Red-Wood Road Channel Stabilization and Culvert Repair at NE 98th St

Critical Areas Report

Prepared for

Eric LaFrance, City of Redmond
City of Redmond
MS: 2NPW
15670 NE 85th Street
PO Box 97010
Redmond, WA 98073

Prepared by

Northwest Environmental Consulting, LLC

Northwest Environmental Consulting, LLC
3639 Palatine Avenue North
Seattle, WA 98103
206-234-2520

August 2016

SUMMARY

The purpose of this project is to repair erosion and stability issues in a ravine between Redmond-Woodinville Road NE (Red-Wood Road; also SR-202) and 160th Avenue NE, and to reconstruct the outlet pipe and piping under Red-Wood Road. The project will repair the failed culvert and discharge water to a roughened channel (engineered pool and cascade) for approximately 90 feet before discharging to an existing 20-foot-long pool. Water from the pool discharges to the existing birdcage structure and is piped for approximately 1,300 feet before it is discharged to the Sammamish River.

The original outfall piped the stormwater the entire distance from Red-Wood Road to the birdcage at the bottom of the slope, but the watercourse is now daylighted after the pipe failure. Washington Department of Fish and Wildlife has recommended that the watercourse be daylighted to the maximum extent practicable as part of the outfall repairs.

A single wetland was identified about 150 feet north of the project. This wetland is not hydraulically connected to the project area, and the wetland and its buffer will be avoided.

The project will take place within a Class IV non-fish bearing stream and will impact the stream's buffer. The stream and buffer qualify as a Fish and Wildlife Habitat Conservation Area and Core Preservation Area per City of Redmond definitions regarding Class IV streams. No habitat is present in the project area to support federal or state-listed species of birds, mammals, anadromous fish, or plants.

The project has been designed to meet the standards in the City of Redmond Code. The project will restore all impacts to the Category IV stream buffer and will stabilize the existing eroded channel that has resulted from pipe failure. The stabilized channel will be a constructed, roughened channel designed as a cascade and pool reach. The roughened channel will include rounded boulders and woody debris salvaged from the site resulting in 90 feet of open channel that was contained in a pipe before failure. This roughened channel will reduce erosion and will increase productivity of the stream, which will increase drift of aquatic insects that will reach the Sammamish River and increase available food sources for listed species there. Best management practices will be used to minimize construction impacts.

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1 INTRODUCTION

1.1 Report Purpose

This report documents the current conditions of critical areas for the Red-Wood Road Channel Stabilization and Culvert Repair at NE 98th Street (the project) along the unnamed stream between 160th Avenue NE and the intersection of Redmond-Woodinville Road NE (Red-Wood Rd) and NE 98th Street in Redmond, Washington. This report describes a wetland determination that was conducted at the site, review of work within a type IV stream (Fish and Wildlife Habitat Conservation Area), and review of other potential critical areas.

This report also describes the temporary and permanent impacts to these critical areas and their buffers from the planned pipe replacement, restructuring of the streambed, and replanting of disturbed area within the buffer. This project t is intended to repair erosion and stability issues in the ravine, and to reconstruct the outlet pipe and piping under Red-Wood Road.

1.2 Site Description

The project is located in King County, in the City of Redmond (Figure 1 – Vicinity Map). The project is located on the forested parcel between 160th Avenue NE and Red-Wood Road in Section 2, Township 25N, Range 05E. The property is owned by the City of Redmond.

The ravine below Red-Wood Road is a narrow gulch descending through fairly steep terrain (up to 50% slope; Figure 2). Stormwater was once routed from under the highway to the base of the hill via pipes. These pipes have broken apart. The lower half of the ravine is now open channel (broken piping has been removed) and the upper half still contains CMP piping which has failed. Stormwater has eroded the channel down to the hardpan along the banks, at the site of the broken pipe (Photos 1, 2 and 3).

At the base of the ravine, the slope eases and water is collected into a culvert through a bird-cage structure uphill of 160th Avenue NE (Photo 7). The water then travels through 1,300 feet of piping underneath the Avignon apartment complex, and ultimately emptying into the Sammamish Slough (Figure 3 – Stormwater System Map).

No vegetation is present in the stream; the substrate is rock and cobble. The stream at the top end of the project contains undercut banks. Beyond the eroded area, the riparian community

along the stream consists of coniferous and deciduous trees. Shrubs include thick coverage of Himalayan blackberry (*Rubus armeniacus*), especially along the lower half of the ravine, growing directly adjacent to the stream and covering nearby slopes.

The area surrounding the project is undeveloped forest on the steep slope between 160th Avenue and Red-Wood Road, and contains roadways, apartment housing, and single-family housing.

1.3 Project Purpose and Description

The purpose of this project is to repair erosion and stability issues in the ravine, and to reconstruct the outlet pipe and piping under Red-Wood Road. The Red-Wood Road culvert at NE 98th Street discharges stormwater via a 24-inch-diameter CMP pipe that now daylights in a ravine. The water flows downslope to a birdcage structure, then via 1,300 linear feet of pipes to the Sammamish River Slough (Figure 2 – Stormwater System Map). The 24-inch CMP has failed over time and broken into several pieces, resulting in erosion throughout the ravine and a buildup of sediment deposits at the bird-cage structure. The pipe used to discharge at the bottom of the slope at the birdcage. Washington Department of Fish and Wildlife (WDFW) has required that the discharge be left as an open water configuration (roughened channel) to the extent feasible. Construction will involve removing old pipe pieces, constructing new channel, installing 20-inch HDPE pipe, and constructing habitat features and improving stream bed materials below the pipe outlet. The project aims to maintain an open stream on the lower half of the slope.

