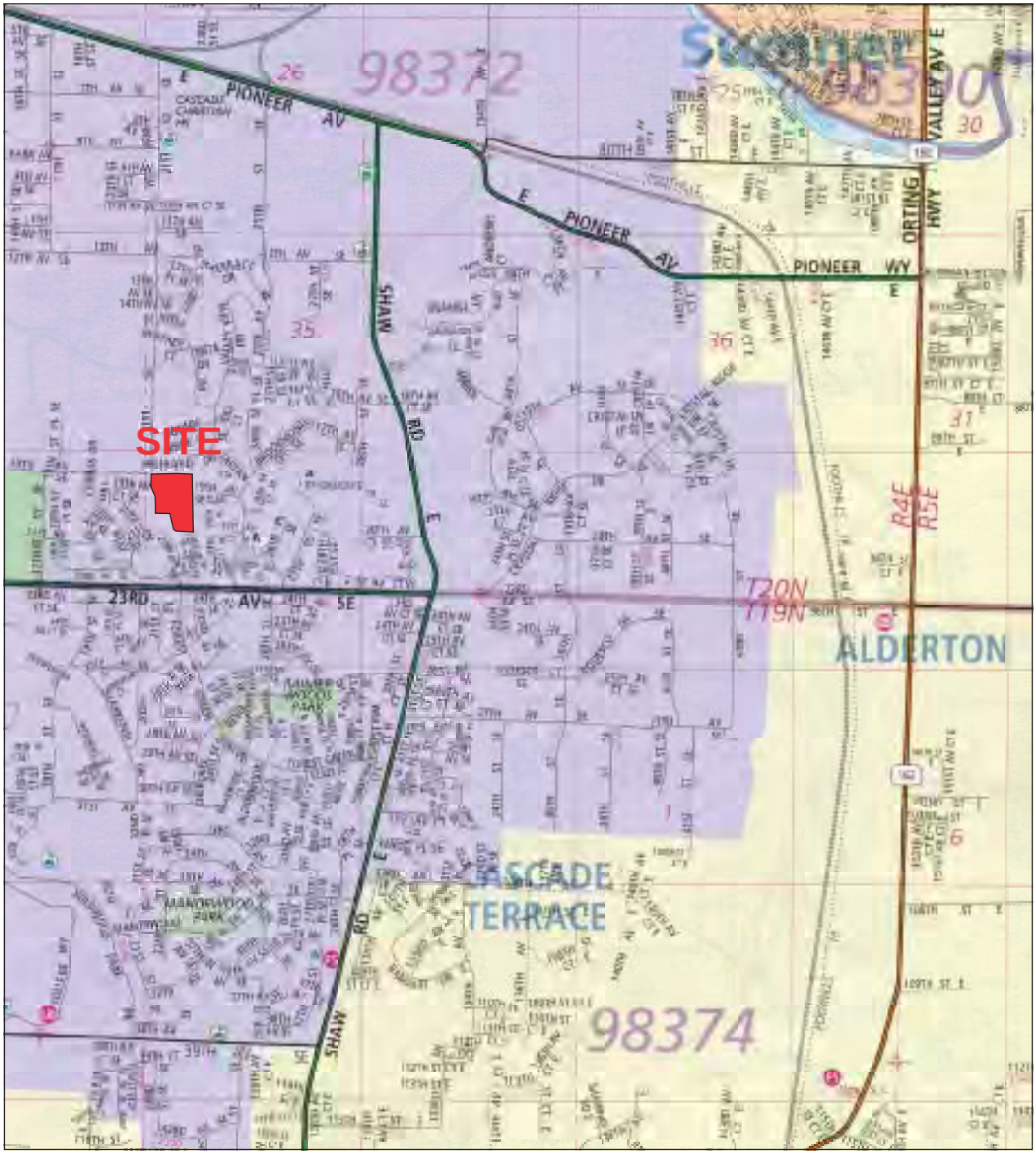
Successful use will depend on the soil's moisture content at the time of placement and compaction. Moisture conditioning of the soils may be necessary at some locations prior to use as structural fill. Each section of the utility lines must be adequately supported in the bedding material. Utility trench backfill should consist of and be placed and compacted to the specifications of structural fill as previously detailed in this report, or to the applicable specifications of the governing jurisdiction or agency.

LIMITATIONS

The recommendations and conclusions provided in this study are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is neither expressed nor implied. Variations in the soil and groundwater conditions observed at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this study if variations are encountered.

Additional Services

ESNW should have an opportunity to review final project plans with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.



Reference:
Pierce County, Washington
Map 835
By The Thomas Guide
Rand McNally
32nd Edition

NORTH

NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

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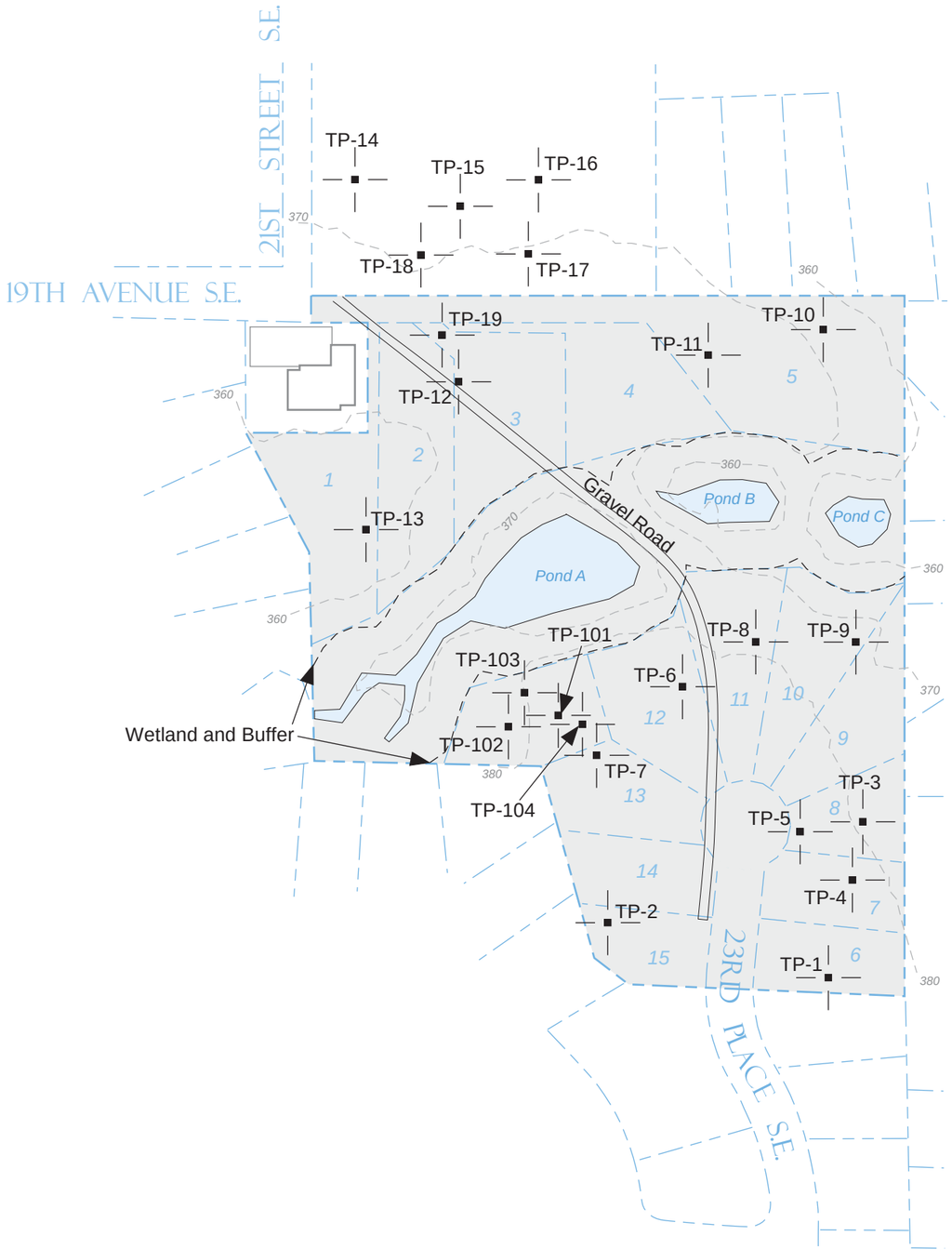
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Sunset Pointe
Puyallup, Washington

Drwn.	MRS	Date	05/31/2019	Proj. No.	5559
Checked	CGH	Date	May 2019	Plate	1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-5559, Oct. 2017

TP-101 — Approximate Location of ESNW Test Pit, Proj No. ES-5559, May 2019

Subject Site

Existing Building

10 — Proposed Lot Number

NORTH

1"=150'

0 75 150

Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

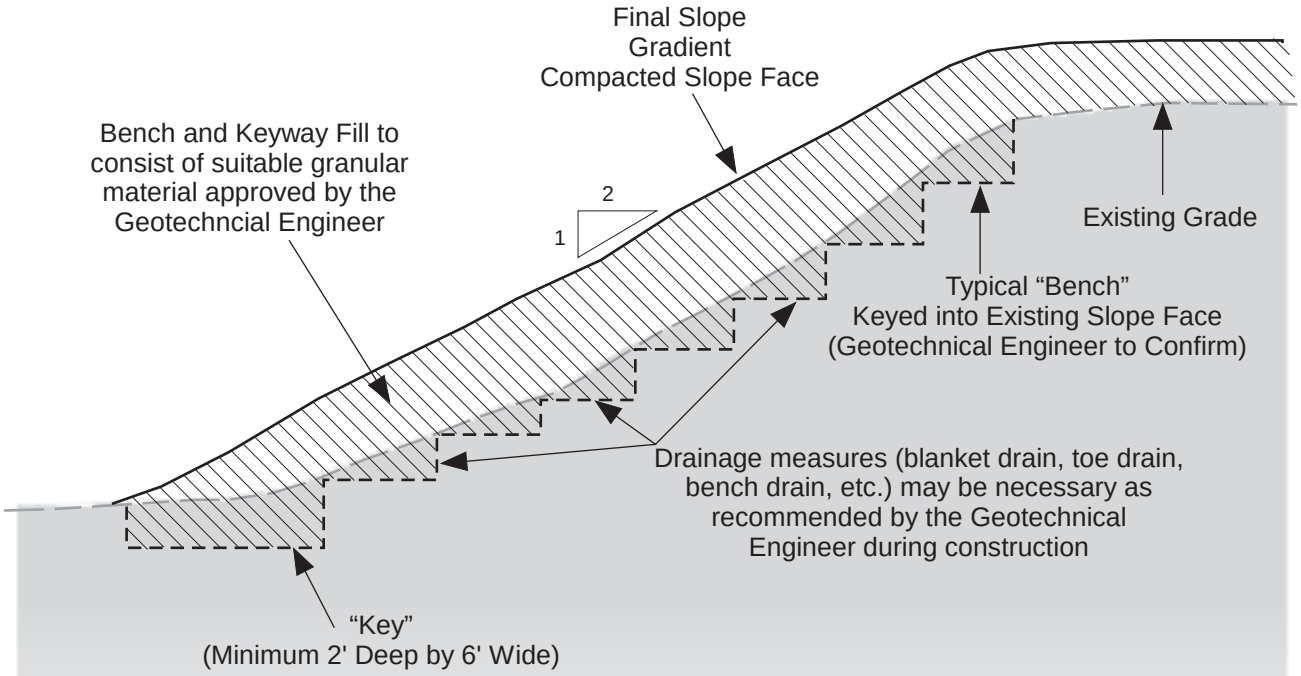
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Test Pit Location Plan
Sunset Pointe
Puyallup, Washington

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Drwn. By	MRS
Checked By	CGH
Date	05/31/2019
Proj. No.	5559
Plate	2

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING



NOTES:

- Slope should be stripped of topsoil and unsuitable materials prior to excavating Keyway or benches.
- Benches will typically be equal to a bulldozer blade width of approximately 8 feet but shall be at least 4 feet.
- Final slope gradient should be 2H : 1V.
- Final slope face should be densified by over-building with compacted fill and trimming back to shape or by compaction with a bulldozer or vibratory drum roller.
- Planting or hydroseeding slope face with a rapid growth deep-rooted vegetative mat will reduce erosion potential of slope area.
- Use of pegged-in-place jute matting or geotechnical fabric will help maintain the seed and mulch in place until the root system has an opportunity to germinate.
- Structural fill should be placed in thin loose lifts not exceeding 12 inches in thickness. Each lift should be compacted to no less than the degree specified in the "Site Preparation and Earthwork" section of this report. No additional lift should be placed until compaction is achieved.

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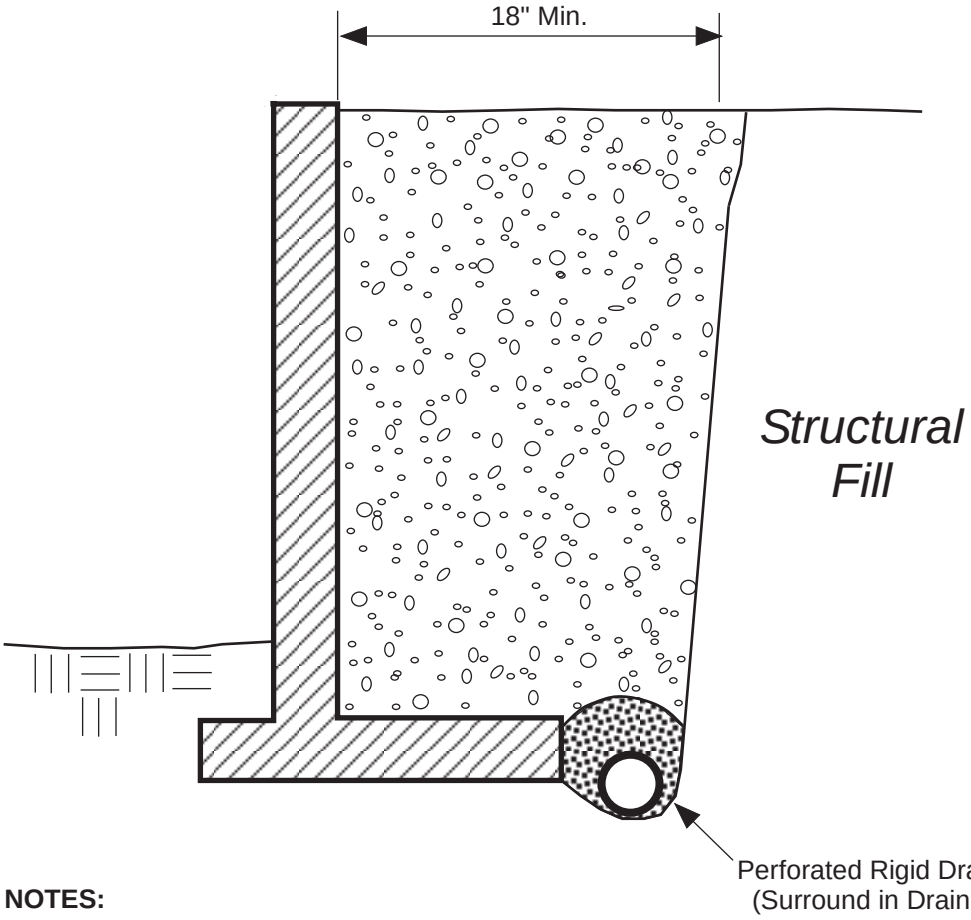
Slope Fill Detail
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 10/09/2018	Proj. No. 5559
Checked CGH	Date Oct. 2018	Plate 3



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

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NOT A CONSTRUCTION DRAWING

LEGEND:

Free-draining Structural Backfill

1-inch Drain Rock

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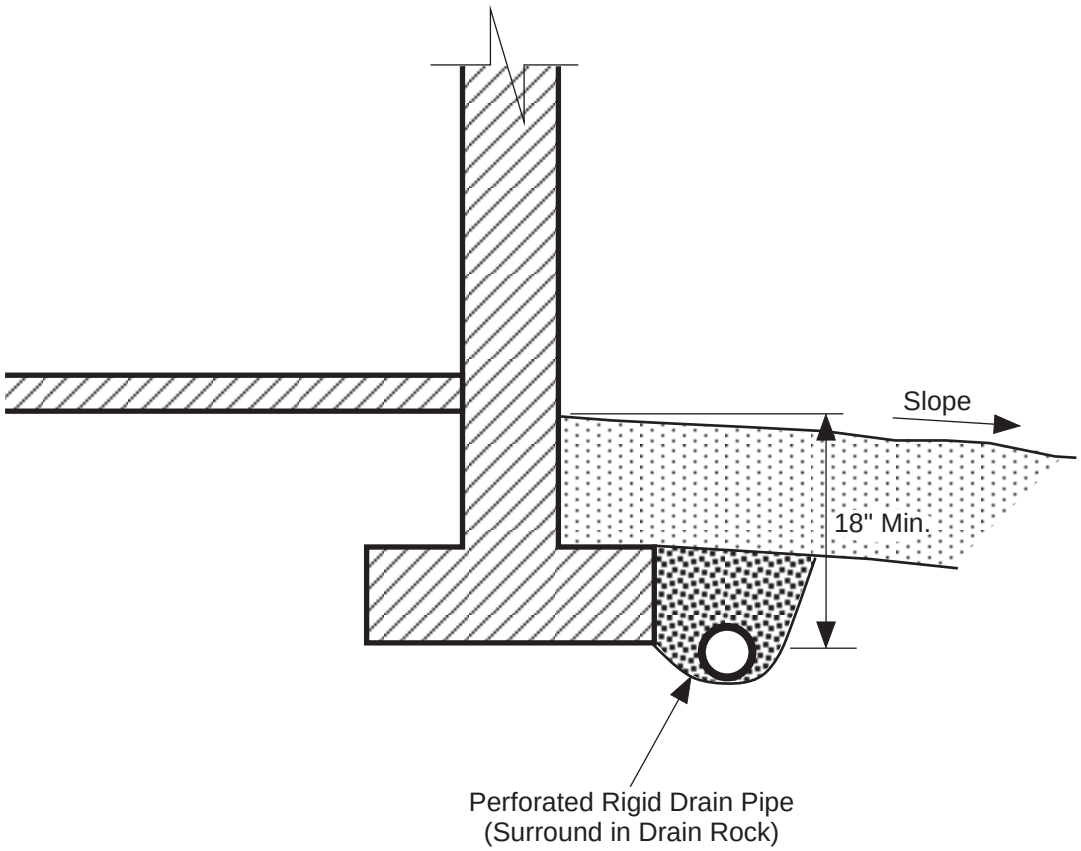
Retaining Wall Drainage Detail
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 10/09/2018	Proj. No. 5559
Checked CGH	Date Oct. 2018	Plate 4



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal: native soil or other low-permeability material.

