Construction Stormwater Pollution Prevention Plan

PREPARED FOR:

Puget Sound Energy
Contact: Mr. Robert Ebert
10885 NE 4th Street
Bellevue, WA 98004

PROJECT:

PSE West Todd Road Temporary Storage
325 Todd Road NW
Puyallup, WA 98371
2191077.10

PREPARED BY:

Claire Hovde, EIT
Project Engineer

REVIEWED BY:

William J. Fierst, PE
Associate Principal

DATE:

August 2020

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August 2020

08/20/2020

I hereby state that this Construction Stormwater Pollution Prevention Plan for the PSE West Todd Road Temporary Storage project has been prepared by me or under my supervision, and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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Appendices

1.0 Project Description

Puget Sound Energy (PSE) is proposing to use their property at 325 Todd Road NW in Puyallup as a temporary storage yard. This storage yard is required because the PSE service center in Puyallup will begin construction in June 2020, and much of the site will be unavailable. Work on the Todd Road site includes the placement of new gravel, restoration of existing gravel, lighting, and some temporary structures.

2.0 Existing and Proposed Conditions

The site is vacant and consists of mostly overgrown grass vegetation, with some areas of trees and gravel surfacing. Surrounding uses are primarily light industrial to the west, south, and north, and rural residential to the north. The site is bordered by Union Pacific Railroad to the north, 4th Street NW to the west, Todd Road NW to the south, and the Meridian Street Bridge over the railway to the east. The site is 2.60 acres. The total area disturbed by construction activities is 0.23 acres (10,000 sf). The proposed volume of cut is 0 cubic yards, and the proposed volume of fill is 250 cubic yards, for a net grading volume of 250 cubic yards.

The site has no buildings and no active utility connections. However, there are most likely abandoned water lines and power conduits on the site. There is a wetland located in the north region of the site along the west property line. This wetland will not be disturbed by any construction activities. Sediment and erosion control elements will be installed to protect it. All activities will remain outside of the 50-foot wetland protection buffer.

According to the National Resources Conservation Service (NRCS), soils on this site are Puyallup fine sandy loam and Sultan silt loam. Puyallup fine sandy loam is categorized as a well-drained soil in hydrologic soil Group A. Sultan silt loam is categorized as moderately well drained soil in hydrologic soil Group C/D. The soils analysis is included as Appendix A.

The project will place approximately 10,000 square feet of new gravel for parking and material storage.

The materials that will be stored at this site are currently located at the PSE Service Center at 5807 Milwaukee Avenue East, one mile to the southeast. The expected haul route is north on Milwaukee Avenue and then west on Todd Road.

Once the site is no longer needed for parking and storage, the affected areas will have their soils amended and seeded to establish permanent vegetation.

3.0 Thirteen Elements

The Washington State Department of Ecology *Stormwater Management Manual for Western Washington (SMMWW)* identifies 13 minimum elements that Erosion Control Reports/Construction Stormwater Pollution Prevention Plans (SWPPPs) must comply with. The following is a description of how each of the 13 elements is addressed for the project:

Element 1: Mark Clearing Limits

Clearing limits will be marked for the project. The clearing limits are identified on the plan. The clearing limits will be marked with stakes and/or wire fence prior to land-disturbing activities to minimize disturbance of natural vegetation (BMPs C101 and C103).

Element 2: Establish Construction Access

One construction entrance (BMP C105) will be provided for this project, utilizing existing construction access on the adjacent site to the east with a driveway onto Todd Road NW. Vehicles will not be permitted to track materials onto Todd Road NW or any other public road. If the construction entrances are not sufficient, a wheel wash (BMP C106) may be required.

Element 3: Control Flow Rates

Because very little of the site will be disturbed, there will be minimal increase in stormwater flows; therefore, there is no need to regulate flow rates. Silt fence (BMP C233) will be adequate to control flow rates. The total disturbed area is less than 1 acre. Therefore, temporary ponds are not required.

Element 4: Install Sediment Controls

Sediment controls will be provided on the site. Sediment removal will be achieved through the use of silt fence (BMP C233) and inlet sediment protection. Silt fences and inlet sediment protection will provide a physical barrier to sediment and reduce the velocities of overland flow. Silt fence will be located along the site clearing limits where applicable. The silt fence and inlet sediment protection are indicated on the plan.