Construction will start with mobilization by the contractor to the site. The first steps will be to install silt fencing and create temporary construction access. The areas to be excavated will be cleared and the old pipe pieces will be removed. The new channel and pipe foundation will be constructed. The existing 24-inch pipe under Red-Wood Road to the outfall will be repaired by lining with 20-inch HDPE pipe. The new 20-inch HDPE pipe will extend above ground to the original outfall location. Habitat features for the approximately 90-foot-long cascade and pool stretch will be constructed and all stream bed materials placed in the channel. The roughened channel will include rounded boulders and woody debris salvaged from the site. All graded areas will be stabilized and planted with native trees and shrubs. See Project Drawings, Sheets 5 and 9.

The new pipe and rebuilt stream channel will stabilize the eroded channel that was created from pipe failure. Water flowing under Red-Wood Road will be delivered to the top of the new, roughened stream channel with cascades and pools. This 90-foot stretch was contained in a pipe before failure. This project will permanently open up a previously piped stream channel.

2 METHODOLOGY

2.1 Existing Document Review

Prior to performing a field investigation to assess the project site's critical areas, NWEC biologists reviewed several sources for existing information about wetlands; potential or known presence of any priority species, species of concern or species of local importance; the extent, functions and values of fish and wildlife habitat conservation areas; and frequently flooded areas near the project. The sources included the following:

- City of Redmond Property Viewer v.1.0. Layers for contours, streams, Class 1 stream buffers, shoreline environments, frequently flooded areas.
- City of Redmond Critical Areas Map 64.4: Wetlands (April 16, 2011).
- King County iMap online mapping database.
- Soil Conservation Service (SCS) Soil Survey of King County Area (USDA SCS 2016).
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) map (USFWS 2015).
- Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) List (WDFW 2008) and publicly accessible database (WDFW 2015a).
- WDFW Washington SalmonScape mapping database (WDFW 2015b).

2.2 Field Investigation

Streams

NWEC rated the site's stream and riparian buffers based on the City of Redmond's municipal code (Redmond Zoning Code Chapter 21.64, Critical Areas Regulations).

Wetlands

NWEC biologists walked the stream and nearby areas within 150 feet, looking for wetland characteristics as defined in the *U.S. Army Corps of Engineers Wetland Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010). These methods were consistent with the routine approach described in the *Washington State Wetlands Identification and Delineation Manual* (Washington State Department of Ecology [Ecology] 1997).

For jurisdictional purposes, wetlands are defined as:

> *Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.*

The presence of the three essential wetland characteristics (i.e., wetland vegetation, soils, and hydrology) is required for an area to be considered a wetland. NWEC evaluated the site for these characteristics, and investigated conditions at test plots where any of these characteristics were present. NWEC recorded the resulting observations on data forms regarding wetland vegetation, soils, and hydrology, and these forms were used to determine whether the sites of these test plots were a jurisdictional wetland.

The City of Redmond rates and regulates wetlands based on municipal code in Chapter 21.64.030.

Fish and Wildlife Habitat Conservation Areas

During the site visit, NWEC biologists observed the habitat conditions for wildlife both in the wetland and in the surrounding buffer area. In particular, they looked for habitat that could support federally listed, state-listed, or PHS-listed species of wildlife.

This assessment included collecting details on vegetation, any areas previously disturbed, habitat layers, diversity and variety. NWEC biologists assessed the quality of habitat present, and the presence or absence of core preservation areas.

Flood Hazard Areas and Critical Aquifer Recharge Areas

NWEC reviewed the online King County and City of Redmond online property databases and FEMA maps to determine currently mapped flood hazard areas and critical aquifer recharge areas.

Geologic Hazards

A geotechnical report was completed (Golder 2016); the project design follows the recommendations of that report.

During the site visit, NWEC biologists confirmed that no wetlands are present within 150 feet of the stream and project area. The biologists also observed that no habitat is present to support endangered or threatened species listed by the USFWS or WDFW. Details of the wetland investigation, as well as stream and wildlife habitat investigations, are described below.

3.1 Stream Rating and Regulations

The unnamed stream is not a shoreline of the state, and is rated as a Class IV stream based on City of Redmond definitions and mapping (see Figure 2). Class IV streams are natural streams, perennial or intermittent, that do not have fish or the potential for fish and are not in headwaters. Class IV streams are included in the City of Redmond's Core Preservation Areas and Riparian Stream Corridors categories for Critical Areas.

The City requires a 25-foot critical areas buffer along intermittent Class IV streams (this stream runs dry in summer months).

As a Class IV stream, the stream and its buffer are considered a Core Preservation Area and Fish and Wildlife Habitat Conservation Area, as described in Section 3.3.