1-inch Drain Rock

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Footing Drain Detail
Sunset Pointe
Puyallup, Washington

Drwn. MRS	Date 10/09/2018	Proj. No. 5559
Checked CGH	Date Oct. 2018	Plate 5

Appendix A

Subsurface Exploration
Test Pit Logs

ES-5559

Subsurface conditions at the subject site were explored by an ESNW representative on October 24, 2017 and May 15, 2019. A total of 23 test pits were excavated at accessible areas of the site using an operator and trackhoe retained by our firm. The approximate locations of the test pits are illustrated on Plate 2 of this study. The test pits logs are provided in this Appendix. The test pits were excavated to a maximum depth of approximately 18 feet bgs.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

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SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-101

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/19/19 **GROUND ELEVATION** 383 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": heavy bramble **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 12"
					1.0 382.0
			SM		Gray silty SAND with gravel, dense, moist (Fill)
		MC = 13.80%			
5					-sand lens ~12" thick
		MC = 20.00%			5.5 377.5
			ML		Gray SILT, medium dense, moist (Fill)
10		MC = 27.30% Fines = 90.00%			-becomes brown, increased fines [USDA Classification: slightly gravelly LOAM]
					13.0 370.0
		MC = 31.90% Fines = 95.80%	ML		Tan SILT, medium dense, wet [USDA Classification: LOAM]
15					15.0 368.0
		MC = 35.30%	SM		Tan silty SAND, medium dense, wet to saturated -minor iron oxide staining -sand lens 6"- 12" thick
		MC = 28.50%			18.0 365.0
					Test pit terminated at 18.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 18.0 feet.

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TEST PIT NUMBER TP-102

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 376 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": heavy bramble **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 2.25'
				1.0	375.0
			SM		Brown silty SAND, loose, moist
				2.5	373.5
		MC = 25.40% Fines = 98.30%			Gray SILT, dense, moist [USDA Classification: LOAM] -heavy iron oxide staining
5					
		MC = 32.00% Fines = 92.50%	ML		-becomes brown, wet [USDA Classification: LOAM]
					-becomes wet to saturated
				9.5	366.5
		MC = 35.20%			Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.5 feet.

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TEST PIT NUMBER TP-103

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 384 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 8": heavy bush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 6.25' (Fill)
0.6					383.4
					Gray silty SAND with gravel, medium dense to dense, moist (Fill)
					-asphalt debris
		MC = 11.30%			
5					
			SM		
		MC = 10.40%			
					-increased sand content
					-erratic silt interbeds
		MC = 11.70%			
10					
		MC = 20.20%			
11.0					373.0
					Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 11.0 feet.

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TEST PIT NUMBER TP-104

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 5/15/19 **COMPLETED** 5/15/19 **GROUND ELEVATION** 383 ft **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** SSR **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 8": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, root intrusions to 12"	
0.6						382.4
					Gray silty SAND with gravel, medium dense to dense, moist	
		MC = 19.90%	SM		-becomes brown	
					-becomes gray	
5		MC = 23.50%			-heavy iron oxide staining	
5.0						378.0
					Gray SILT, loose, moist to wet	
			ML		-becomes brown, wet	
10						
11.0		MC = 29.80% Fines = 93.50%			[USDA Classification: LOAM]	372.0
					Test pit terminated at 11.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.	
					Bottom of test pit at 11.0 feet.	

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Fax: 425-449-4711

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil &Sod 1"- 3": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			Rock		Crushed Rock (Fill)
				0.5	
			ML		Brown SILT, loose, moist
				1.0	
					Brown poorly graded SAND with silt, medium dense, moist
		MC = 7.40% Fines = 6.20%			[USDA Classification: slightly gravelly SAND]
					-increased gravel content
5			SP-SM		-becomes medium dense to dense
		MC = 4.40%			
					-increased cobbles
		MC = 7.40%		9.0	
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-2

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** — **TEST PIT SIZE** —

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD —

AT TIME OF EXCAVATION —

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL	0.3	Dark brown TOPSOIL (Fill), root intrusions to 7'
			Fill	1.0	Clean washed ROCK (Fill)
					Brown/tan sandy SILT, medium dense, moist
					-light iron oxide staining 2'- 4'
		MC = 21.60%	ML		
5				5.0	
					Gray poorly graded SAND, medium dense to dense, moist
			SP	6.5	
		MC = 9.50%			Tan sandy SILT, dense, moist
			ML	8.0	
					Gray poorly graded SAND with gravel, dense, moist
			SP		-caving caused by excavation activities
		MC = 4.80%		9.0	Test pit terminated at 9.0 feet below existing grade. No groundwater seepage encountered during excavation. Caving observed from 6.0 to 6.5 feet and 8.0 feet to BOH. Bottom of test pit at 9.0 feet.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-3

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** —

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 18": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL (Fill), intrusions to 7'
					1.5
					Gray silty SAND with gravel, medium dense, moist (Fill)
		MC = 8.90%			-clean washed rock ~4" thick
					-becomes brown dense
			SM		
5		MC = 8.10% Fines = 15.90%			[USDA Classification: very gravelly loamy SAND]
					7.0
					Gray SILT with sand, medium dense, moist (Fill)
			ML		
		MC = 19.20%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

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TEST PIT NUMBER TP-4

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, loose to medium dense, moist (Fill)
					-root intrusions to 9'
5					-heavy perched groundwater seepage
		MC = 12.30%			
					7.0
					Gray SILT with sand, loose to medium dense, wet (Fill)
					-trace organics
					-light iron oxide staining
10			ML		
		MC = 19.30%			
		MC = 22.10%			12.0
					Brown sandy SILT, dense, moist
					-light iron oxide staining
			ML		
15					
		MC = 27.40%			15.0
					Test pit terminated at 15.0 feet below existing grade. Groundwater encountered seepage encountered at 4.0 feet during excavation. Caving observed from 0.0 to 9.0 feet. Bottom of test pit at 15.0 feet.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-5

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 12": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
					1.0 Brown silty SAND, medium dense, moist
		MC = 7.20%			-becomes tan, damp to moist
5			SM		
		MC = 20.90%			-becomes dense -light iron oxide staining
					-becomes gray, very dense -moderate cementation, light iron oxide staining
		MC = 12.40%			9.5 Test pit terminated at 9.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 9.5 feet.

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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-6

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2"- 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, medium dense, moist (Fill)
					-root intrusions to 7'
					2.0
					Relic TOPSOIL Horizon
					2.5
					Brown sandy SILT, medium dense, moist (Fill)
					-minor brick debris
		MC = 20.50%			-becomes gray
5			ML		
					8.0
		MC = 10.00%			Brown poorly graded SAND, dense, moist
					-light iron oxide staining
10			SP		
					-becomes wet to saturated
		MC = 31.70%			12.0
					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 12.0 feet.

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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-7

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 6"- 8": brush **AFTER EXCAVATION** --

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 7'
				0.5	Brown silty SAND, loose to medium dense, moist
		MC = 9.50%			-light to moderate iron staining
					-becomes gray, very dense
5			SM		
		MC = 18.00%			-becomes wet
				9.0	Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

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1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-8

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		0.5 Dark brown TOPSOIL, root intrusions to 5'
					Brown silty SAND, medium dense, moist
		MC = 16.30%	SM		-becomes gray, dense
5					
		MC = 17.80%			
					8.0
			SP		Gray poorly graded SAND, dense, moist
		MC = 3.20%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-9

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
0.5					Brown SILT with sand, medium dense to dense, moist
		MC = 21.70% Fines = 81.20%	ML		[USDA Classification: LOAM] -becomes gray -light iron oxide staining
5					
6.0					
		MC = 3.90%	SP		Gray poorly graded SAND, dense, moist
6.5					Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 6.5 feet.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-10

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Gray silty SAND, medium dense, moist (Fill)
					-root intrusions to 3.5'
					2.0
			TPSL		Relic TOPSOIL Horizon
		MC = 12.40%			2.5
					Brown silty SAND, medium dense, moist
					-becomes gray, dense
5					
		MC = 18.70%	SM		
		MC = 8.90%			9.0
					Test pit terminated at 9.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 9.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-11

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		0.5 Dark brown TOPSOIL, root intrusions to 4'
					Tan silty SAND, medium dense, moist
					-moderate iron oxide staining to 4'
		MC = 21.10%			
5		MC = 20.10%	SM		-intermittent light iron oxide staining
					-becomes dense
10		MC = 16.00%			10.0 Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 10.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-12

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, medium dense, moist
					-root intrusions to 3'
			ML		-becomes gray
		MC = 15.20% Fines = 60.20%			[USDA Classification: LOAM]
5					
		MC = 17.30%			
				6.0	Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 6.0 feet.

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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-13

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** —

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 4": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown sandy SILT, loose to medium dense, moist
		MC = 27.30%			
5			ML		-becomes gray
		MC = 23.90%			
				9.5	
10		MC = 16.00%	SP	10.0	Gray poorly graded SAND with gravel, dense, wet
					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 10.0 feet.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
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Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-14

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 6"- 8": grass **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 3'
0.5					Brown silty SAND, loose to medium dense, moist
		MC = 15.20%	SM		-becomes gray, medium dense -light iron oxide staining
5					
		MC = 7.10%			
7.0					Gray poorly graded SAND, dense, moist
			SP		
10		MC = 12.50%			
10.0					Brown silty SAND, dense, moist
			SM		
		MC = 9.00%			
12.0					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 12.0 feet.

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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-15

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Surface Conditions: brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			SM		Brown silty SAND, loose, moist (Fill) -trace to moderate organics throughout -root intrusions to 12'
		MC = 18.90%			
5					
10		MC = 91.30% Fines = 79.00%			[USDA Classification: gravelly loamy coarse SAND] -becomes wet
15				15.5	
		MC = 28.60%	ML	16.0	Gray sandy SILT, medium dense, moist
					Test pit terminated at 16.0 feet below existing grade. No groundwater encountered during excavation. No caving observed. Bottom of test pit at 16.0 feet.

GENERAL BH / TP / WELL 5559.GPJ GINT US.GDT 12/21/17

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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-16

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Surface Conditions: brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Dark brown silty SAND, loose, wet
					-root intrusions to 3'
		MC = 30.80%	SM		
5		MC = 16.50%			-becomes brown, medium dense, moist
		MC = 7.90%			-becomes gray
				6.0	Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 6.0 feet.

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1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-17

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** —

NOTES Depth of Topsoil & Sod 4": brush **AFTER EXCAVATION** —

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, wet (Fill)
					-root intrusions to 7'
		MC = 24.10%	SM		
5					
					7.0
		MC = 6.30%	SM		Tan silty SAND, medium dense, moist
					7.5
					Test pit terminated at 7.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 7.5 feet.

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Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-18

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** **TEST PIT SIZE**

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 2"- 3": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0					Brown silty SAND, loose, moist (Fill)
					-root intrusions to 3'
		MC = 14.90%	SM		
					-wire debris
5				5.0	
			SM		Tan silty SAND, medium dense, moist
		MC = 6.30%		6.0	
					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 6.0 feet.

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-19

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe

DATE STARTED 10/24/17 **COMPLETED** 10/24/17 **GROUND ELEVATION** _____ **TEST PIT SIZE** _____

EXCAVATION CONTRACTOR NW Excavating **GROUND WATER LEVELS:**

EXCAVATION METHOD _____ **AT TIME OF EXCAVATION** ---

LOGGED BY CGH **CHECKED BY** HTW **AT END OF EXCAVATION** ---

NOTES Depth of Topsoil & Sod 10": brush **AFTER EXCAVATION** ---

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, root intrusions to 2'
				1.0	
			SM		Gray silty SAND, medium dense, moist
		MC = 13.00%			
					-becomes dense
5		MC = 15.40%		5.0	
					Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.
					Bottom of test pit at 5.0 feet.

Appendix B

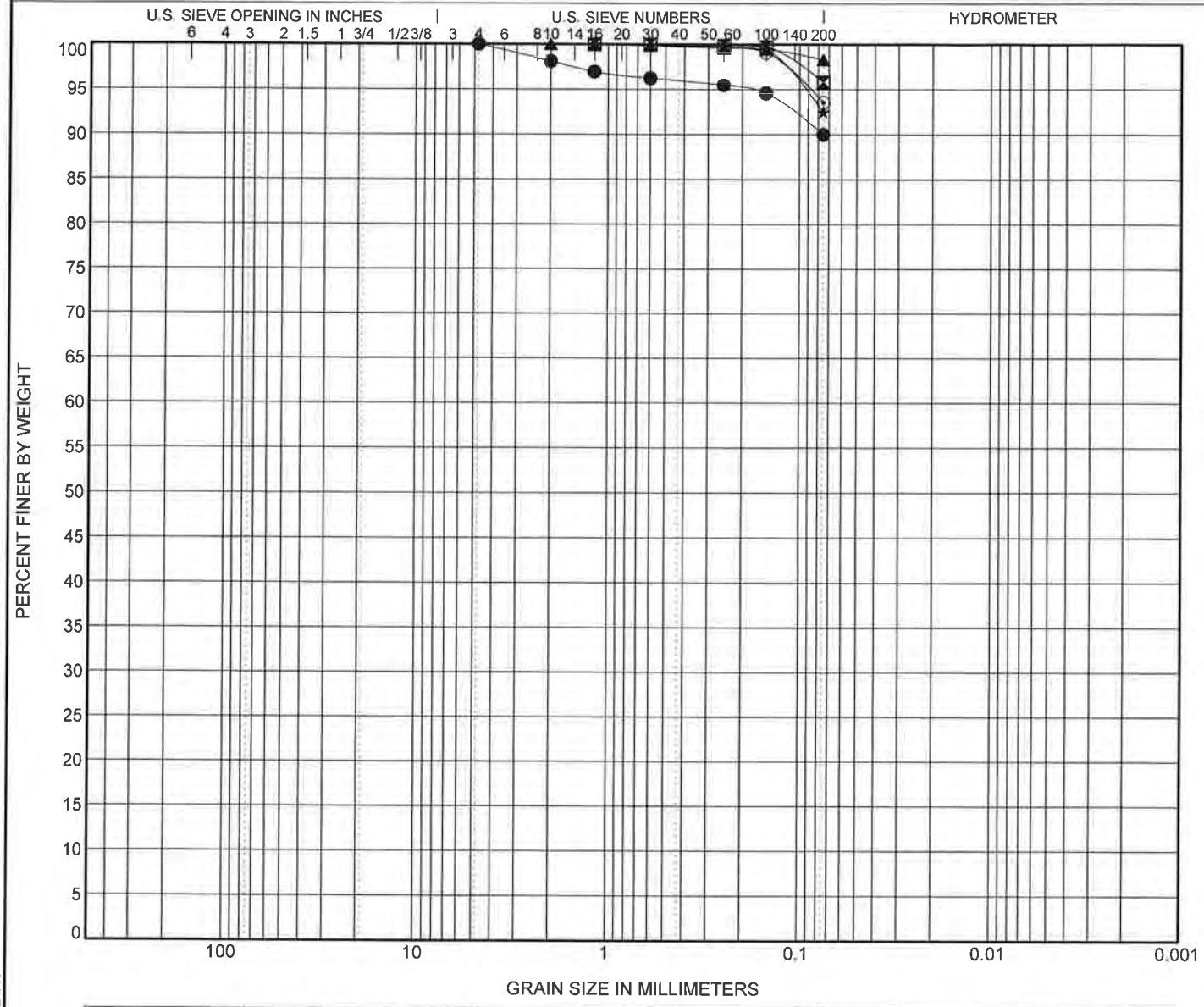
Laboratory Test Results

ES-5559

Earth Solutions NW
1805 - 136th Place N.E., Suite 201
Bellevue, Washington 98005
Telephone: 425-449-4704
Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-5559 **PROJECT NAME** Sunset Pointe



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
●	TP-101 10.00ft.	USDA: Gray Slightly Gravelly Loam. USCS: ML.		
⊠	TP-101 14.00ft.	USDA: Tan Loam. USCS: ML.		
▲	TP-102 3.00ft.	USDA: Gray Loam. USCS: ML.		
★	TP-102 6.00ft.	USDA Brown Loam. USCS: ML.		
⊙	TP-104 11.00ft.	USDA: Brown Loam. USCS: ML.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	TP-101 10.0ft.	4.75							90.0	
⊠	TP-101 14.0ft.	1.18							95.8	
▲	TP-102 3.0ft.	2							98.3	
★	TP-102 6.0ft.	1.18							92.5	
⊙	TP-104 11.0ft.	1.18							93.5	