Element 5: Stabilize Soils

Site soils shall be stabilized to protect from the erosive forces of raindrops, flowing water, and wind. From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. Take the following actions:

- Site soils will be stabilized by the use of temporary and permanent seeding (BMP C120), mulching (BMP C121), surface roughening (BMP C130), topsoiling (BMP C125), or dust control (BMP C140).
- Temporary seeding will be used to reduce erosion in disturbed areas that have reached final grade or will remain unworked for more than 30 days.
- Mulching shall be used to provide immediate temporary protection from erosion, including:
    - Disturbed areas that require cover measures for less than 30 days.
    - Cover for seed during the wet season and during the hot summer months.
    - During the wet season on slopes steeper than 3H:1V, with more than 10 feet of vertical relief.
    - Mulch may be applied at any time of the year and must be refreshed periodically.
- Topsoil shall be used to provide a suitable growth medium for final site stabilization with vegetation. Dust control shall be used to prevent wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Once the site is no longer needed for storage, permanent seeding will stabilize the site.

Element 6: Protect Slopes

The site is mostly flat; therefore, slope protection is not an issue.

Element 7: Protect Drain Inlets

There are several storm drains located on Todd Road NW. These existing catch basins will be protected with storm drain inlet protection (BMP C220). Storm drain inlet protection will prevent coarse sediment from entering the drainage system prior to permanent stabilization of the disturbed areas. Inlets shall be inspected weekly, at a minimum, and daily during storm events. Inlet protection devices should be cleaned or removed and replaced when sediment has filled one-third of the available storage (unless a different standard is specified by the product manufacturer).

Element 8: Stabilize Channels and Outlets

Channels and outlets are not proposed for this project. If temporary channels are constructed, check dams (BMP C207) may be implemented to reduce the velocity of concentrated flow.

Element 9: Control Pollutants

- All pollutants, including waste materials and demolition debris created onsite during construction, shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread onsite.

- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste). Fuel tanks will not be stored on the site. All fueling will be conducted at offsite fueling stations.

- Maintenance and repair of heavy equipment and vehicles will not be performed onsite, but instead at maintenance facilities offsite. If a vehicle is found to be inoperable, it will be towed to a repair facility.

- Wheel wash or tire bath wastewater shall be discharged to a separate onsite treatment system. Wastewater shall not be discharged to any sewer system.

- Application of agricultural chemicals, including fertilizers and pesticides, shall be conducted in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Manufacturers' recommendations for application rates and procedures shall be followed.

- Construction sites shall adjust the pH of stormwater if necessary to prevent violations of water quality standards. Projects must obtain written approval from the Department of Ecology before using chemical treatment to adjust pH.

Element 10: Control Dewatering

Dewatering is not anticipated for this project.

Element 11: Best Management Practices (BMPs) shall be maintained as follows:

- All temporary and permanent ESC BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with BMP specifications.

- All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized onsite. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.

Element 12: Manage the Project

- **Phasing of Construction** – The new gravel will be placed as quickly as possible, stabilizing the site.

- **Seasonal Work Limitations** – From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of City of Puyallup that the transport of sediment from the construction site to receiving waters will be prevented through a combination of the following:

    1. Site conditions, including existing vegetative coverage, slope, soil type, and proximity to receiving waters.
    2. Limitations on activities and the extent of disturbed areas.
    3. Proposed erosion and sediment control measures.

- **Coordination with Utilities and Other Contractors** – The primary project proponent shall evaluate, with input from utilities and other contractors, the surface water management requirements for the entire project, including the utilities.

- **Inspection and Monitoring** – All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function.

While not required, we recommend that the Contractor appoint a Certified Erosion and Sediment Control Lead (CESCL) for the project. We recommend that the Contractor's CESCL shall be onsite or on-call at all times.

Sampling and analysis of the surface water discharges from a construction site may be necessary on a case-by-case basis to ensure compliance with standards. The City may establish monitoring and reporting requirements when necessary.

Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP/Erosion Control Plan are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, the Construction SWPPP shall be modified, as appropriate, in a timely manner.

- **Reporting –** Report spillage or discharge of pollutants within 24 hours.

- **Maintaining an Updated Construction SWPPP –** The Construction SWPPP shall be retained onsite or within reasonable access to the site. It shall be modified whenever there is a change in the design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the state. If during inspections or investigations conducted by the owner/operator or the

applicable local or state regulatory authority it is determined that the Construction SWPPP is ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site, the Construction SWPPP shall be modified. The Construction SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the Construction SWPPP shall be completed within 7 days following the inspection.