3.2 Wetland Investigation

Document Review

The NWI map for the area does not indicate wetlands between Red-Wood Road and 160th Avenue NE at the NE 98th location (see Wetland Delineation Memo in Appendix C). NWI does map a large area west of 160th Avenue NE as palustrine emergent seasonally flooded wetland. Most or all of this wetland no longer exists, as it is currently developed as an apartment complex. The mapped wetland also includes a strip of land east of the road at the base of the ravine's slope, up to the rough location of the birdcage structure on the project.

The City of Redmond's critical areas mapping identifies the entire project area as Mixed Wetland/Upland.

The USDA Soil Survey for King County maps all soils around the ravine site as Alderwood gravelly sandy loam, 15-30 percent slopes. The Alderwood series is made up of moderately well

drained soils, which are considered upland soils. Soils west of 160th Avenue NE are mapped as Snohomish silt loam, thick surface variant.

Field Investigation

No wetlands are present within 150 feet of the project. Upland vegetation at the site grows directly adjacent to the stream. Small benches on the slopes above the ravine are not wetlands, as they lack dominant hydric soils and wetland hydrology other than geomorphic position. A wetland determination report was completed and is included in Appendix C.

One small (approximately 600-square-foot) wetland is present) northwest of the project area. The estimated border of this wetland is approximately 150 feet (50 meters) from the nearest point of the ravine's stream (at the birdcage). The wetland's edge was estimated based on the results of a wetland test plot and the distribution of upland vegetation (thick Himalayan Blackberry). See Appendix C for the wetland categorization datasheets. The wetland is not hydraulically connected to the ravine's stream.

NWEC categorized this wetland as Category III according to the Washington State Department of Ecology's Western Washington wetland rating system (Ecology 2006). Based on the City of Redmond municipal code (RZC 21.64.030), this wetland would require a 75-foot buffer due to its Category III rating and low intensity use. This wetland's 75-foot-wide buffer area is outside of the project area. Restoration for the project is likely to involve approach from the south, and impacts to the wetland buffer will be avoided. Should restoration require approach from the north or northwest, this wetland should be precisely delineated and further permitting and mitigation could be required.

3.3 Fish and Wildlife Habitat Assessment

Document Review

The City of Redmond classifies the project area as a **Fish and Wildlife Habitat Conservation Area** and as a **Core Preservation Area** (areas already protected by other mechanisms) because it is a riparian stream corridor around a Class IV stream.

The WDFW priority habitats and species (PHS) database does not map any priority species in or adjacent to the project area. The database maps the same historical wetland indicated by the NWI database at the Avignon apartment complex.

A biological evaluation (BE) has also been prepared for the project's permitting. The BE states that no USFWS-listed species are present, and thus none would be affected by the project. A potential indirect effect of the project is an increase in nutrients or aquatic insects flowing downstream from the new cascades-and-pools section of the ravine.

Field Investigation

Wildlife observations and habitat: Wildlife observed during the September and October 2016 site visits included songbirds (bushtits, song sparrows, and spotted towhees).

No habitat is present to support USFWS-listed or WDFW-listed species of birds, mammals, anadromous fish, or plants. Some tall trees along the project area's slope may provide perching opportunities for bald eagles (state-Sensitive and Federal species of concern); the nearest foraging opportunities are in the Sammamish River Slough. The forested habitat provides foraging opportunities for pileated woodpeckers, a WDFW priority species. However, the area is small and isolated from other forested areas, so this species is not likely to use the area regularly.

General site conditions: The project area is steeply sloped on the eastern portion, and flattens out on the western portion around the base of the stream at the birdcage. Below the birdcage area, a cement retaining wall separates the project site from 160th Avenue NE and the road's sidewalk. The unnamed stream is the only water feature in the project area, flowing through the ravine from the base of the Red-Wood Road retaining wall to the birdcage. The stream substrate is rock and cobble. The stream at the top end of the project contains undercut banks created by pipe failure. No wetlands occur within the project area, as described in the previous sections.

Vegetation conditions: As described in the Site Description above, no vegetation is present in the stream. Beyond the eroded area, there are two main habitats in the riparian area and surrounding slopes:

- Secondary deciduous/coniferous forest with a shrub and herb understory. This habitat has a canopy of red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*) and Douglas-fir (*Psuedotsuga menzeisii*). Shrubs include Indian plum (*Oemleria cerasiformis*) growing along the eroded areas along the stream (with many dying individuals where erosion has recently occurred), salmonberry (*Rubus spectabilis*), and trailing blackberry (*Rubus ursinus*). The herb layer is sparse, mostly consisting of sword fern (*Polystichum munitum*) and small patches of reed canarygrass (*Phalaris arundinaceae*).

- Shrub-dominated areas with thick coverage of Himalayan blackberry. This is the dominant habitat to the north of the project area and along the lower half of the ravine within the project area. In these areas, blackberries are growing directly adjacent to and shading the stream, and covering nearby slopes. One patch of willows (Salix sp.) is present on the north slope of the lower half of the ravine.

Outside of the project area, the forest continues to the south, and the blackberry-dominated area stretches to the north becoming interspersed with patches of forested habitat. Vegetation across Red-Wood Road and 160th Avenue NE from the project area consists of landscaping plants and trees at the apartment complex and single family homes.

Layers and diversity: The forested area has primarily one layer of tree canopy, with a shrub layer below. Plant diversity is typical of regenerating forest in the greater Seattle area. Some vegetation along the stream is being affected by the erosion at the broken pipe (undercutting large trees to expose their roots, and dying shrubs whose their roots have become exposed by the erosion).