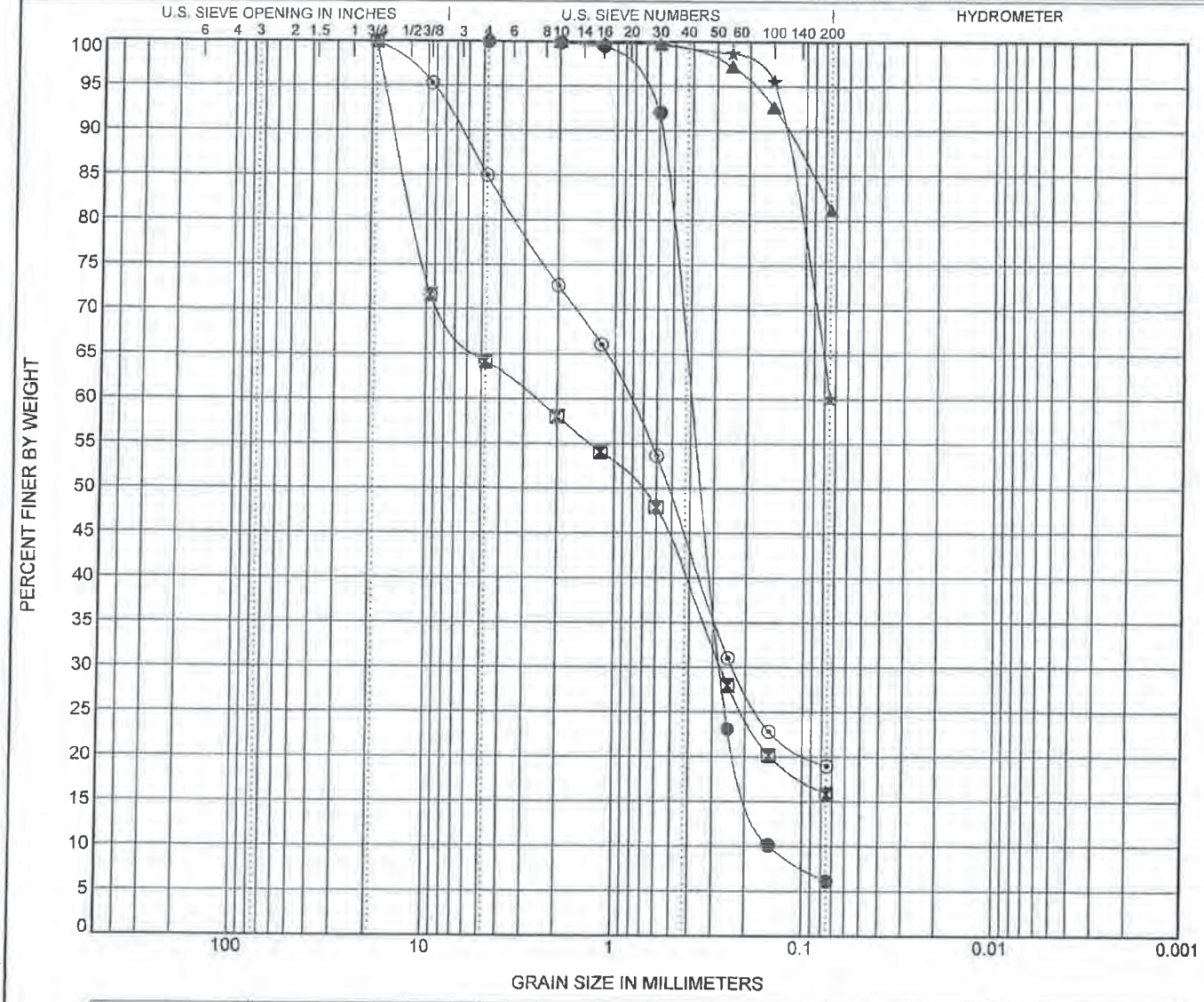
GRAIN SIZE USDA ES-5559 SUNSET POINTE.GPJ GINT US LAB.GDT 6/24/19

Earth Solutions NW, LLC
1805 - 136th PL N.E., Suite 201
Bellevue, WA 98005
Telephone: 425-449-4704
Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

CLIENT Peter Chen **PROJECT NAME** Sunset Pointe

PROJECT NUMBER ES-5559 **PROJECT LOCATION** Puyallup, Washington



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
TP-01	3.00ft.	USDA: Brown Slightly Gravelly Sand. USCS: SP-SM.	1.28	2.74
TP-03	5.00ft.	USDA: Brown Very Gravelly Loamy Sand. USCS: SM with Gravel.		
TP-09	2.50ft.	USDA: Gray Loam. USCS: ML with Sand.		
TP-12	4.00ft.	USDA: Brown Loam. USCS: Sandy ML.		
TP-15	10.50ft.	USDA: Brown Gravelly Loamy Coarse Sand. USCS: SM with Gravel.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
TP-01	3.0ft.	4.75	0.399	0.273	0.146				6.2	
TP-03	5.0ft.	19	2.638	0.273					15.9	
TP-09	2.5ft.	2							81.2	
TP-12	4.0ft.	2							60.2	
TP-15	10.5ft.	19	0.847	0.234					19.0	

GRAIN SIZE USDA ES-5559 SUNSET POINTE.GPJ GINT US LAB.GDT 11/10/17

Report Distribution

ES-5559

EMAIL ONLY

Mr. Peter Chen
4709 Memory Lane West
University Place, Washington 98488

EMAIL ONLY

CES NW, Inc.
429 – 29th Street Northeast, Suite D
Puyallup, Washington 98372

Attention: Ms. Dawn Markakis

CRITICAL AREA ASSESSMENT

HABITAT TECHNOLOGIES

CRITICAL AREAS ASSESSMENT

SUNSET POINTE RESIDENTIAL COMMUNITY
PARCELS 0420353026 and 0420353027
2100 - 19th Avenue SE, City of Puyallup, Washington

This report has been revised to incorporate review comments provided by the City of Puyallup Environmental Review Team

prepared for

Ms. Jennifer Caldwell, Senior Planner
@ CES NW Inc.
310 - 29th Street NE, Suite 101
Puyallup, Washington 98372

prepared by

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

January 19, 2018

REVISED
SEPTEMBER 21, 2018

Table of Contents

INTRODUCTION

This document details the culmination of activities and onsite evaluations undertaken to complete a critical areas (i.e. wetlands, streams, fish and wildlife habitats) assessment for the proposed **Sunset Pointe Residential Community** - **Parcels 0420353026 and 0420353027 (project site).** Initial planning for this residential community also included two independent parcel to the north of 19th Avenue SE (Parcels 0420353009 and 0420157011). However, these two northern parcels have been removed for this residential community following a series of discussions with the City of Puyallup Environmental Review Team.

The project site was located at 2100 - 19th Avenue SE 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, to include the establishment of protective buffers, does not result in adverse environmental impacts to identified critical areas, their associated buffer, or adversely impact local water quality.

The assessment and delineation of specific critical areas within and immediately adjacent to the project site followed the methods and procedures defined in the *Corps of Engineers Wetland Delineation Manual* (United States Army Corps of Engineers, 1987) with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (United States Army Corps of Engineers, 2010); the Washington State *Wetland Rating System for Western Washington* (Hruby, 2014), the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030), and the City of Puyallup Chapter 21. This document was designed to accommodate site planning and potential regulatory actions and is suitable for submittal to federal, state, and local authorities for potential critical areas verification and permitting actions.

PROJECT SITE DESCRIPTION

The project site was irregular in shape and approximately 9.45-acres in size. The project site was accessed along the northwestern boundary via 19th Avenue SE. The project site was surrounded by existing development to the west, east, and south. A vacant parcel was located to the north. The project site had undergone a number of land use manipulations over the past several decades. These manipulations have included forest harvest; clearing and grading; excavation, creation, and maintenance of a series of ornamental ponds; the development and management of pastures; perimeter and internal fencing; the development of internal roadways; the development and demolition of prior homesites and associated outbuildings, the development of a new single-family home; the manipulation of seasonal surface water runoff within the watershed; and the development of adjacent parcels and public roadways.

Legal Description - Parcel 0420353026: Section 35 Township 20 Range 04 Quarter 33 : PARCEL `C` 0F DBLR 95-07-17-0491 DESC AS FOLL COM AT SW COR OF SW TH N ALG W LI SD SW 1387.82 FT TO NW COR OF SW OF SW TH E ALG N LI SD SUBD 1260.60 FT TO POB TH CONT E 81.25 FT TH S 51 DEG 21 MIN 11 SEC E

Legal Description - Parcel 0420353027: Section 35 Township 20 Range 04 Quarter 34 : PARCEL `D` OF DBLR 95-05-17-0491 DESC AS FOLL COM AT SW COR OF SW TH E ALG S LI SD SW 1974.60 FT TH N 01 DEG 06 MIN 54 SEC W 615.92 FT TO POB TH N 87 DEG 01 MIN 41 SEC W 292.30 FT TH N 61 DEG 33 MIN 32 SEC W 4

Directions to Project Site: From Meridian Avenue South through the center of the City of Puyallup turn east onto 23rd Avenue SE. Continue easterly on 23rd Avenue SE to 19th Street SE. Turn north onto 19rd Street SE and continue to 21st Avenue SE. Turn east onto 21st Avenue SE and continue to 2100 - 21st Avenue SE (project site).

BACKGROUND INFORMATION

NATIONAL WETLAND INVENTORY

The *National Wetland Inventory (NWI) Mapping* completed by the U.S. Fish and Wildlife Service was reviewed as a part of this assessment. This mapping resource identified an excavated pond within the central portion of the project site. This excavated pond was identified as palustrine, unconsolidated bottom, permanently flooded, excavated (PUBHx) (Figure 2). This mapping resource also identified an excavated pond directly to the south of the southwestern corner of the project site. The adjacent excavated pond to the south was identified as palustrine, unconsolidated bottom, permanently flooded, excavated (PUBHx).

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 species within or immediately adjacent to the project site. This mapping resource did identify an offsite wetland to the southwest of the project site separated by existing residential development.

STATE OF WASHINGTON DEPARTMENT OF FISH AND WILDLIFE

The State of Washington Department of Fish and Wildlife (WDFW) *SalmonScape Mapping* was reviewed as a part of this assessment (Figure 4). This mapping resource did not identify any drainage corridors within or immediately adjacent to the project site.

STATE OF WASHINGTON DEPARTMENT OF NATURAL RESOURCES

The State of Washington Department of Natural Resources (WDNR) *Water Type Mapping* was reviewed as a part of this assessment (Figure 5). This mapping resource did not identify any wetlands or drainage corridors within or immediately adjacent to the project site.

CITY OF PUYALLUP MAPPING

The City of Puyallup *Inventory Mapping* was reviewed as a part of this assessment (Figure 6). This mapping resource identified a stream entering the southwestern portion of the project site. This stream then crossed through the project site to the east/northeast existing along the eastern boundary of the project site. This mapping resource also noted an offsite wetland to the west of 21st Avenue SE to the west of the project site.

SOILS MAPPING

The soil mapping prepared by the *Natural Resource Conservation Service* was reviewed as a part of this assessment (Figure 5). This mapping resource identified the northern portion of the project site was dominated by Kitsap silt loam (#20B and #20C). The Kitsap soil series consists of moderately well drained soil that formed in glacial lake sediments on remnant terraces along Puget Sound. This mapping resource also identified the southern portion of the project site to contain Everett gravelly sandy loam (#13C). The Everett soil series is noted as somewhat excessively drained and formed in gravelly glacial outwash. The Everett soil series is not listed as a “hydric” soil.

ONSITE ANALYSIS

CRITERIA FOR CRITICAL AREAS IDENTIFICATION

The City of Puyallup defines “critical areas” to include wetlands, fish and wildlife habitat areas, critical aquifer recharge areas, geologically hazardous areas, and frequently flooded areas. The critical areas assessment reported in this document has been limited to address wetlands and fish and wildlife habitat areas.

Wetlands: The City of Puyallup has defined "wetlands" as areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, retention 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 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 plan 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 repented 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.

Fish and Wildlife Habitat Areas: The City of Puyallup has defined "fish and wildlife habitat areas" to include those areas necessary for maintaining species in suitable habitats within their natural geographic distribution so that isolated subpopulations are not created as designated by WAC 365-190-080. These areas include:

(a) Areas with which state or federally designated endangered, threatened, and sensitive species have a primary association;
(b) Habitats of local importance, including but not limited to areas designated as priority habitat by the Department of Fish and Wildlife;
(c) Streams and surface waters within the jurisdiction of the state of Washington; and

(d) Land essential for preserving connections between habitats and open spaces.

STUDY METHODS

Habitat Technologies completed a series of onsite assessments from September through early December 2017. In addition, Habitat Technologies has completed similar assessments for parcels located within the general area of the project site over the past several decades. The objective of this evaluation was to define and delineate potential critical areas (wetlands; drainage corridors; and fish and wildlife habitats) that may be present within or immediately adjacent to the project area. Onsite activities were completed in accordance with criteria and procedures established in the *Corps of Engineers Wetland Delineation Manual* (United States Army Corps of Engineers, 1987) with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (United States Army Corps of Engineers, 2010); the Washington State *Wetland Rating System for Western Washington* (Hruby, 2014), the State of Washington Department of Natural Resources (WDNR) Forest Practice Rules (WAC 222-16-030), and the City of Puyallup Chapter 21.

FIELD OBSERVATION

The project site was accessed via 19th Street SE along the northwestern boundary of the project site. The project site had historically been managed as a single-family home associated with the production of livestock and for the production of hay crops. These activities appeared to have stopped around 2008. The phased demolition of the historic single-family home and associated outbuildings appeared to have begun in 2011. A new single-family home appeared to have been constructed in 2014 and was located at 2100 - 19th Avenue SE (along the western boundary of the project site).

The project site had undergone a number of land use manipulations over the past several decades. These manipulations have included forest harvest; clearing and grading; excavation, creation, and maintenance of a series of ornamental ponds; the development and management of pastures; perimeter and internal fencing; the development of internal roadways; the development and demolition of prior homesites and associated outbuildings, the development of a new single-family home; the manipulation of seasonal surface water runoff within the watershed; and the development of adjacent parcels and public roadways.

The project site was generally slightly sloped to the north/northeast. A ravine crossed through the site from the western boundary to the eastern boundary. This ravine was identified to contain a seasonal stream that originated offsite to the south. Onsite this ravine had undergone prior development actions to include the excavation and creation of three (3) ornamental ponds. These ponds appeared to have been created through the excavation of material within the ravine and through the placement of material to establish two (2) internal roadways corridors crossing the ravine generally north to south. Hydrology

control structures and culverts had been installed to intentionally control surface water ponding within these ornamental features.

- **Onsite Plant Communities**

The plant communities throughout the entire project site had been altered by prior and ongoing land use actions. The plant community within the very southwestern portion of the project site adjacent with the drainage corridor was dominated by a mixed forest that included a number of mature trees. Observed tree species included Douglas fir (*Pseudotsuga menziesii*), Western red cedar (*Thuja plicata*), big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), Western hemlock (*Tsuga heterophylla*), Hawthorne (*Crataegus monogyna*), and black cottonwood (*Populus trichocarpa*). The understory within this forested area included hazelnut (*Corylus cornuta*), vine maple (*Acer circinatum*), Scot's broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus procera*), evergreen blackberry (*Rubus laciniatus*), trailing blackberry (*Rubus ursinus*), Oregon grape (*Berberis nervosa* and *Berberis aquifolium*), snowberry (*Symphoricarpus albus*), salmonberry (*Rubus spectabilis*), wild rose (*Rosa gymnocarpa*), Indian plum (*Oemleria cerasiformis*), sword fern (*Polystichum munitum*), bracken fern (*Pteridium aquilium*), salal (*Gaultheria shallon*), holly (*Ilex* spp.), Pacific red elderberry (*Sambucus racemosa*), geranium (*Geranium* spp.), smooth cats ear (*Hypochaeris glabra*), nettle (*Urtica dioica*), and buttercup (*Ranunculus repens*). This plant community was identified as non-hydrophytic in character (i.e. typical of non-wetlands).

The plant community associated with the drainage corridor and intentionally excavated ornamental ponds within the southern portion of the project site included a mixture of mature trees, dense shrubs, grasses, herbs, and aquatic plants. Observed species included red alder, Western red cedar, black cottonwood, salmonberry, Douglas spiraea (*Spiraea douglasii*), red osier dogwood (*Cornus stolonifera*), twinberry (*Lonicera involucrata*), nettle, buttercup, skunk cabbage (*Lysichitum americanum),* softrush (*Juncus effusus*), slough sedge (*Carex obnupta*), reed canarygrass (*Phalaris arundinacea*), reed managrass (*Glyceria grandis*), common cattail (*Typha latifolia*), water parsley (*Oenanthe sarmentosa*), speedwell (*Veronica* spp.), lady fern (*Athyrium filix-femina*), small fruited bulrush (*Scirpus microcarpus*), and horsetail (Equisetum spp.). This plant community appeared to have formed following the creation of the three (3) excavated ponds within the drainage corridor. This plant community was identified as hydrophytic in character (i.e. typical of wetlands).

- **Hydrology Patterns**

Onsite hydrology appeared to be the result of seasonal stormwater runoff from onsite and offsite areas, concentration of surface flows within identified drainage corridor, and the series of onsite hillside seeps. The majority of the project site appeared to drain moderately well and did not exhibit field indicators associated with the movement of seasonal surface water runoff.

A surface water drainage corridor was identified entering near the southwestern corner of the project site. This drainage corridor extended through the project site generally to the east/northeast within a well-defined ravine. This ravine had undergone prior development actions to include the intentional creation of three (3) excavated ornamental ponds. These ornamental ponds appeared to have been created through the excavation of material within the ravine and through the placement of material to establish two (2) internal roadways corridors crossing the ravine generally north to south. Hydrology control structures and culverts had been installed to intentionally control surface water ponding within these ornamental features. At the property boundary the surface water within this drainage corridor was captured within a buried drainage system installed as a part of the development of the adjacent residential community. This drainage appeared to be an eventual tributary to the Deer Creek System located well offsite to the northeast. The lower reaches of Deer Creek well offsite have been identified to meet the criteria for designation as a City of Puyallup Category II Stream with salmonids.

- **Soils**

As documented at several sample plots the project site was dominated by soil that exhibited a silty loam texture and coloration typical of the Kitsap soil series. The majority of the onsite soil appeared to drain moderately well and did not exhibit prominent redoximorphic features. In addition, prior land use actions appeared to have dramatically altered the surface soil profile. Within many areas the surface soil appeared to have been removed by prior grading. Throughout the project site the surface soil had been compacted by the historic livestock usage.