Element 13: Protect Low Impact Development

Once the site is no longer required for storage, the soils shall be restored in accordance with Department of Ecology BMP T5.13, Soil Preservation and Amendment.

4.0 Construction Sequence and Procedure

The construction sequence is as follows:

1. Hold a preconstruction meeting with the City, the owner, and the engineer, and obtain required permits.

2. Establish and flag clearing and grading limits.

3. Construct temporary construction entrance.

4. Construct inlet protection, silt fences, and other erosion control devices as shown on the TESC plans.

5. Construct protection devices for critical areas and significant trees proposed for protection.

6. Schedule an erosion control inspection with the City.

7. No uncontrolled surface water shall be allowed to leave the site or be discharged to a critical area at any time during the grading operations.

8. Clearly state on the construction schedule at what point grading activities can begin, usually only after all drainage and erosion control measures are in place.

9. Identify erosion control measures that require regular maintenance.

10. Construct utilities.

11. Install or repair gravel surfacing as needed, noted on the plan.

12. Deliver stored materials to the site.

13. Relocate erosion control measures or install new measures so that, as site conditions change, the erosion and sediment control is always in accordance with City of Puyallup minimum requirements.

14. Once the site is no longer needed, remove all stored materials.

15. Amend soils and seed as indicated on the restoration plan.

16. Remove the remaining temporary erosion control items once site has been stabilized and approved.

5.0 Inspection Sequence

The following structural items will be used to control erosion and sedimentation processes:

- Silt fences.
- Inlet protection.
- Temporary construction entrance.

Erosion control facilities shall not be allowed to fall into disrepair. All erosion control facilities shall be inspected following site demolition, site grading, final acceptance and, at a minimum, according to the following schedule:

- Dry Season: Once a week
- Wet Season: Daily and after every storm event that produces runoff.

Needed repairs shall be made within 24 hours or immediately if possible. If necessary, the engineer or City will instruct the Contractor to provide additional facilities, as warranted, during field inspections.

6.0 Administration

Construction Phasing – Construction will have three phases: surfacing, storage, and restoration.

Construction Schedule – Surfacing work will occur during October 2020. Materials will be shipped to the site in October 2020 and will be stored there for approximately 14 months. Afterward, the stored materials will be removed, and the site will be restored.

Financial and Ownership Responsibilities – PSE, as owner, will be financially responsible for the construction of this project; PSE's contractor will be in charge of construction operations.

Engineering Calculations – Engineering calculations are included in this report as Appendix B.

This analysis is based on data and records either supplied to or obtained by AHBL. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry.

AHBL, Inc.

Claire Hovde, EIT
Project Engineer

CFH/lsk

August 2020

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Appendix A

NRCS Soils Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Pierce County Area, Washington