Existing Habitat Functions and Values: The riparian corridor's vegetation provides the following functions:

- Delivers woody debris to the stream (though these features would not travel further downstream due to the birdcage).
- Moderates water temperatures and provide nutrient sources to downstream waters.
- Provides habitat for terrestrial wildlife.
- Provides an extension of a fragmented wildlife corridor.
- Provides aesthetic value to residents in nearby housing and travelers on the areas' roads.

The stream conveys stormwater from under Red-Wood Road to the stream's eventual outlet at the Sammamish River Slough. The project will enhance the Category IV stream by reducing streambank erosion and creating a stable cascade and pool system. All impacts to the buffer will be restored to increase riparian habitat functions and values and maintain connectivity to other habitats.

3.4 Frequently Flooded Areas

Document Review

The City of Redmond online mapping database maps the majority of the Avignon apartment complex, located across 160th Avenue NE from the project area, as being within a FEMA 100-year floodplain. The mapped boundary of the 100-year floodplain is about 150 feet from the cement wall below the project area, and about 175 feet from the lowest end of the stream in the project area, at the birdcage. The boundary of this area is at least 10 feet lower in elevation than the lowest portion of the project area. See Figure 2 for a map of this 100-year floodplain boundary. The project will not affect Frequently Flooded Areas.

3.5 Critical Aquifer Recharge Areas

Document Review

King County's online mapping database does not identify any critical aquifer recharge areas (CARAs) within 1 mile of the project. The nearest mapped CARA is about 1.3 miles to the south, south of SR 520. King County does map the project area as having a high susceptibility to groundwater contamination; the site is part of the Redmond-Bear Creek valley groundwater management area. The project will not affect Critical Aquifer Recharge areas.

3.6 Geological Hazards

Document Review

King County's online mapping database does not identify any landslide hazards, seismic hazards or erosion hazards within 0.75 mile of the project. A geotechnical report was prepared by and the project followed design recommendations in the report (Golder 2016).

5 IMPACTS

Replacement of the existing pipe and reconstruction of the stream channel will take place directly in the unnamed stream (see Project Drawings, Sheets 2 through 9). The construction activities will take place when the stream is dry to avoid impacts to the stream's waters. The stream structures will not encroach further into the critical areas buffer than existing conditions. The project is intended as an overall improvement of current conditions, by removing a significant source of erosion (the broken piping) and opening up the lower half of the stream where historically the entire stream was enclosed in piping.

Impacts to the creek and buffer areas will include clearing, grading, and tree removal in the critical areas buffer, and disturbance during the installation of new pipe and construction of cascades and pools along 90 feet of stream.

Work in dry: The project will be phased and will use a gravity diversion to ensure that all work will be completed in the dry.

Clearing and grading: The project will impact approximately 2,995 square feet of critical areas buffer. After construction, these disturbed areas will be revegetated by planting with native trees and shrubs to restore cover (See Sheet 9). The habitat around the stream will see an overall benefit, as non-native Himalayan blackberry will be replaced with a more diverse vegetation community of native plants, and a source of erosion and instability that affects streamside vegetation will be eliminated.

Stream channel construction: About 90 linear feet of stream channel will be recreated as a cascade-and-pool roughened channel, using rounded boulders and woody debris. This roughened channel will reduce erosion and will increase productivity of the stream, which will increase drift of aquatic insects that will reach the Sammamish River and increase available food sources for listed species there. Best management practices will be used to minimize erosion during these activities.

6 STREAM MITIGATION PLAN

6.1 Avoidance and Minimization

Impacts to critical areas are required to follow mitigation sequencing. Mitigation sequencing requires the following steps be taken:

- Avoiding the impact altogether by not taking a certain action or parts of actions;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation by using appropriate technology or by taking affirmative steps to avoid or reduce impacts;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action;
- Compensating for the impact by replacing or providing substitute resources or environments; and/or
- Monitoring the impact and the compensation projects and taking appropriate corrective measures.

In order to complete the project, impacts to the stream and buffer are unavoidable. The broken pipe must be replaced to avoid additional erosion, and the streambed must be disturbed to rebuild it as a roughened channel to also reduce erosion downstream of the pipe. These actions will cause impacts to the critical areas buffer during construction. These impacts are unavoidable.

Project impacts will be minimized by performing work during the dry season when the stream will not be flowing. A stormwater bypass pump will be used so that all work will occur in the dry. Filter fences will be used to avoid any unnecessary sedimentation. Existing trees in the work corridor will be preserved wherever possible. The footprint of disturbance to the critical area will be minimized during construction, and critical area buffer will be restored with plantings and stream channel roughening to a condition that improves upon the current condition.

6.2 Mitigation Approach

The project is designed to be as positive an action for fish and wildlife habitat as feasible.

The existing broken pipe is contributing to significant erosion of the stream channel and undercutting of the steep banks. The erosion is also a concern to the retaining wall for Red-Wood Road upslope of the broken pipe. These areas of erosion are also causing excess sediment delivery to the stream channel downslope of the culvert, and eventually to the Sammamish River Slough.