A drainage corridor was identified entering the project site near the southwestern boundary and continued through the project site through a series of intentionally excavated ornamental ponds to the eastern boundary. The surface soil within these intentionally excavated ponds was black to very dark gray (10YR 2/1 to 10YR 3/1) to a depth of 8 to 20 inches. The subsoil to a depth of 20 to 24 inches was very dark gray to gray (10YR 3/1 to 10YR 4/2) and exhibited prominent redoximorphic features and oxidized root channels. The soil within these intentionally excavated ponds exhibited a surface layer of generally soft captured alluvial sandy silty loam to silty loam with a high organic content as a result of intentionally ponded seasonal surface water.

- **Wildlife**

Wildlife species observed onsite, observed within the general area during prior assessments, and that would be reasonably expected to utilize the habitats provided within or adjacent to the project site would include red tailed hawk (*Buteo jamaicensis*), great blue heron (*Ardea herodias*), American crow (*Corvus brachynchos*), American robin (*Turdus migratorius*), black capped chickadee (*Parus atricapillus*), dark eyed junco (*Junco hyemalis*), rufous hummingbird (*Selasphorus rufus*), merlin (*Falco columbarius*), pileated

woodpecker (*Dryocopus pileatus*), rock dove (*Columbia livia*), evening grosbeak (*Hesperiphona vespertina*), black-headed grosbeak (*Pheucticus melanocephalus*), mourning dove (*Zenaida macroura*), red winged blackbird (*Agelaius phoenisues*), brewers blackbird (*Euphagus cyanocephalus*), golden crowned sparrow (*Zonotrichia atricapilla*), song sparrow (*Melospiza melodia*), white crowned sparrow (*Zonotrichia leucophrys*), house sparrow, house finch (*Carpodacus mexicanus*), starling (*Sturnus vulgaris*), American goldfinch (*Carduelis tristis*), purple finch (*Carpodacus purpureus*), violet green swallow (*Tachycineta thallassina*), tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), song sparrow (*Melospiza melodia*), Steller's jay (*Cyanocitta stelleri*), starling (*Sturnus vulgaris*), black capped chickadee (*Parus atricapillus*), Northern flicker (*Colaptes auratus*), house sparrow (*Passer domesticus*), rufous-sided towhee (*Pipilo erythrophthalmus*), American goldfinch (*Carduelis tristis*), marsh wren (*Cistothorus palustirs*), killdeer (*Charadrius vociferus*), common mallard (*Anas platyrhynchos*), Canadian goose (*Branta canadensis*), black tailed deer (*Odocoileus hemionus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginianus*), eastern gray squirrel (*Sciurus carolinensis*), deer mouse (*Peromyscus maniculatus*), shrew (*Sorex* spp.), Townsend mole (*Scapanus townsendii*), voles (*Microtus* spp.), Norway rat (*Rattus norvegicus*), bats (*Myotis spp.*), common garter snake (*Thamnophis sirtalis*).

The project site provided suitable spawning and rearing habitats for Pacific treefrog (*Hyla regilla*), red-legged frog (*Rana aurora*), and salamander (*Ambystoma* spp). Common garter snake (*Thamnophis sirtalis*) was also present across the project site.

The project site did **not** provide direct habitats for fish species.

Wildlife Movement Corridors: The project site was within a well urbanized area. As identified by onsite wildlife trials, small and medium sized mammals appeared to be moving throughout the project site. The project site is also within the general area of the migratory movement of passerine birds.

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

> **Game Species:** "Game species" are regulated by the State of Washington through recreational hunting bag limits, harvest seasons, and harvest area restrictions. Observed or documented "game species" within and adjacent to the project site included black tailed deer, common mallard, Canada goose, and mourning dove.
>
> **State Monitored:** State Monitored species are native to Washington but require habitat that has limited availability, are indicators of environmental quality, require further assessment, have unresolved taxonomy, may be competing with other species of concern, or have significant popular appeal. One State Monitored

species – great blue heron - was observed within the excavated pond in the southern portion of the project site.

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. One State Candidate species - pileated woodpecker – was not observed to use the habitats associated with the project site but has been identified during prior assessments to use the habitats associated with Wildwood Park located offsite to the west.

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 or have been documented to use the habitats associated with the project site.

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

Federally Listed Species: The project site has not been documented to provide critical habitats for federally listed Endangered, Threatened, or Sensitive species. A single, federally listed species of concern – bald eagle – has been documented to use the offsite habitats associated with the Puyallup River Corridor and the Clarks Creek Corridor.

CRITICAL AREAS DETERMINATION

WETLANDS

Wetland determination was based on observations of hydrophytic vegetation, hydric soils, and wetland hydrology in accordance with the *Corps of Engineers Wetland Delineation Manual* (United States Army Corps of Engineers, 1987) with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (United States Army Corps of Engineers, 2010). Based on these methods

no area within the project site was identified within the project site to exhibit all three of the established wetland criteria. Two (2) areas within the vicinity of the project site were identified to exhibit all three of the established wetland criteria.

WETLAND	CLASSIFICATION (USFWS)	CITY OF PUYALLUP CATEGORY	WDOE RATING SCORE	WDOE HABITAT SCORE	BUFFER WIDTH (High Intensity)
D	PFOEx/PSSEx	III	17	6	150 feet
E	PSSE/PEME	III	16	5	150 feet

Wetland D: Wetland D was identified offsite to the north of the eastern portion of the of the project site. This wetland was within a ravine associated with hillside seeps and a seasonal surface water drainage corridor. Hydrology for this wetland appeared to be provided primarily by the hillside seeps and seasonal surface water runoff from the local area. Wetland D had undergone prior land use manipulations to include clearing, grading, the intentional excavation of small livestock ponds, the installation of culverts, and the creation of internal roadways. Wetland D was dominated by a mixed forest plant community. The understory was limited as a result of the prior livestock grazing. The movement of surface water through this wetland was intermittent and controlled in part by prior ditch excavation. However, this movement did not form a continuous defined channel or swale. Surface flow within Wetland D was captured along the eastern parcel boundary and conveyed offsite via a buried storm drainage system.

Wetland D met the U.S. Fish and Wildlife Service (USFWS) criteria for classification as palustrine, forested, seasonally flooded/saturated, excavated (PFOEx); and palustrine, scrub-shrub, seasonally flooded/saturated, excavated (PEMEx). Following a series of discussions with City of Puyallup Environmental Review Team Wetland D was best defined to meet the criteria for designation as a City of Puyallup Category III Wetland. Wetland D achieved a total functions score of 17 points utilizing the Washington State Department of Ecology (WDOE) *Wetland Rating Form for Western Washington* (Hruby 2014) (Appendix B).

Wetland E: Wetland E was identified offsite to the north of the western portion of the project site within a swale adjacent to 21st Street SE. Hydrology appeared provided primarily from hillside seeps and seasonal sheetflow from adjacent upland areas. Wetland E was dominated by blackberries and included areas of buttercup, slough sedge, soft rush, and reed canary grass. Wetland E had undergone prior land use manipulations associated with livestock usage. The development of 21st Street SE also appeared to have been completed without the placement of a culvert to allow for the movement of seasonal surface water runoff to the northwest as existing topography would suggest.

This wetland met the USFWS criteria for classification as palustrine, emergent, seasonally flooded/saturated (PEME). Following a series of discussions with City of Puyallup Environmental Review Team Wetland E appeared best defined to meet the criteria for designation as a City of Puyallup Category III Wetland. Wetland E achieved a total functions score of 16 points utilizing the WDOE *Wetland Rating Form for Western Washington* (Hruby 2014) (Appendix B).

FISH AND WILDLIFE HABITAT AREAS

This onsite assessment and discussions with the City of Puyallup Environmental Review Team identified two (2) City of Puyallup designated "fish and wildlife habitat areas." These areas were identified within and immediately adjacent to the project site and were defined as "streams" within the jurisdiction of the State of Washington. No state or federally designated endangered, threatened, and sensitive species have been documented to have a primary association within the habitats onsite; no portion of the project site has been defined as a "habitat of local importance;" and no lands essential for preserving connections between habitats and open spaces have been identified or documented within the project site.

Stream A: Stream A was identified entering near the southwestern corner of the project site. This drainage corridor extended through the project site generally to the east/northeast within a well-defined ravine. This ravine had undergone prior development actions to include the intentional creation of three (3) excavated ornamental ponds. These ornamental ponds appeared to have been created through the excavation of material within the ravine and through the placement of material to establish two (2) internal roadways corridors crossing the ravine generally north to south. Hydrology control structures and culverts had been installed to intentionally control surface water ponding within these ornamental features. At the property boundary the surface water within this drainage corridor was captured within a buried drainage system installed as a part of the development of the adjacent residential community. This drainage appeared to be an eventual tributary to the Deer Creek System located well offsite to the northeast.

As discussed with the City of Puyallup Environmental Review Team Stream A meet the criteria for designation as a City of Puyallup Type III Stream within the project site. A Type III Stream is defined to exhibit perennial or intermittent flow and as not used by anadromous fish. The standard buffer for a Type III Stream is 50 feet in width as measured perpendicular from the ordinary high water mark (OHWM).

Stream B: Stream B was identified offsite to the north of the eastern portion of project site and as associated with offsite Wetland D. This stream commenced from a series of hillside seeps then flowed generally to the north/northeast. Hydrology was collected in a drainage system along the western boundary of the adjacent housing development. Further to the north, hydrology appeared to infiltrate within the historic pasture area. Stream B had undergone prior development activities to include to creation of excavated livestock ponds, ditching, internal road crossing, and culvert installation within the project site.

Stream B appeared to meet the criteria for designation as a City of Puyallup Type III Stream. A Type III Stream is defined to exhibit perennial or intermittent flow and as not used by anadromous fish. The standard buffer for a Type III Stream is 50 feet in width as measured perpendicular from the OHWM.

INTENTIONALLY CREATED MAN-MADE FEATURES

EXCAVATED PONDS

Three intentionally excavated ponds were identified associated with Stream A in the southern portion of the project site. These excavated ponds had been created in a topographic ravine that contained Stream A which entered the site near the southwestern boundary and continued through the site generally to the east/northeast. These ponds appeared best defined as intentionally created through the excavation of material within the Stream A ravine and through the placement of material to establish two (2) internal roadways corridors crossing the ravine generally north to south. Hydrology control structures and culverts had also been installed and maintained to provide hydrology within the ponds and to control seasonal high storage levels. These excavated ponds had been historically created as a part of the site development activities associated with the use by livestock and irrigation of the project site.

These intentionally excavated ponds appeared to meet the criteria within the City of Puyallup Title 21.06.210 Definitions section:

> (21.06.210.75) "Intentionally created wetland or surface water systems" means wetlands or surface water systems created through purposeful human action, such as irrigation and drainage ditches, grass-lined swales, canals, farm ponds, detention/retention facilities, and landscape/ornamental amenities. Purposeful creation must be demonstrated through documentation, photographs, statements and/or other evidence. Intentionally created wetlands or surface water systems do not include areas or systems created as mitigation.

SELECTED DEVELOPMENT ACTION

The *Selected Development Action* for the project site for the project site focuses on the creation of a number of new parcels suitable for single-family homesite development. The final creation of new homesite parcels would be consistent with the City of Puyallup Comprehensive Plan, local zoning, and the City's Critical Areas Ordinance. As presently identified within the initial site plan and as discussed with the City of Puyallup Environmental Review Team, the final site plan would establish a protective stream buffer as measured from the top edge of the excavated ponds associated with Stream A within the project site. Protective buffers associated with Wetlands D and E located offsite to the north would not be expected to encroach into the project site. The proposed development of this residential community would avoid potential adverse impacts to identified streams and wetlands within the project site and adjacent area.

STANDARD OF CARE

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

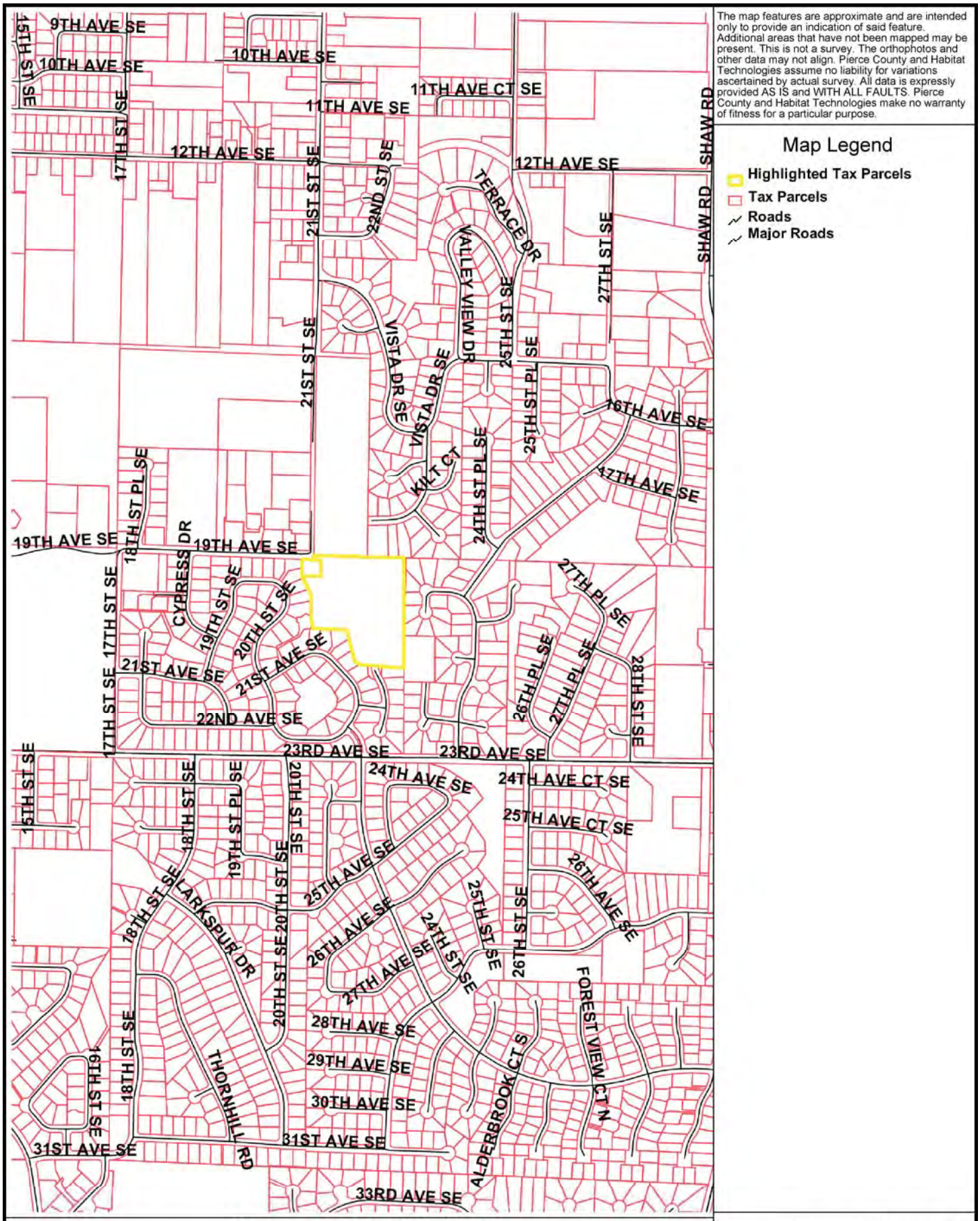
Bryan W. Peck

Bryan W. Peck
Wetland Biologist

Thomas D. Deming

Thomas D. Deming, PWS
Habitat Technologies

FIGURES



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Highlighted Tax Parcels
- Tax Parcels
- Roads
- Major Roads

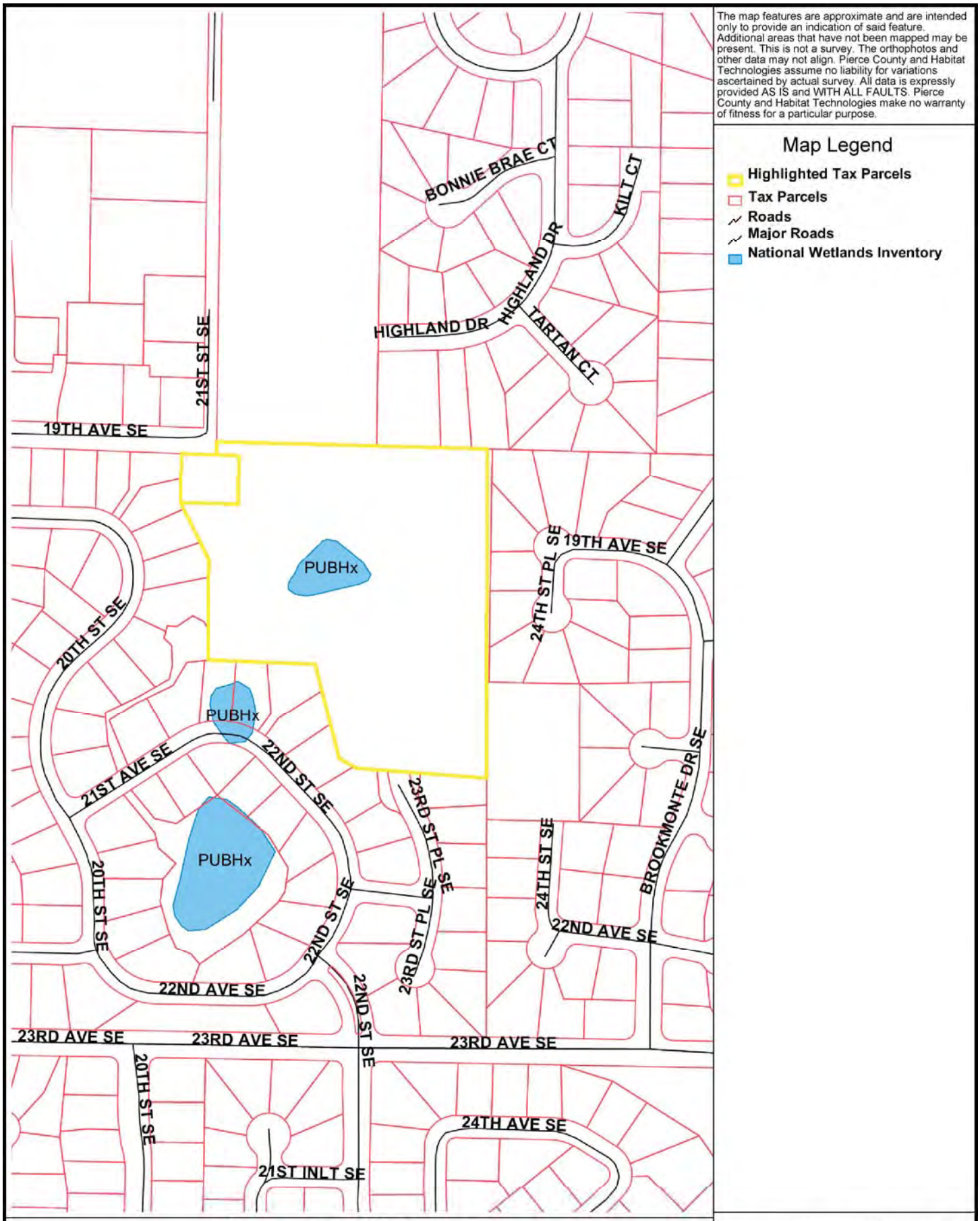
Figure 1 Site Vicinity

0 450 900 ft.