April 14, 2020

Preface

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

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

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

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

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

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

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

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

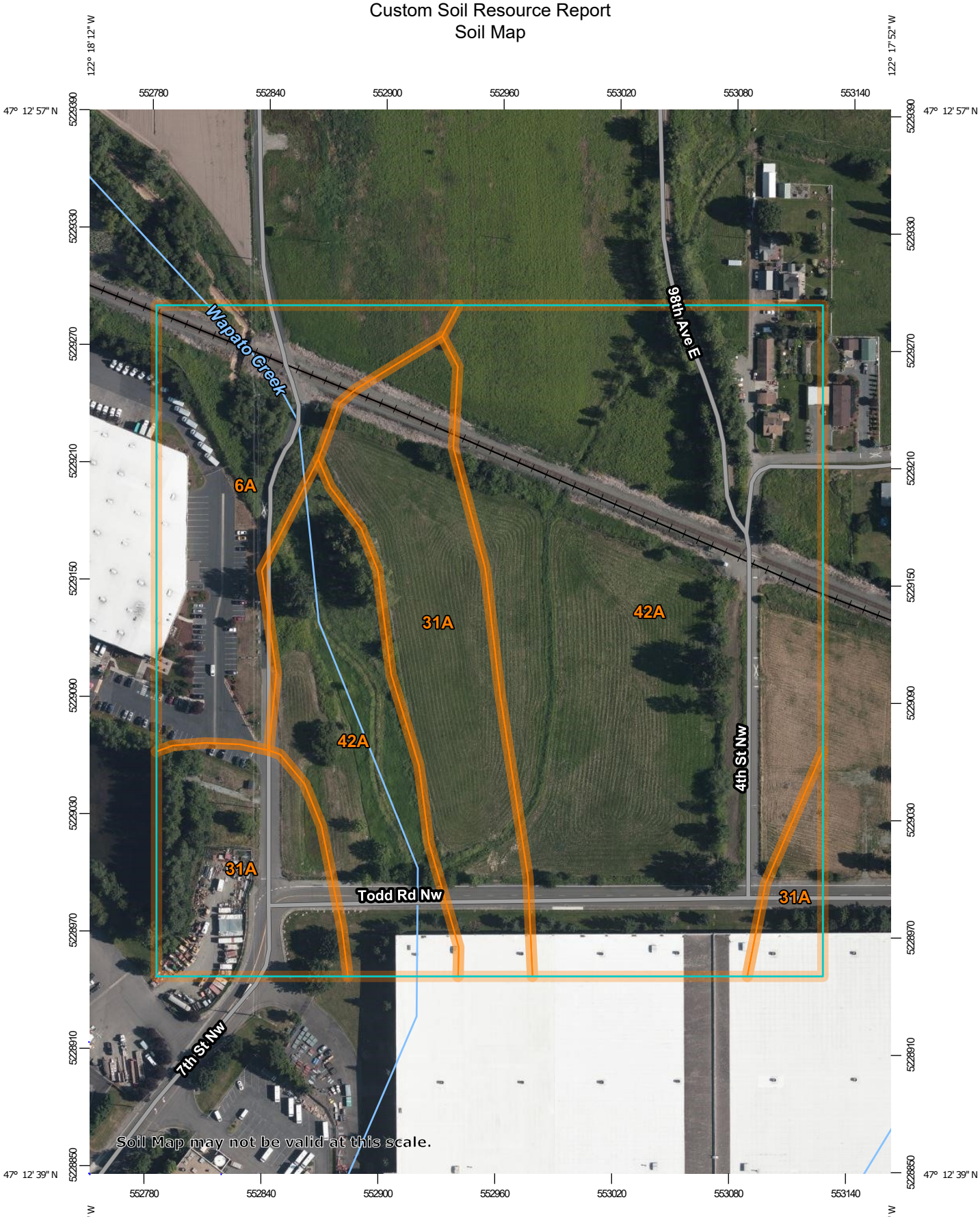
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,650 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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 15, Sep 16, 2019

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

Date(s) aerial images were photographed: Jul 29, 2018—Jul 22, 2019

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
6A	Briscot loam	4.5	15.4%
31A	Puyallup fine sandy loam	7.3	25.0%
42A	Sultan silt loam	17.3	59.5%
Totals for Area of Interest		**29.1**	**100.0%**

Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Pierce County Area, Washington

6A—Briscot loam

Map Unit Setting

National map unit symbol: 2hrc
Elevation: 20 to 250 feet
Mean annual precipitation: 30 to 55 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

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

Description of Briscot

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 38 inches: stratified fine sand to silt loam
H3 - 38 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Available water storage in profile: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): 4w
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

31A—Puyallup fine sandy loam

Map Unit Setting

National map unit symbol: 2hq9
Elevation: 0 to 390 feet

Mean annual precipitation: 35 to 60 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 170 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Puyallup

Setting

Landform: Flood plains, terraces
Parent material: Alluvium

Typical profile

H1 - 0 to 13 inches: ashy fine sandy loam
H2 - 13 to 29 inches: loamy fine sand
H3 - 29 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 48 to 72 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): 3w
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Forage suitability group: Droughty Soils (G002XN402WA)
Hydric soil rating: No

Minor Components

Briscot

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

42A—Sultan silt loam

Map Unit Setting

National map unit symbol: 2hqx
Elevation: 0 to 200 feet

Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 150 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sultan and similar soils: 85 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sultan

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 14 inches: ashy silt loam
H2 - 14 to 23 inches: silt loam
H3 - 23 to 60 inches: stratified sand to silty clay loam

Properties and qualities

Slope: 0 to 2 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 high (0.20 to 0.57 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water storage in profile: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: No

Minor Components

Briscot

Percent of map unit: 6 percent
Landform: Depressions
Hydric soil rating: Yes

Puget

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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