The new pipe and rebuilt stream channel will stabilize the new channel that has resulted from pipe failure. Water flowing under Red-Wood Road will be delivered to the top of the new, roughened stream channel. The new channel is designed as a cascades and pool reach, and includes rounded boulders and woody debris salvaged from the site. The channel permanently opens up a previously piped stream channel.

Turbidity and sediment delivery to the stream should not be an issue during construction, as construction will occur during the dry season. Best management practices such as temporary erosion fences, a stormwater bypass, and tarps over loose materials will minimize the movement of soil during any summer rainstorms during construction. After construction, any woody debris that was moved during regrading of the stream will be placed back below the ordinary high water mark (OHWM) of the stream as part of the cascade and pool construction. Potential erosion in new areas of topsoil will be reduced or eliminated by erosion control blankets, and replanting with native trees, and shrubs (see Project Drawings, Sheet 9). The plantings, stream reconstruction,

and new pipe are designed to reduce sediment delivery to the stream and subsequently to the Sammamish Slough downstream.

The stream at the project area will remain inaccessible to fish, due to the steep grade of the stream, the birdcage structure, and the 1,300 linear feet of piping between the stream and Sammamish River Slough. However, the project will improve water quality and reduce stream erosion, to the benefit of downstream waters where anadromous fish occur.

Restoring the buffer to existing conditions, and enhancing areas with native trees and shrubs will mitigate impacts to the critical areas buffer. In total, approximately 2,795 square feet will be replanted (Sheet 9).

6.3 Proposed Mitigation

To offset temporary impacts to stream buffers, 2,795 square feet of buffer will be restored by planting with bare root or containerized native trees and shrubs.

Non-native species will be removed from the planting zone (e.g., English ivy, Himalayan blackberry, yellow iris, or holly if present). Native trees and shrubs will then be planted in project-disturbed areas along the sides of the roughened channel (approximately 675 square feet; Planting Zone 1), and at the bottom of the roughened area and around the birdcage (approximately 2,120 square feet; Planting Zone 2).

Table 1 shows the proposed species to be planted in the buffer. The planting plan on Sheet 9 of the project drawings provides more detail on the planting installations and locations of these plantings.

Table 1. Tree and Shrub Species in Planting Plan

Common Name	Scientific Name
Trees	
Red alder	*Alnus rubra*
Douglas-fir	*Pseudotsuga menziesii*
Western red cedar	*Thuja plicata*
Pacific willow	*Salix lucida*
Scouler's willow	*Salix scouleriana*

Shrubs	
Black twinberry	*Lonicera involucrate*
Salmonberry	*Rubus spectabilis*
Red osier dogwood	*Cornus sericea*
Snowberry	*Symphoricarpos albus*
Indian plum	*Oemleria cerasiformis*
Vine maple	*Acer circinatum*
Sword fern	*Polystichum munitum*

6.4 Mitigation Goals

Mitigation goals include the following:

- Restore 2,795 square feet of stream buffer.
- Stabilize and restore approximately 90 feet of stream channel.
- Control Himalayan blackberry and other invasive plant species in the enhancement area.

6.5 Performance Standards

The following performance standards will be met to ensure the enhancement measures are performing to enhance the critical areas buffer functions.

- Riparian buffer plantings shall maintain 80% survival in years one through five.
- The stream channel structure will not significantly degrade or cause erosion of streambanks for the five-year monitoring period.
- Invasive plant species will be limited to 20% coverage in the restored and enhanced areas for a period of five years.

6.6 Schedule and Maintenance

Plantings shall be containerized plants or bare root. Watering of the installed plants may be required if drought conditions occur during the summer months. Invasive plants will be removed throughout the year as they occur.

7 Proposed Monitoring, Reporting and Contingency

7.1 Plant Survival

To ensure that the performance standards are met, plantings will be counted in August or September for survival for the first year. The site will be monitored for five years from the time of completion of site construction by a qualified individual(s) who is experienced or trained in wetland vegetation and monitoring techniques.

Valid monitoring data are critical to making meaningful management decisions that help the mitigation site meet its objectives. Monitoring plans are based on mitigation site conditions and plant community development. These factors together with the mitigation objectives are to be incorporated into a site-specific monitoring plan that will be developed at the beginning of each monitoring season. Photo documentation of the stream channel will be included during annual plant monitoring activities.

7.2 Monitoring Reports

Monitoring reports will be completed and submitted to the City within 30 days of completing the monitoring.

- Site plan and location
- General background information
- Goals of the mitigation plan
- Performance standards
- Monitoring methodology
- Photographic documentation
- Results of the monitoring to date
- Contingency actions, if needed

7.3 Contingency Actions

All dead plantings will be replaced so that 100% survival is reached for the first year. A subsample can be completed to assure that the 100% survival is reached. In years two through five all plantings will maintain an 80% survival rate.

If new erosion of the stream channel or banks is occurring, the City will be notified so that proper actions can occur to remedy the situation.

Himalayan blackberry and other invasive species identified will also be manually removed from the planting areas if they occur during the five-year period.