N

9/27/18 2:34 PM

Habitat Technologies



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Highlighted Tax Parcels
- Tax Parcels
- Roads
- Major Roads
- National Wetlands Inventory

Figure 2 NWI Mapping

0 150 300 ft.

N

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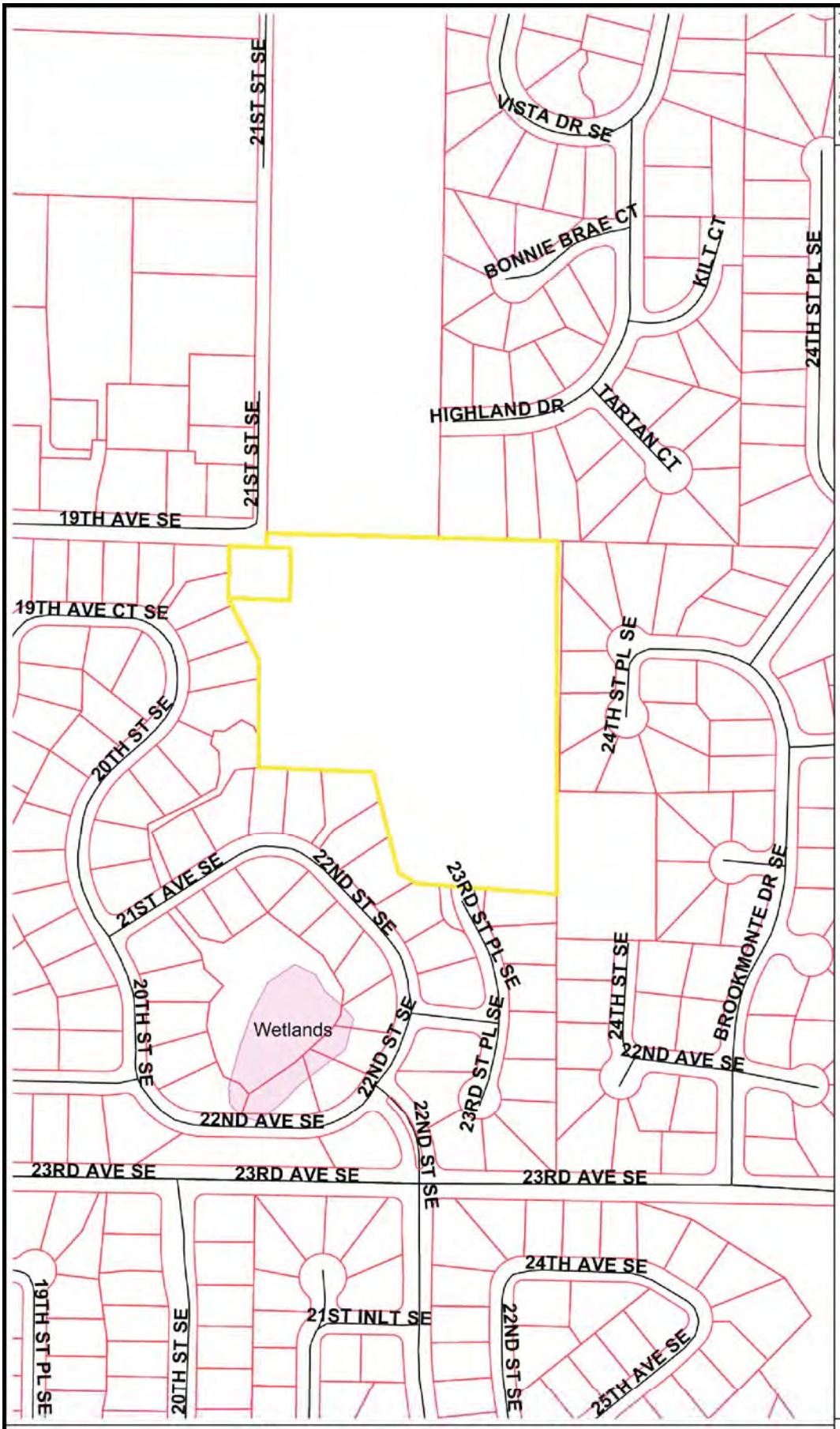
Habitat Technologies



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Highlighted Tax Parcels
- Tax Parcels
- Roads
- Major Roads
- Priority Habitat/Species

Figure 3 PHS Mapping

0 160 320 ft.

N

9/27/18 2:25 PM

Habitat Technologies

Figure 4 WDFW Mapping

September 27, 2018

1:9,028

All SalmonScape Species

0 0.075 0.15 0.3 mi

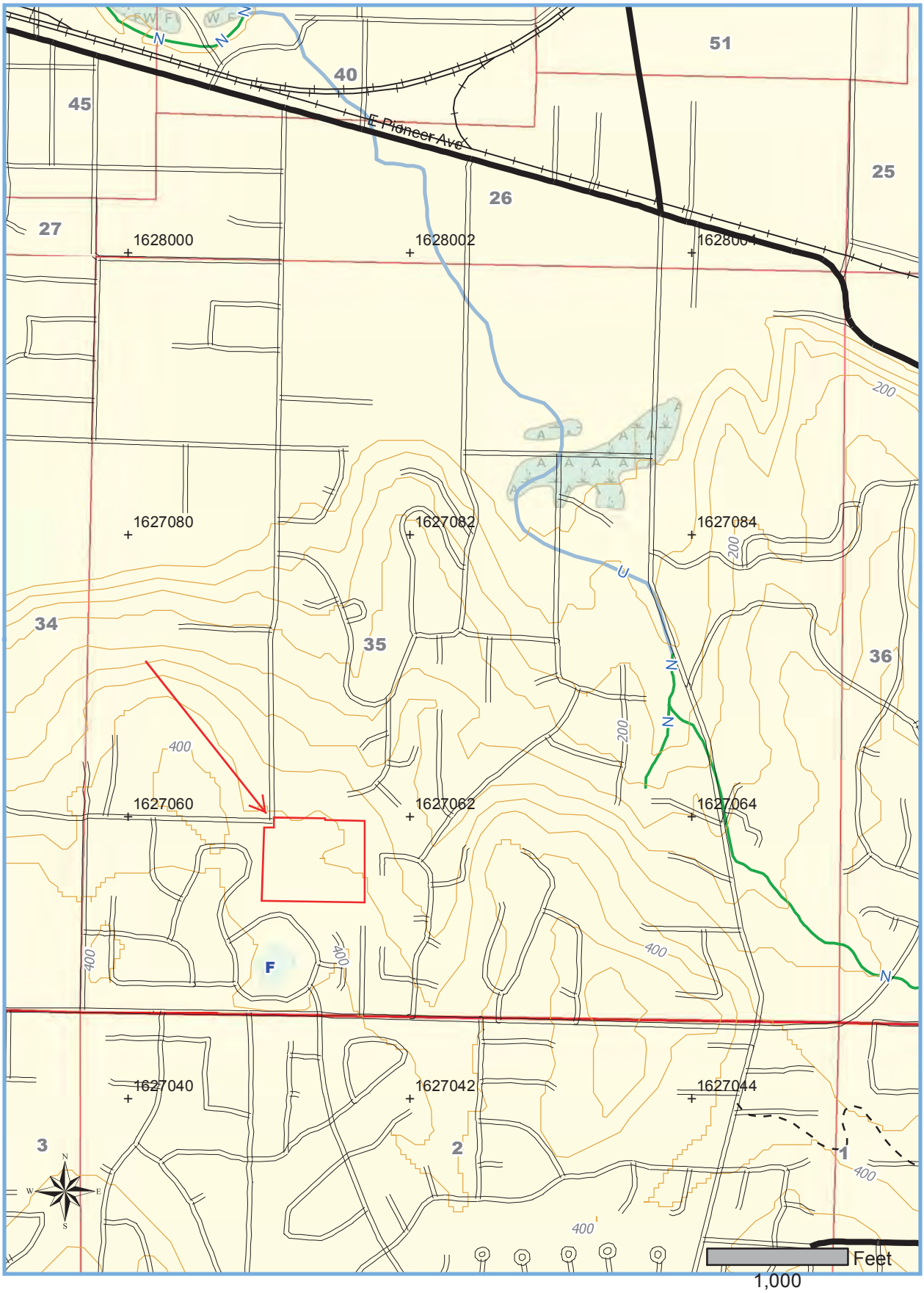
0 0.1 0.2 0.4 km

USGS/NHD
Esri, HERE, Garmin, © 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

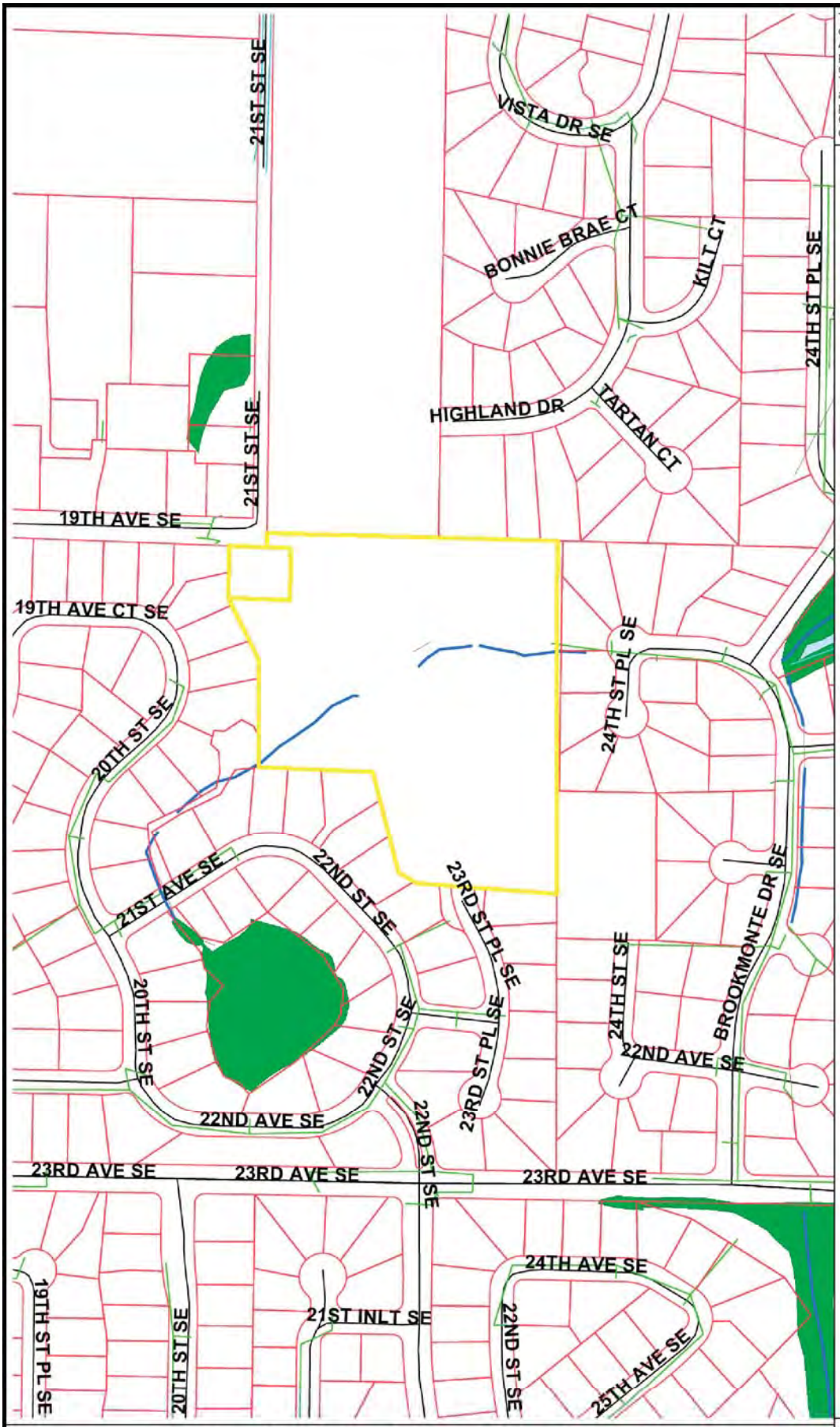
Figure 5 FOREST PRACTICE WATER TYPE MAP

TOWNSHIP 20 NORTH HALF 0, RANGE 04 EAST (W.M.) HALF 0, SECTION 35

Application #: _____



Date: 10/31/2017 Time: 10:43:11 AM
NAD 83
Contour Interval: 40 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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Drainage - Control Structures - Puyallup
- Highlighted Tax Parcels
- Tax Parcels
- Streams - Puyallup
- Drainage - Culverts - Puyallup
- Drainage - Channels - Puyallup
- Drainage - Pipes - Puyallup
- Roads
- Major Roads
- General Habitat Areas
- Wetlands - Puyallup
  - Field-verified Delineated
  - Field-verified
  - Unverified
  - Buffer
  - Mitigation Site
- Drainage - Stormwater Facilities

Figure 6 City of Puyallup Mapping

0 160 320 ft.

N

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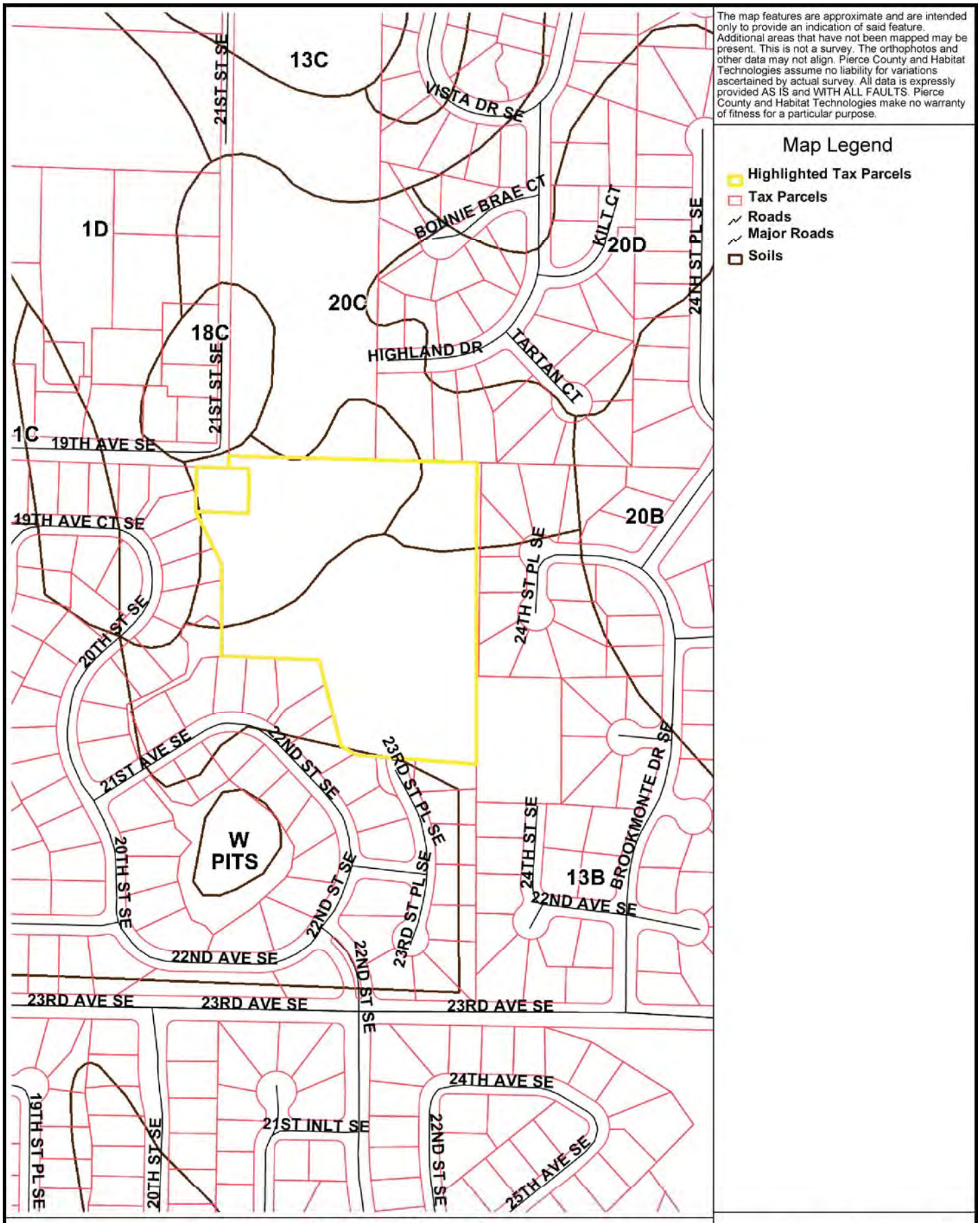
Habitat Technologies



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Highlighted Tax Parcels
- Tax Parcels
- Roads
- Major Roads
- Soils

Figure 7 Soils Mapping

0 160 320 ft.

N

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Habitat Technologies

REFERENCE AND BACKGROUND LIST

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Washington State Department of Fish and Wildlife SalmonScape Mapping System, 2016 (for fish presence): http://apps.wdfw.wa.gov/salmonscape/map.html

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

APPENDIX A – Field Data Forms

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-1

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Wetland D.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	yes	FAC
2.			
3.			
4.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Cornus stolonifera	20	yes	FACW
2.			
3.			
4.			
5.			
	20	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Lysichitum americanum	30	yes	OBL
2. Equisetum arvense	20	yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	40	yes	FAC
2.			
	40	= Total Cover	

% Bare Ground in Herb Stratum 40

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ☒ **No** ☐

Remarks:

SOIL

Sampling Point: SPB-1

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100					L	
4-20	10YR 4/2	80	10YR 4/6	20	C	M	Gcl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☒ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☒ No ☐ Depth (inches): 2

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-2

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Upland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pseudotsuga menziesii	45	yes	FACU
2. Crataegus monogyna	20	yes	FACU
3.			
4.			
	65	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Oemleria cerasiformis	10	yes	FACU
2. Sambucus racemosa	10	yes	FACU
3.			
4.			
5.			
	20	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	30	yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	30	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	40	yes	FAC
2. Rubus ursinus	50	yes	FACU
	90	= Total Cover	

% Bare Ground in Herb Stratum 40

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 14 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:

SOIL

Sampling Point: SPB-2

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

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

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

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

Wetland Hydrology Present? Yes ☐ No ☒

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-3

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Upland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pseudotsuga menziesii	50	yes	FACU
2.			
3.			
4.			
	50 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Sambucus racemosa	30	yes	FACU
2.			
3.			
4.			
5.			
	30 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Polystichum munitum	20	yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	100	yes	FAC
2. Rubus ursinus	30	yes	FACU
	100 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:

SOIL

Sampling Point: SPB-3

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					L	
4-18	10YR 3/3	100					Sgl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

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

Wetland Hydrology Present? Yes ☐ No ☒

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: State: Washington Sampling Point: SPB-10

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification:

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Ranunculus repens	100	yes	FAC
2. Juncus effusus	20	yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	60	yes	FAC
2.			
	60 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: SPB-10

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	100					SI	
8-18	10YR 4/1	80	10YR 4/6	20	C	M	SI	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☒ No ☐ Depth (inches): 3

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-11

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Wetland

VEGETATION – Use scientific names of plants.

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

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: SPB-11

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					SI	
6-18	10YR 4/1	70	10YR 4/6	30	C	M	SI	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☒ No ☐ Depth (inches): 3

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-12

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Upland

VEGETATION – Use scientific names of plants.

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

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: SPB-12

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

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/3	100					SI	
12-18	10YR 4/2	95	10YR 4/6	5	C	M	SI	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☐ No ☒ Depth (inches):

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

Wetland Hydrology Present? Yes ☐ No ☒

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: State: Washington Sampling Point: SPB-16

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification:

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Upland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	20	yes	FAC
2.			
3.			
4.			
	20	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Equisetum arvense	30	yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	30	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	100	yes	FAC
2.			
	100	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ☒ **No** ☐

Remarks:

SOIL

Sampling Point: SPB-16

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

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

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:_____

Depth (inches):_____

Hydric Soil Present? Yes ☐ No ☒

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): _____

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

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

Wetland Hydrology Present? Yes ☐ No ☒

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-18

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Wetland

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	40	yes	FAC
2.			
3.			
4.			
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1.			
2.			
3.			
4.			
5.			
	0	= Total Cover	
Herb Stratum (Plot size: 15ft radius)			
1. Juncus effusus	20	yes	FACW
2. Equisetum arvense	30	yes	FAC
3. Athyrium filix-femina	30	yes	FAC
4. Ranunculus repens	20	yes	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 15ft radius)			
1. Rubus procera	30	yes	FAC
2.			
	30	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: SPB-18

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 4/2	100					SI	
4-20	10YR 4/1	80	10YR 4/6	20	C	M	SI	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☒ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☒ No ☐ Depth (inches): 4

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks:

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

Project/Site: Sunset Pointe City/County: Puyallup / Pierce Sampling Date: 03 OCT 2017

Applicant/Owner: _____ State: Washington Sampling Point: SPB-24

Investigator(s): Habitat Technologies Section, Township, Range: S35, T20, R4E

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

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

Soil Map Unit Name: Kitsap silt loam NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

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

Remarks: Wetland.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 15ft radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	30	yes	FAC
2.			
3.			
4.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15ft radius)			
1. Rubus spectabilis	20	yes	FAC
2.			
3.			
4.			
5.			
	20 = Total Cover		
Herb Stratum (Plot size: 15ft radius)			
1. Lysichitum americanum	80	yes	FACW
2. Equisetum arvense	20	yes	FAC
3. Athyrium filix-femina	20	yes	FAC
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 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

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

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

Prevalence Index worksheet:

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

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:

SOIL

Sampling Point: SPB-24

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

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

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☒ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes ☒ No ☐

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches):

Water Table Present? Yes ☒ No ☐ Depth (inches): 3

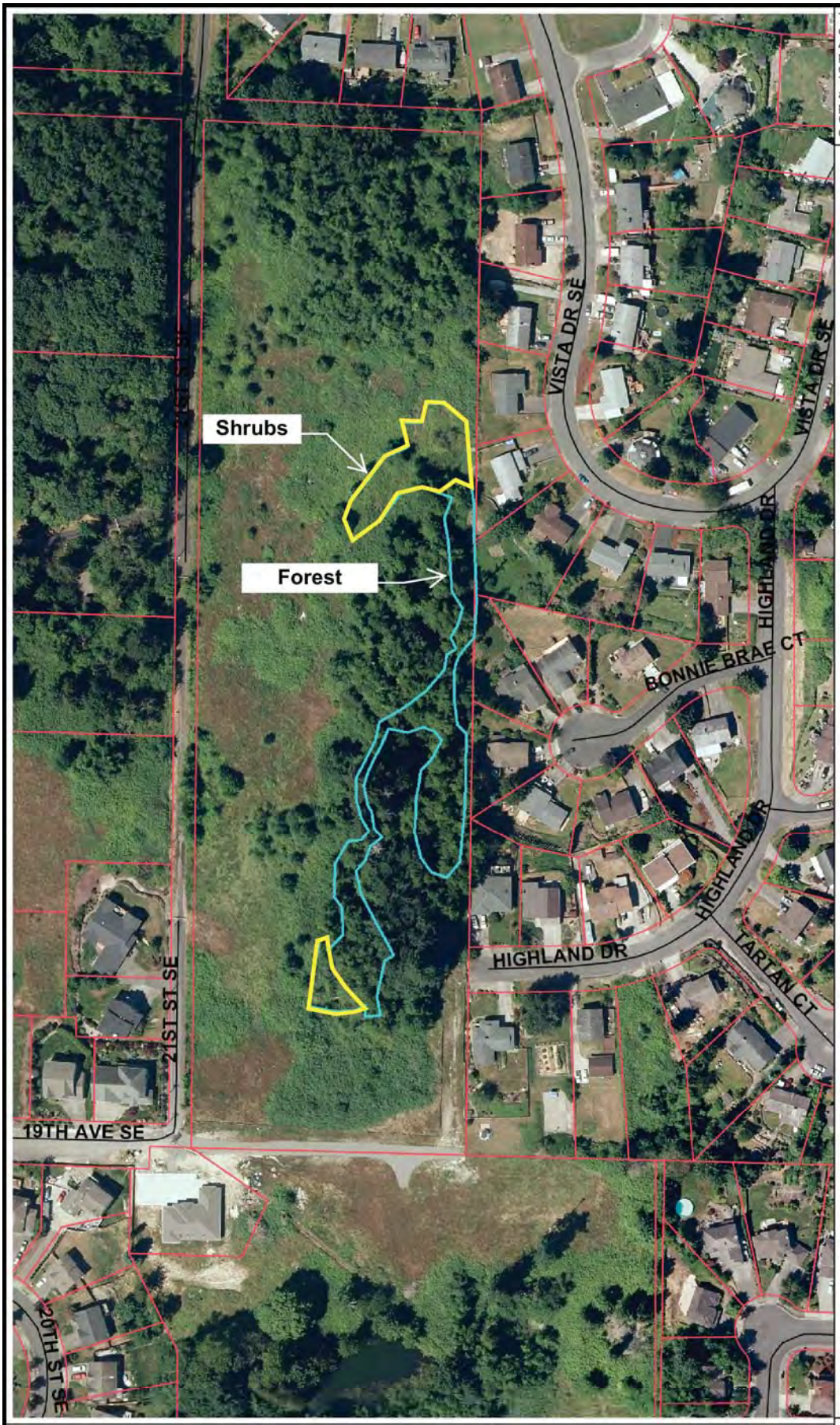
Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): 0

Wetland Hydrology Present? Yes ☒ No ☐

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

Remarks:

APPENDIX B – Wetland Rating Worksheets



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Wetland D
- Highlighted Tax Parcels
- Tax Parcels
- Roads
- Major Roads
- County - 2014 - Ortho

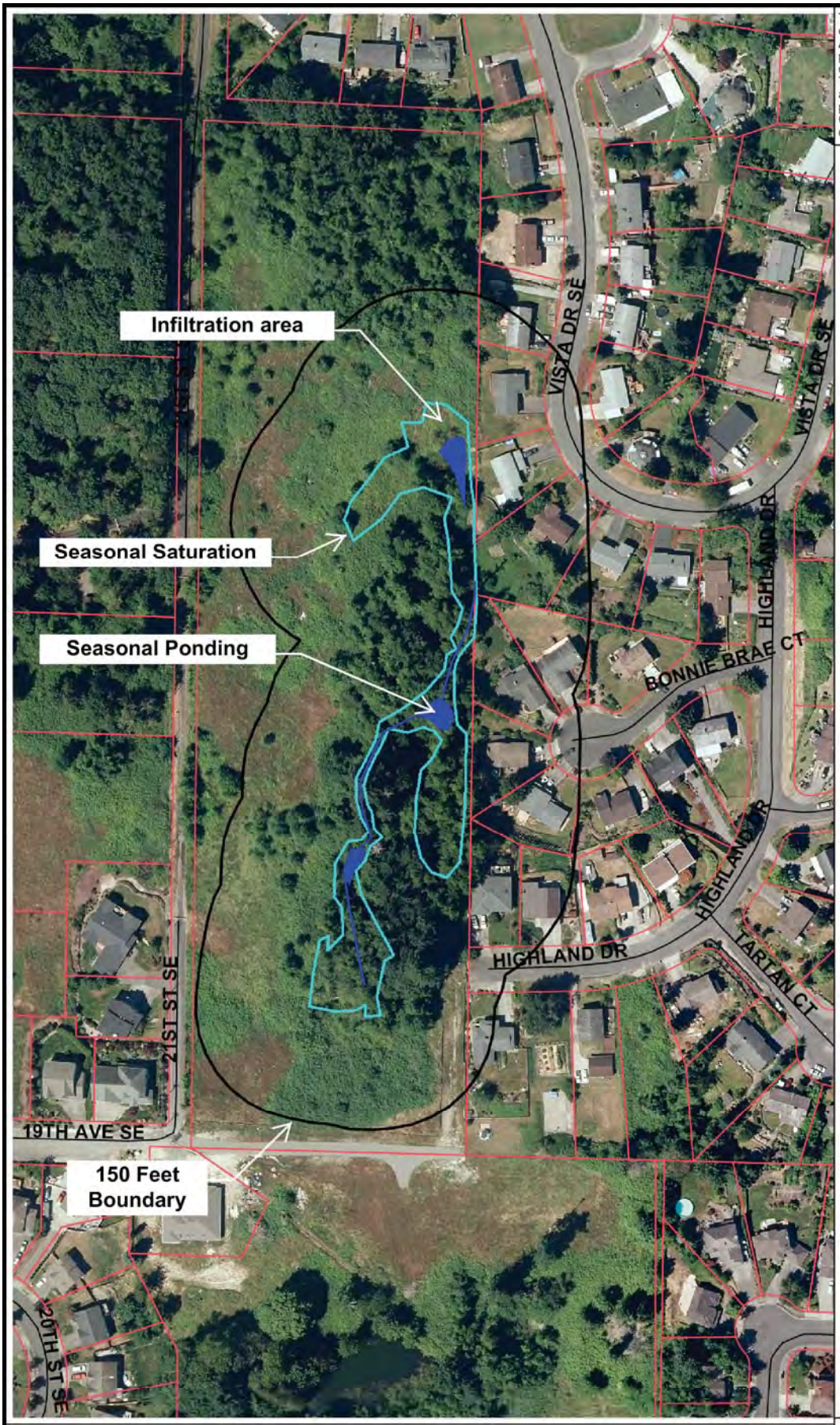
Figure D1

0 100 200 ft.

N

10/11/17 11:58 AM

Habitat Technologies



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Wetland D
- Highlighted Tax Parcels
- Tax Parcels
- Roads
- Major Roads
- County - 2014 - Ortho

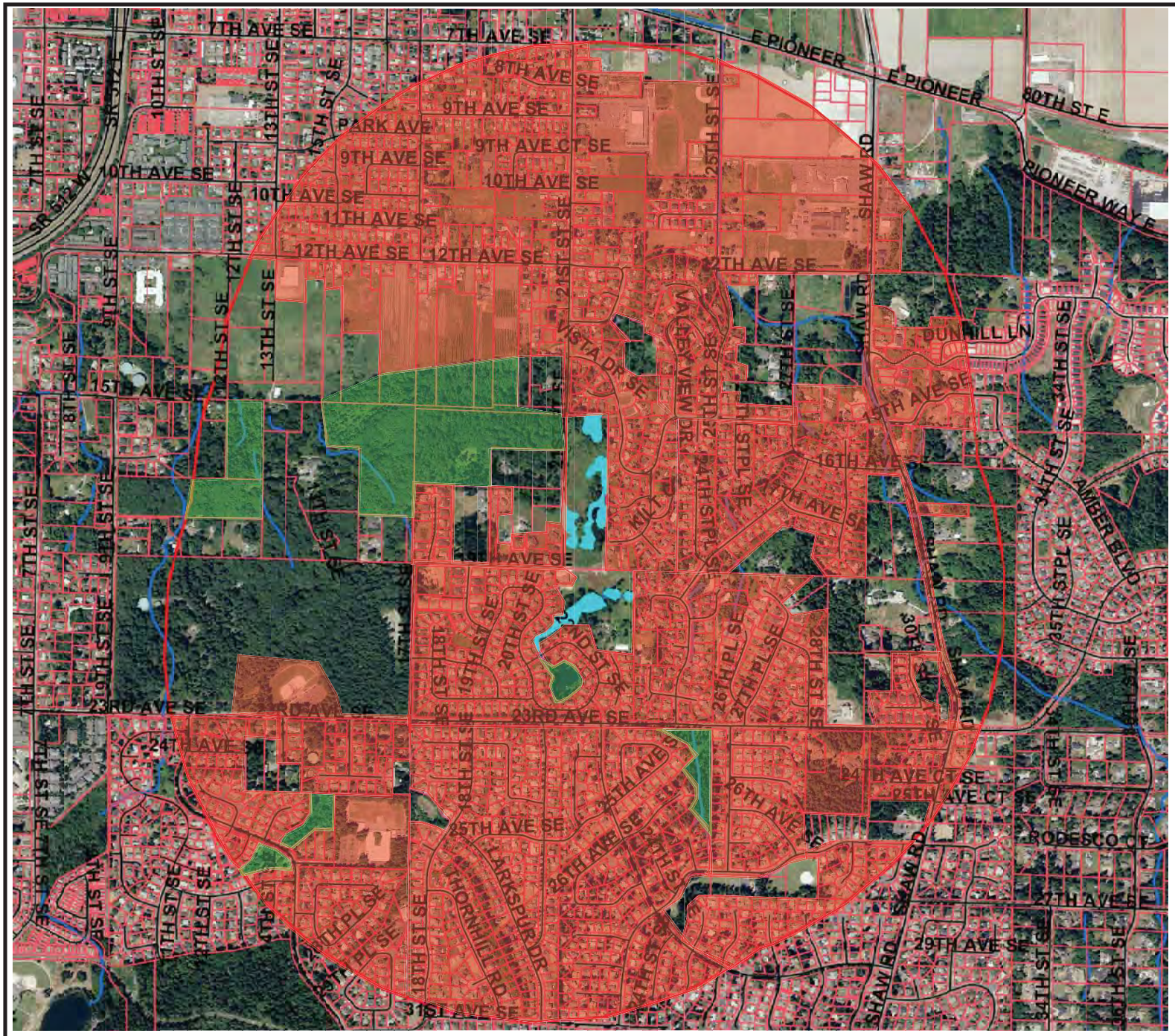
Figure D2

0 100 200 ft.