8 Document Preparers

Brad Thiele	Biologist	18 years of experience	Northwest Environmental Consulting LLC. (NWEC)
Emily Drew	Ecologist	16 years of experience	NWEC

Northwest Environmental Consulting, LLC followed standard acceptable field methods and protocols at the time work was performed. These standards include delineation of wetland and stream boundaries, characterization, rating, functional analyses, impact assessments and mitigation of impacts. The conclusions and findings in this report are based on field observations and measurements and represent our best professional judgment and to some extent rely on other professional service firms and available site information. Within the limitations of project scope, budget, and seasonal variations, we believe the information provided herein is accurate and true to the best of our knowledge. Northwest Environmental Consulting does not warrant any assumptions or conclusions not expressly made in this report, or based on information or analyses other than what is included herein.

9 REFERENCES

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Appendix A - Figures and Project Drawings

Figure 1 – Vicinity Map
9800 Ravine Stabilization Project

Property Report

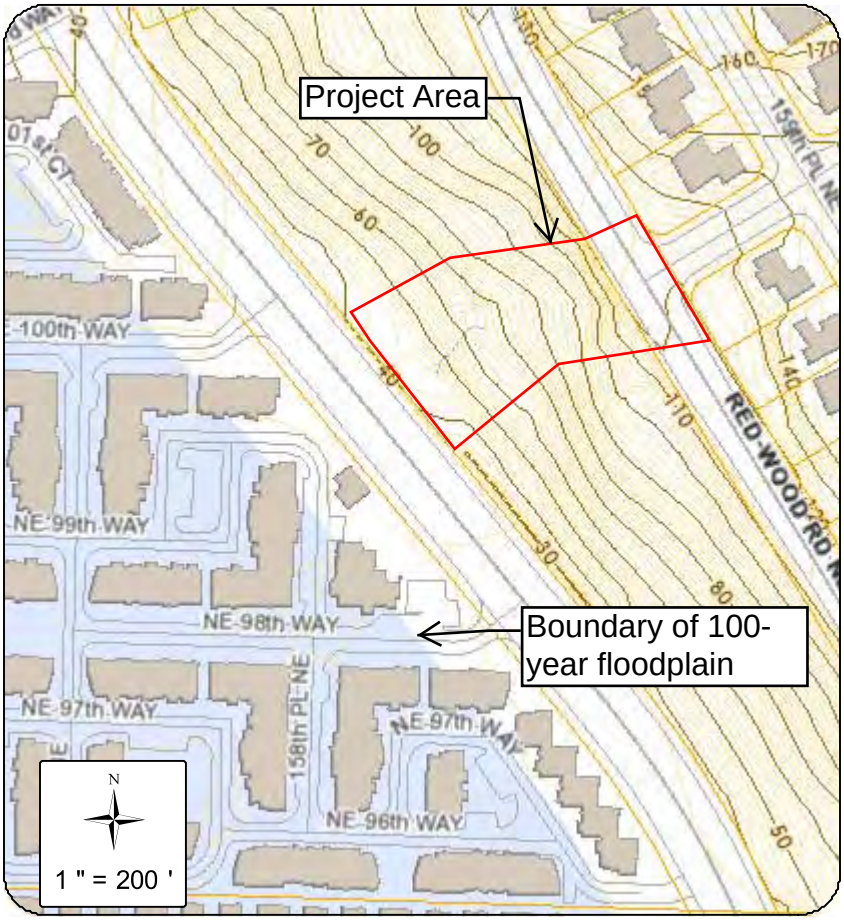
Property Info

PIN:
0325059018
Site Address:
Unknown
Taxpayer Name:
REDMOND CITY OF

Taxpayer Address:
PO BOX 97010 M/S 3NFN
REDMOND, WA 98073

Critical Areas

Flooded Areas:
No
Class I-IV Stream:
Class IV
Class I Stream Buffer:
Yes
Shoreline environment(s):
No
Wellhead Protection Zone:
4



Zoning / LandUse

Current Land Use:
Transportation, communication, information, and utilities

Zone:
R-20

Zoning Overlay:
No

Comprehensive Plan Land Use Designation:
High Density Residential

Cottages allowed:
No

Affordable housing regulations:
Yes

Neighborhood:
Willows / Rose Hill

This map printout may not show all features selected on-screen. The display of certain map features may be obscured by other features that have been selected. Information shown on these maps is derived from public records that are constantly undergoing change and does not replace a site survey, and is not warranted for content or accuracy. The City does not guarantee the positional or thematic accuracy of the GIS data. The GIS data or cartographic digital files are not a legal representation of any of the features which it depicts, and disclaims any assumption of the legal status of which it represents. Any implied warranties, including warranties of merchantability or fitness for a particular purpose, shall be expressly excluded.

Figure 2 - Property Map and Contour Lines

STORMWATER SYSTEM MAP

LEGEND

Redmond MH	●	Valve	⋈	Redmond Underdrain		Pump	
Redmond CB	■	Cleanout	○	Non-Redmond Underdrain		City Limits	
Redmond MH CS	◉	Redmond Pipe		Redmond Vault		Ponds	
Redmond CB CS	▣	Non-Redmond Pipe		Non-Redmond Vault		Streams	
Redmond Unknown	×	Non-Redmond Culvert		Redmond Bioswale		Contours	
Redmond Inlet/Area Drain	●	Redmond Culvert		Non-Redmond Bioswale			
Non-Redmond Chambers	●	SW SideSewer					

N

0 60 120 180

SCALE: 1" - 200'

1/4 SEC. , T. N., R. E

Figure 3

DATE **4/29/2016**

FOR INFORMATION ONLY

THIS MAP AND RELATED DATA IS INTENDED TO ASSIST IN FIELD LOCATIONS AND IS NOT GUARANTEED TO BE ACCURATE. FIELD VERIFICATION IS REQUIRED FOR ALL DEVELOPMENT OR CONSTRUCTION PLANS.