N

10/11/17 12:01 PM

Habitat Technologies



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Wetlands
- Highlighted Wetland F
- Tax Parcels
- Streams - Puyallup
- Roads
- Major Roads
- County - 2014 - Ortho
- High Intensity Land Use
- Low/Moderate Intensity Land Use
- Habitat Area

Printed: 10/19/17 3:56 PM

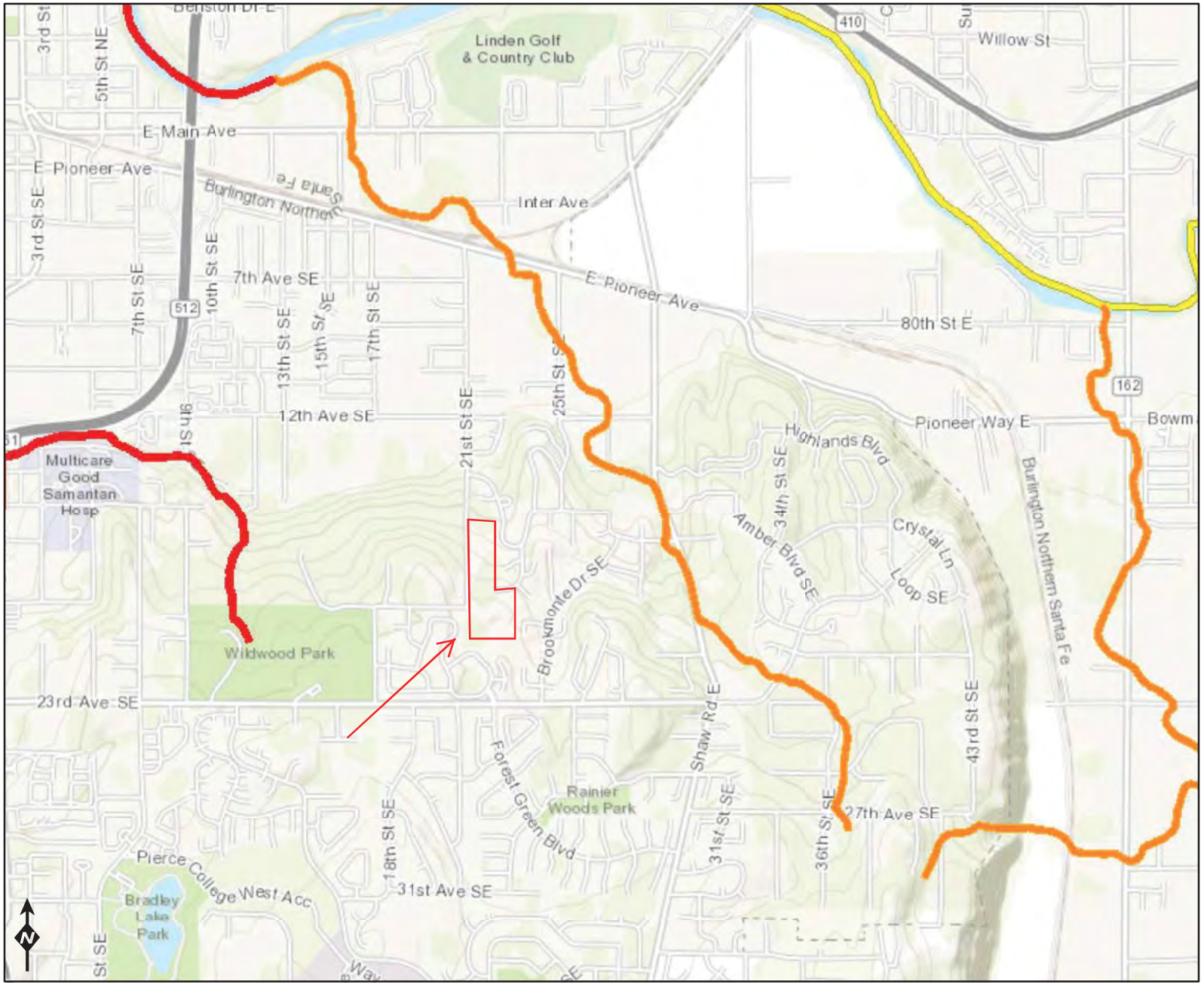
0 650 1300 ft.

Habitat Technologies

Figure W4

October 11, 2017

Figure W5



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

Miles
0 0.25 0.5 1

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, ©

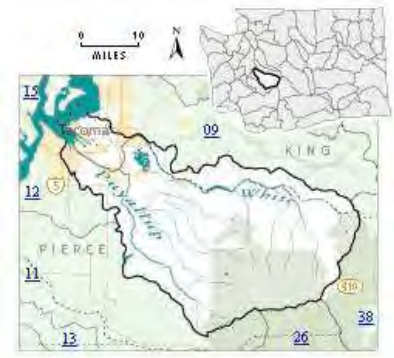
DEPARTMENT OF ECOLOGY
State of Washington

Figure W6

Water Quality Improvement Projects (TMDLs)

WRIA 10: Puyallup-White

The following table lists overview information for water quality improvement projects (also known as total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.



Counties

- King County
- Pierce County

Waterbody Name	Pollutant	Status**	TMDL Leads
Clarks Creek Meeker Creek	Dissolved Oxygen Sediment	Approved by EPA Has an implementation plan	Donovan Gray 360-407-6407
	Fecal Coliform	Approved by EPA Has an implementation plan	
Commencement Bay	Dioxin	Approved by EPA	Donovan Gray 360-407-6407
Puyallup River Watershed	Fecal Coliform	Approved by EPA	Donovan Gray 360-407-6407
	Multi-parameter Ammonia-N BOD (5-day)	Approved by EPA	
	White River Watershed Upper White: • Sediment • Temperature Lower White • pH	Approved by EPA Under Development	
South Prairie Creek Tributary: Wilkeson/Gale Creek	Fecal Coliform Temperature	Approved by EPA Has an implementation plan	Donovan Gray 360-407-6407

** ***Status*** *will be listed as one of the following: Approved by EPA, Under Development or Implementation*

For more information about WRIA 10:

- Waterbodies in WRIA 10 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 10

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

Back to top of page

Last updated October 2016

Wetland name or number _D__

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Sunset Pointe Date of site visit: 11 OCT 2017

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

HGM Class used for rating Slope Wetland has multiple HGM classes?___Y _x__N

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

Source of base aerial photo/map Pierce County GIS

OVERALL WETLAND CATEGORY __4__ (based on functions___ or special characteristics___)

1. Category of wetland based on FUNCTIONS

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

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

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

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

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
			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	5	5	4	14

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 D

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	N/A
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and 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)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	N/A
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	N/A
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	D1
Hydroperiods	H 1.2	D2
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	D1
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	D1
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	D2
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	W4
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	W5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	W6

Wetland name or number D

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?
x The wetland is on a slope (*slope can be very gradual*),
x 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,
x 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 D

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 D

SLOPE WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

S 1.0. Does the site have the potential to improve water quality?	
S 1.1. Characteristics of the average slope of the wetland: *(a 1% slope has a 1 ft vertical drop in elevation for every 100 ft of horizontal distance*) Slope is 1% or less points = 3 Slope is > 1%-2% points = 2 Slope is > 2%-5% points = 1 Slope is greater than 5% points = 0	0
S 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*: Yes = 3 No = 0	0
S 1.3. Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. *Dense means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 in.* Dense, uncut, herbaceous plants > 90% of the wetland area points = 6 Dense, uncut, herbaceous plants > ½ of area points = 3 Dense, woody, plants > ½ of area points = 2 Dense, uncut, herbaceous plants > ¼ of area points = 1 Does not meet any of the criteria above for plants points = 0	3
Total for S 1 Add the points in the boxes above	3

Rating of Site Potential If score is: ___ **12 = H** ___ **6-11 = M** X **0-5 = L** *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function of the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources _____ Yes = 1 No = 0	0
Total for S 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: X **1-2 = M** ___ **0 = L** *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 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
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list*. Yes = 1 No = 0	0
S 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 unit is found*. Yes = 2 No = 0	1
Total for S 3 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 D

SLOPE WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream erosion

S 4.0. Does the site have the potential to reduce flooding and stream erosion?	
S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > 1/8 in), or dense enough, to remain erect during surface flows.* Dense, uncut, **rigid** plants cover > 90% of the area of the wetland points = 1 All other conditions points = 0	1

Rating of Site Potential If score is: X **1 = M** ___ **0 = L** *Record the rating on the first page*

S 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff? Yes = 1 No = 0	0

Rating of Landscape Potential If score is: ___ **1 = M** X **0 = L** *Record the rating on the first page*

S 6.0. Are the hydrologic functions provided by the site valuable to society?	
S 6.1. Distance to the nearest areas downstream that have flooding problems: The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) points = 2 Surface flooding problems are in a sub-basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	0
S 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 S 6 Add the points in the boxes above	0

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

NOTES and FIELD OBSERVATIONS:

Wetland name or number D

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
____	Emergent	3 structures: points = 2
_X_	Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
_X_	Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

_X_ The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

2

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

____	Permanently flooded or inundated	4 or more types present: points = 3
_X_	Seasonally flooded or inundated	3 types present: points = 2
____	Occasionally flooded or inundated	2 types present: points = 1
_X_	Saturated only	1 type present: points = 0
____	Permanently flowing stream or river in, or adjacent to, the wetland	
_X_	Seasonally flowing stream in, or adjacent to, the wetland	
____	**Lake Fringe wetland**	**2 points**
____	**Freshwater tidal wetland**	**2 points**

2

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

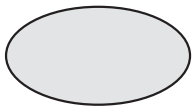
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

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

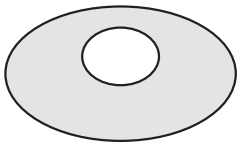
1

H 1.4. Interspersion of habitats

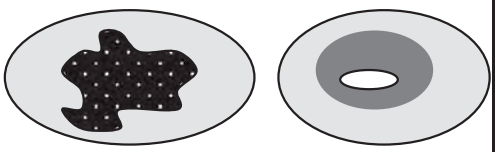
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



None = 0 points

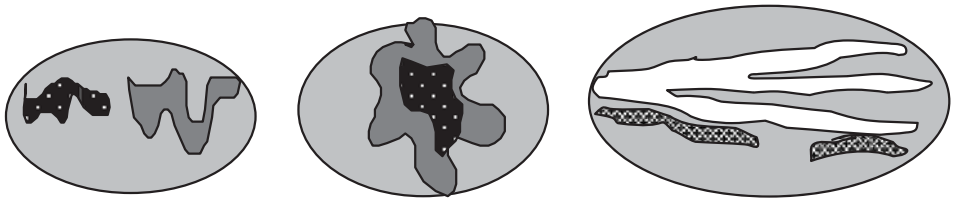


Low = 1 point



Moderate = 2 points

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



1

Wetland name or number D

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* X Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). X Standing snags (dbh > 4 in) within the wetland X Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 Add the points in the boxes above	9

Rating of Site Potential If score is: ___**15-18 = H** X **7-14 = M** ___**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat 5 **+** [(% moderate and low intensity land uses)/2] 3 **=** 8 % 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 12 **+** [(% moderate and low intensity land uses)/2] 20 **=** 32 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	2
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 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 points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If score is: ___**2 = H** ___**1 = M** X **0 = L** *Record the rating on the first page*

Wetland name or number D

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

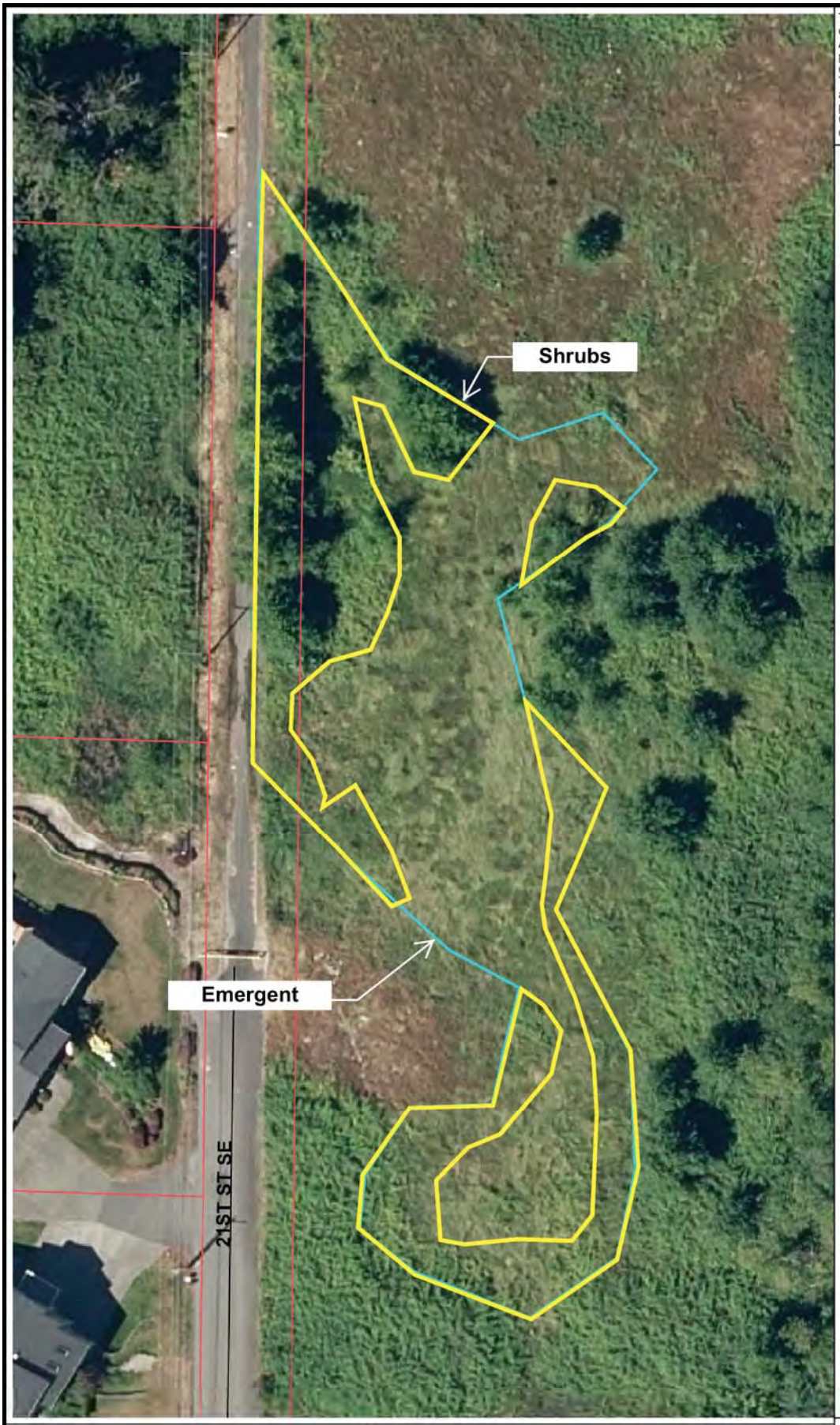
— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.



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. The orthophotos and other data may not align. Pierce County and Habitat Technologies assume no liability for variations ascertained by actual survey. All data is expressly provided AS IS and WITH ALL FAULTS. Pierce County and Habitat Technologies make no warranty of fitness for a particular purpose.

Map Legend

- Wetland E
- Tax Parcels
- Streams - Puyallup
- Drainage - Main Lines
- Roads
- Major Roads
- County - 2014 - Ortho

Figure E1

0 25 50 ft.

N

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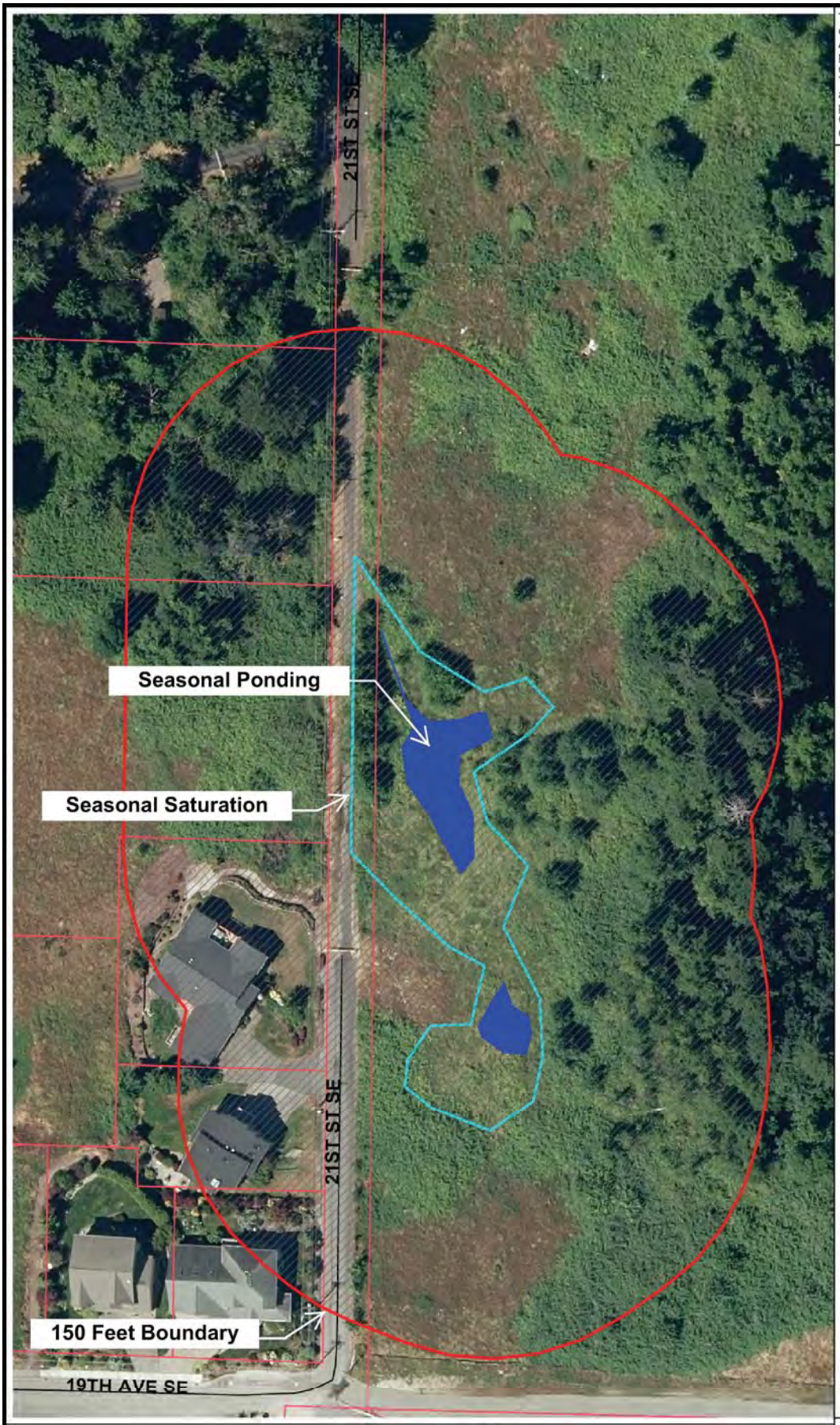
Habitat Technologies



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Map Legend

- Wetland E
- Tax Parcels
- Streams - Puyallup
- Drainage - Main Lines
- Roads
- Major Roads
- County - 2014 - Ortho

Figure E2

0 50 100 ft.

N

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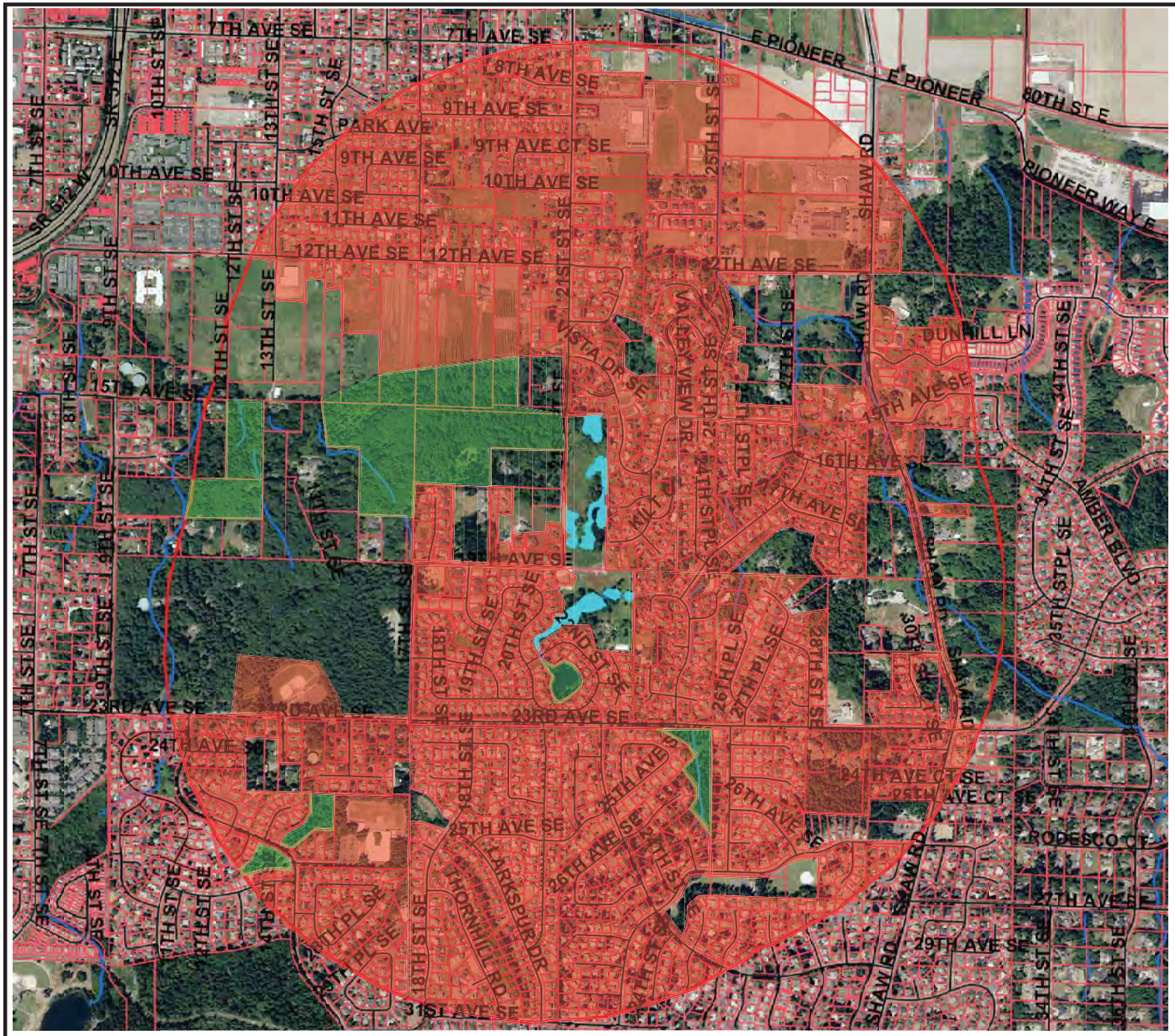

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Map Legend

- Wetlands
- Highlighted Wetland F
- Tax Parcels
- Streams - Puyallup
- Roads
- Major Roads
- County - 2014 - Ortho
- High Intensity Land Use
- Low/Moderate Intensity Land Use
- Habitat Area

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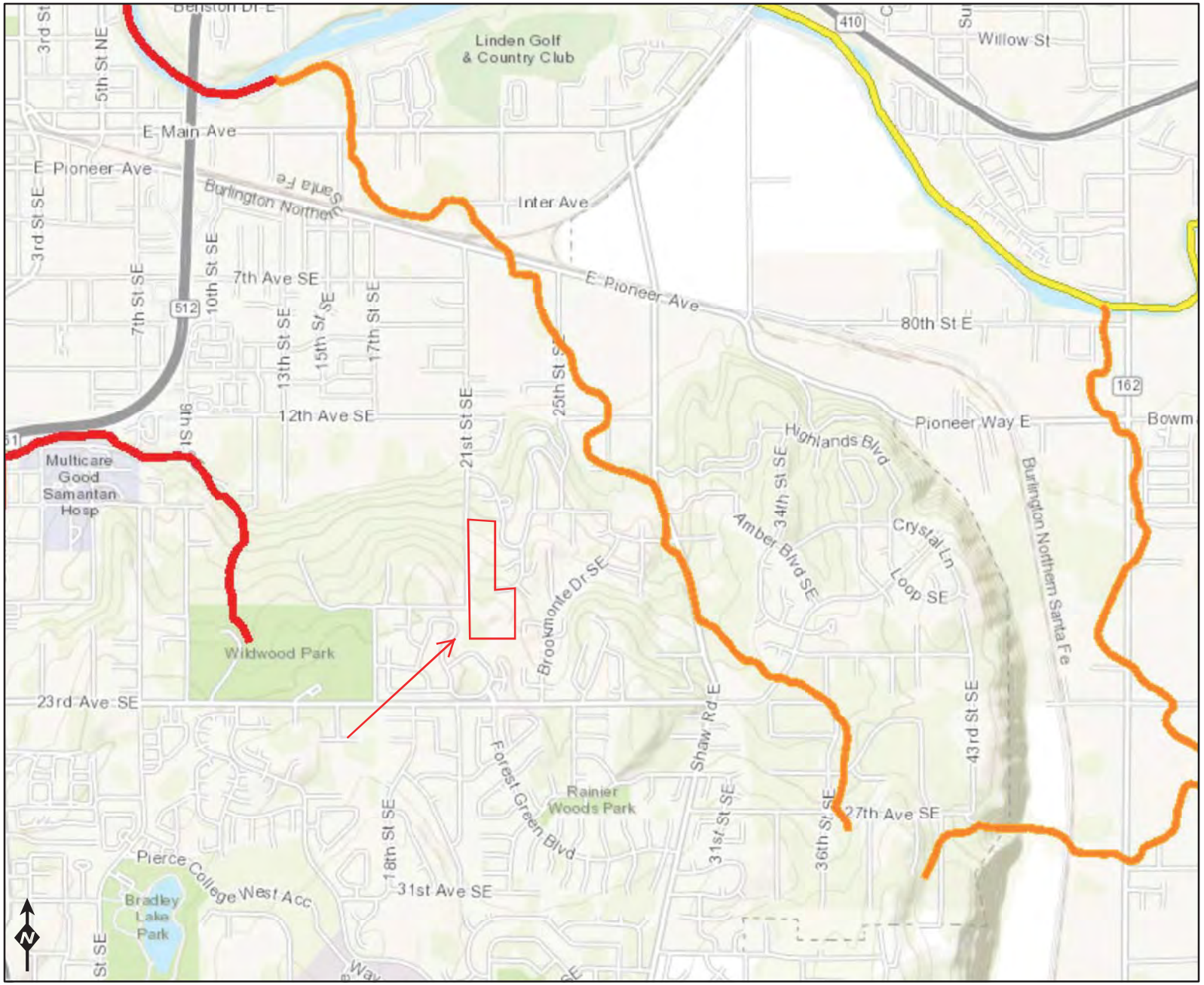
0 650 1300 ft.

Habitat Technologies

Figure W4

October 11, 2017

Figure W5



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

Miles
0 0.25 0.5 1

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, ©

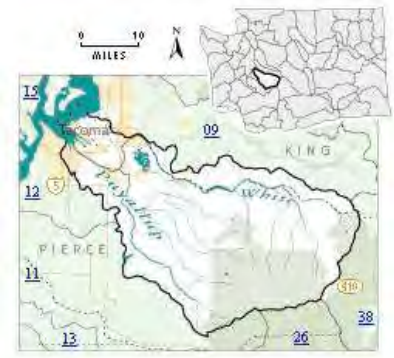
DEPARTMENT OF ECOLOGY
State of Washington

Figure W6

Water Quality Improvement Projects (TMDLs)

WRIA 10: Puyallup-White

The following table lists overview information for water quality improvement projects (also known as total maximum daily loads, or TMDLs) for this water resource inventory area (WRIA). Please use links (where available) for more information on a project.



Counties

- King County
- Pierce County

Waterbody Name	Pollutant	Status**	TMDL Leads
Clarks Creek Meeker Creek	Dissolved Oxygen Sediment	Approved by EPA Has an implementation plan	Donovan Gray 360-407-6407
	Fecal Coliform	Approved by EPA Has an implementation plan	
Commencement Bay	Dioxin	Approved by EPA	Donovan Gray 360-407-6407
Puyallup River Watershed	Fecal Coliform	Approved by EPA	Donovan Gray 360-407-6407
	Multi-parameter Ammonia-N BOD (5-day)	Approved by EPA	
	White River Watershed Upper White: • Sediment • Temperature Lower White • pH	Approved by EPA Under Development	
South Prairie Creek Tributary: Wilkeson/Gale Creek	Fecal Coliform Temperature	Approved by EPA Has an implementation plan	Donovan Gray 360-407-6407

** ***Status*** *will be listed as one of the following: Approved by EPA, Under Development or Implementation*

For more information about WRIA 10:

- Waterbodies in WRIA 10 - using the Water Quality Assessment Query Tool
- Watershed Information for WRIA 10

* The Department of Ecology and other state resource agencies frequently use a system of 62 "Water Resource Inventory Areas" or "WRIAs" to refer to the state's major watershed basins.

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Last updated October 2016

Wetland name or number E

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Sunset Pointe Date of site visit: 11 OCT 2017

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

HGM Class used for rating Slope Wetland has multiple HGM classes? ___Y _x_N

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

Source of base aerial photo/map Pierce County GIS

OVERALL WETLAND CATEGORY _4_ (based on functions___ or special characteristics___)

1. Category of wetland based on FUNCTIONS

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

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

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

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

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	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	5	5	3	13

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 E

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	N/A
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and 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)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	N/A
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	N/A
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	E1
Hydroperiods	H 1.2	E2
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	E1
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	E1
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	E2
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	W4
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	W5
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	W6

Wetland name or number E

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?
x The wetland is on a slope (*slope can be very gradual*),
x 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,
x 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 E

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 E

SLOPE WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

S 1.0. Does the site have the potential to improve water quality?	
S 1.1. Characteristics of the average slope of the wetland: *(a 1% slope has a 1 ft vertical drop in elevation for every 100 ft of horizontal distance*) Slope is 1% or less points = 3 Slope is > 1%-2% points = 2 Slope is > 2%-5% points = 1 Slope is greater than 5% points = 0	0
S 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*: Yes = 3 No = 0	0
S 1.3. Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. *Dense means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 in.* Dense, uncut, herbaceous plants > 90% of the wetland area points = 6 Dense, uncut, herbaceous plants > ½ of area points = 3 Dense, woody, plants > ½ of area points = 2 Dense, uncut, herbaceous plants > ¼ of area points = 1 Does not meet any of the criteria above for plants points = 0	3
Total for S 1 Add the points in the boxes above	3

Rating of Site Potential If score is: ___ **12 = H** ___ **6-11 = M** X **0-5 = L** *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function of the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources _____ Yes = 1 No = 0	0
Total for S 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: X **1-2 = M** ___ **0 = L** *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 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
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list*. Yes = 1 No = 0	0
S 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 unit is found*. Yes = 2 No = 0	1
Total for S 3 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 E

SLOPE WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream erosion

S 4.0. Does the site have the potential to reduce flooding and stream erosion?	
S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > 1/8 in), or dense enough, to remain erect during surface flows.* Dense, uncut, **rigid** plants cover > 90% of the area of the wetland points = 1 All other conditions points = 0	1

Rating of Site Potential If score is: X **1 = M** ___ **0 = L** *Record the rating on the first page*

S 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff? Yes = 1 No = 0	0

Rating of Landscape Potential If score is: ___ **1 = M** X **0 = L** *Record the rating on the first page*

S 6.0. Are the hydrologic functions provided by the site valuable to society?	
S 6.1. Distance to the nearest areas downstream that have flooding problems: The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) points = 2 Surface flooding problems are in a sub-basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	1
S 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 S 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*

NOTES and FIELD OBSERVATIONS:

Wetland name or number E

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
X	Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
____	Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

____	Permanently flooded or inundated	4 or more types present: points = 3
X	Seasonally flooded or inundated	3 types present: points = 2
____	Occasionally flooded or inundated	2 types present: points = 1
X	Saturated only	1 type present: points = 0
____	Permanently flowing stream or river in, or adjacent to, the wetland	
____	Seasonally flowing stream in, or adjacent to, the wetland	
____	**Lake Fringe wetland**	**2 points**
____	**Freshwater tidal wetland**	**2 points**

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

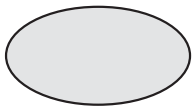
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

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

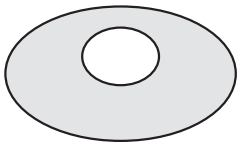
1

H 1.4. Interspersion of habitats

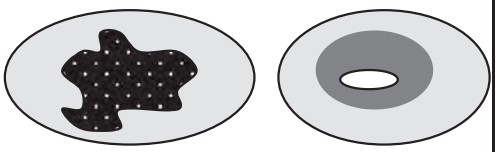
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



None = 0 points

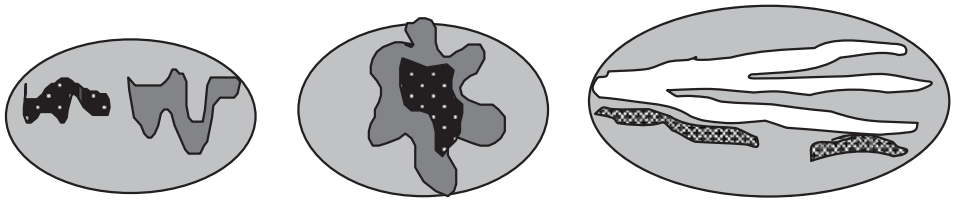


Low = 1 point



Moderate = 2 points

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



1

Wetland name or number E

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* X Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). ____Standing snags (dbh > 4 in) within the wetland ____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*)	1
Total for H 1 Add the points in the boxes above	5

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 2 **+** [(% moderate and low intensity land uses)/2] 3 = 5 % 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 12 **+** [(% moderate and low intensity land uses)/2] 20 = 32 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	2
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 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 points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value If score is: ___**2 = H** ___**1 = M** X **0 = L** *Record the rating on the first page*

Wetland name or number E

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

APPENDIX E

Maintenance Schedules

4.6 Maintenance Standards for Drainage Facilities

The facility-specific maintenance standards contained in this section are intended to be conditions for determining if maintenance actions are required as identified through inspection. They are not intended to be measures of the facility's required condition at all times between inspections. In other words, exceedence of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the inspection and maintenance schedules shall be adjusted to minimize the length of time that a facility is in a condition that requires a maintenance action.

Table 4.5.2 Maintenance Standards

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	Any trash and debris which exceed 1 cubic feet per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
	Poisonous Vegetation and noxious weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined by State or local regulations. (Apply requirements of adopted IPM policies for the use of herbicides).	No danger of poisonous vegetation where maintenance personnel or the public might normally be. (Coordinate with local health department) Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required
	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants (Coordinate removal/cleanup with local water quality response agency).	~~No contaminants or pollutants present.~~
	Rodent Holes	Any evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with local health department; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Beaver Dams	Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies
	Tree Growth and Hazard Trees	Tree growth does not allow maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements). If trees are not interfering with access or maintenance, do not remove If dead, diseased, or dying trees are identified (Use a certified Arborist to determine health of tree or removal requirements)	Trees do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood). Remove hazard Trees
Side Slopes of Pond	Erosion	Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes should be stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. If erosion is occurring on compacted berms a licensed civil engineer should be consulted to resolve source of erosion.
Storage Area	Sediment	Accumulated sediment that exceeds 10% of the designed pond depth unless otherwise specified or affects inletting or outletting condition of the facility.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion.
	Liner (If Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Pond Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.

No. 1 – Detention Ponds

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Emergency Overflow/ Spillway and Berms over 4 feet in height.	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway	Emergency Overflow/ Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See “Side Slopes of Pond”	

No. 4 – Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall.	Structure securely attached to wall and outlet pipe.
		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		Any holes--other than designed holes--in the structure.	Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See “Closed Detention Systems” (No. 3).	See “Closed Detention Systems” (No. 3).	See “Closed Detention Systems” (No. 3).
Catch Basin	See “Catch Basins” (No. 5).	See “Catch Basins” (No. 5).	See “Catch Basins” (No. 5).

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No Trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation or root growth present.
	Contamination and Pollution	See "Detention Ponds" (No. 1).	No pollution present.

No. 5 – Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

No. 6 – Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		Bars are missing or entire barrier missing.	Bars in place according to design.
		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

No. 7 – Energy Dissipaters

Maintenance Components	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
External:			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged.	Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flows Out Top of "Distributor" Catch Basin.	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or its causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See "Catch Basins" (No. 5).	See "Catch Basins" (No. 5).