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CITY OF REDMOND

RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST

TASK ORDER 15-06

PERMIT SUBMITTAL - NOT FOR CONSTRUCTION

PROJECT NUMBER 20021514

UTILITY COORDINATION CONTACTS:

UTILITIES:

PUGET SOUND ENERGY, POWER & GAS
EMERGENCY: 1-888-CALL-PSE
GAS: JEANNE COLEMAN (425) 463-6550
ELECTRIC: ERIK GUERRA (425) 748-6318

FRONTIER COMMUNICATIONS
JAY SCHWAB (425) 263-4019

COMCAST
RAYMOND PILKENTON (425) 263-5332

CITY OF REDMOND:

PROJECT MANAGER
ERIC LaFRANCE (425) 556-2722

UTILITIES
REBECCA BORKER (425) 556-2706

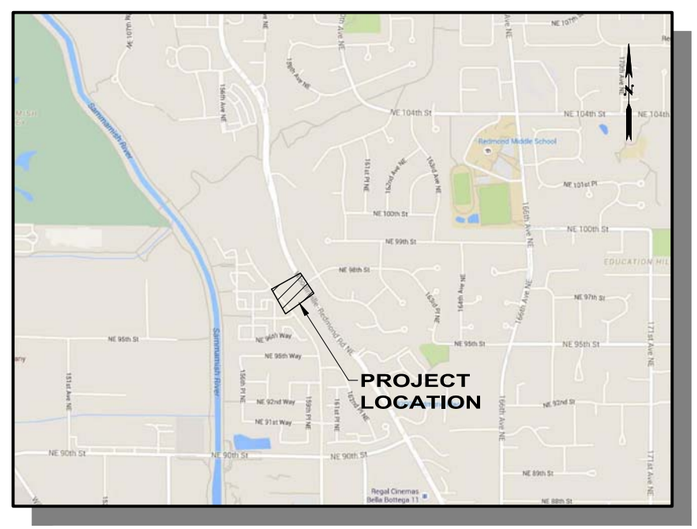
TRAFFIC SIGNAL
TRAFFIC SIGNAL TECHNICIANS (425) 556-2830

SURVEYOR:

AXIS SURVEY AND MAPPING
ZANE NALL, PLS
15241 NE 90TH ST.
REDMOND, WA 98052
(425) 823-5700
1-800-933-AXIS

ENGINEERING:

OSBORN CONSULTING, INC.
LAURA RUPPERT, PE
1800 112TH AVE. NE, SUITE 220E
BELLEVUE, WA 98004
(425) 451-4009



VICINITY MAP
N.T.S.

SHEET INDEX

SHEET #	SHEET TITLE
1	COVER SHEET
2	NOTES AND LEGEND
3	EXISTING CONDITIONS
4	TEMPORARY EROSION AND SEDIMENT CONTROL PLAN (TESC)
5	OVERALL SITE PLAN AND PROFILE
6	STREAM SECTION AND DETAILS
7	SPECIAL CHAMBER PLAN AND PROFILE
8	STANDARD DETAILS
9	PLANTING PLAN AND DETAILS

APPROVED FOR CONSTRUCTION

DAVID M. PAUL, P.E. DATE
CITY ENGINEER

Know what's below.
Call before you dig.

LAURA RUPPERT
STATE OF WASHINGTON
43848
REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY AGR	OSBORN CONSULTING INCORPORATED	OSBORN CONSULTING, INC.	NO.	DATE	REVISION	BY	CityofRedmond WASHINGTON	RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST	JOB# / DWG 15-06	DATE JULY 2016
DRAWN BY TNF		1800 112th Ave. NE, Suite 220E Ph (425) 451-4009						CITY OF REDMOND	SCALE H: N/A V: N/A	SHEET 1 of 9
CHECKED BY LCR		Bellevue, WA. 98004 Fax (425) 451-4901						COVER SHEET		

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_CVR.DWG
PLOT TIME: 8/16/2016 9:01 AM
USER NAME:TRAVIS FRANKLIN

GENERAL NOTES:

1. CALL FOR UTILITY LOCATES @ 1-800-424-5555.
2. SUBMIT A TRAFFIC CONTROL PLAN FOR REVIEW AND APPROVAL PER CITY OF REDMOND STANDARD SPECIFICATIONS.
3. APPLICANT IS REQUIRED TO SEND OUT "CONSTRUCTION NOTICES" TO RESIDENTS 5 DAYS PRIOR TO START OF WORK.
4. EXISTING UTILITIES WITHIN PROPOSED EXCAVATION LIMITS ARE REQUIRED TO BE "POTHOLED" PRIOR TO CONSTRUCTION. ALL OPEN-CUT STREET SURFACES AND HARD SURFACE AREAS SHALL BE BACKFILLED PER CITY OF REDMOND STANDARD SPECIFICATIONS & STANDARD DETAIL DRAWING. MIXED DESIGNS SHALL BE SUBMITTED FOR REVIEW & APPROVAL.
5. ALL CITY UTILITIES HAVE PRIORITY. REFERENCE PLACEMENT VERTICALLY AND HORIZONTALLY.
6. FRANCHISE UTILITIES ARE REQUIRED TO BE PLACED BENEATH CITY WATER MAINS AND SERVICES WITH 1' MINIMUM VERTICAL SEPARATION. HORIZONTAL SEPARATION REQUIRES A 5' MINIMUM BEHIND FIRE HYDRANTS AND WHEN PARALLELING CITY-OWNED UTILITIES. THERE IS A 10' MINIMUM REQUIREMENT WHEN ADJACENT TO POWER VAULTS.
7. TRENCH SHORING IS TO MEET MINIMUM SAFETY STANDARDS SET BY THE STATE OF WASHINGTON DEPARTMENT OF LABOR AND INDUSTRIES. [CHAPTER 296-155 WAC.]
8. REQUIREMENTS FOR TYPE AND PLACEMENT OF STEEL SHEETS: MINIMUM SIZE IS 1" THICK BY 8' WIDE BY 20' LONG WITH SKID PROOF SURFACE. SHEETS ARE TO BE PINNED AND COLD MIX PLACED ON EDGES. AREA IS TO BE KEPT CLEAN AT ALL TIMES. "STEEL PLATES AHEAD" WARNING SIGNS REQUIRED.
9. RESTORATION OF OPEN-CUT PAVEMENT SECTIONS SHALL MEET THE REQUIREMENTS OF CITY OF REDMOND STANDARD SPECIFICATIONS & STANDARD DETAIL DRAWING & AS DIRECTED BY CITY INSPECTION.
10. SILT AND EROSION CONTROL SHALL MEET THE REQUIREMENTS OF THE REDMOND COMMUNITY DEVELOPMENT GUIDE CODE. CONTRACTOR IS REQUIRED TO PROVIDE PROTECTION OF THE CITY STORM DRAIN SYSTEM. CONCRETE TRUCKS ARE REQUIRED TO USE A DESIGNATED WASHOUT AREA.
11. RESTORATION SHALL MEET THE REQUIREMENT OF CITY OF REDMOND STANDARD SPECIFICATIONS. ROADWAY RESTORATION SHALL INCLUDE STREETS, SIDEWALKS, DRIVEWAYS, CURB & GUTTER, TRAFFIC SIGNS AND MARKINGS, LANDSCAPING, AND IRRIGATION SYSTEMS (FOR PARKS DEPT SYSTEMS CONTACT SCOTT VAN DE VANTER @ 425-556-2354). CITY OF REDMOND MAY REQUIRE WIDTH OR HALF-STREET GRIND & OVERLAY.
12. FINAL INSPECTION AND APPROVAL PER CITY OF REDMOND STANDARD SPECIFICATIONS.
13. RECORD DRAWINGS PER CITY OF REDMOND STANDARD SPECIFICATIONS.
14. HOURS OF WORK PER CITY OF REDMOND STANDARD SPECIFICATIONS. CERTAIN STREETS REQUIRE LIMITED HOURS FOR CONSTRUCTION.
15. NOISE CONTROL PER CITY OF REDMOND STANDARD SPECIFICATIONS & ORDINANCE #2006.
16. TREE PROTECTION & REPLACEMENT PER ORDINANCE #1998.
17. OVERTIME HOURS WILL BE BILLED TO THE APPLICANT PER CITY OF REDMOND STANDARD SPECIFICATIONS.
18. CITY OF REDMOND BUSINESS LICENSES ARE REQUIRED OF ALL CONTRACTORS & SUBCONTRACTORS PER CITY OF REDMOND STANDARD SPECIFICATIONS. SUPPLIERS ARE EXEMPT.
19. A COPY OF THE CITY OF REDMOND STANDARD SPECIFICATIONS ARE REQUIRED TO BE ON SITE AT ALL TIMES.
20. THE DETAILS AND SEQUENCING SHOWN IN THESE PLANS ARE INTENDED TO SHOW ONE POSSIBLE METHOD FOR CONSTRUCTION.
21. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PREPARE, SUBMIT FOR APPROVAL, IMPLEMENT AND MAINTAIN A WORK ACCESS PLAN, DEWATERING AND TEMPORARY BYPASS PLAN, AND TRAFFIC CONTROL PLAN BASED ON CONSTRUCTION ACCESS, SEQUENCING AND SITE CONDITIONS ENCOUNTERED AS WORK PROGRESSES.

STANDARD CLEARING, GRADING AND TEMPORARY EROSION CONTROL PLAN NOTES:

1. ALL WORK AND MATERIALS TO BE PER CITY OF REDMOND STANDARDS.
2. KEEP OFF-SITE STREETS CLEAN AT ALL TIMES. FLUSHING STREETS SHALL NOT BE ALLOWED. ALL STREETS SHOULD BE SWEPT.
3. ADDITIONAL EROSION/SEDIMENT CONTROL MEASURES MAY BE REQUIRED BY CITY INSPECTOR.
4. WHEN WORK IS STOPPED/COMPLETED IN AN AREA, THE CITY INSPECTOR MAY REQUIRE POST-CONSTRUCTION EROSION CONTROL INCLUDING SEEDING OR OTHER MEASURES.
5. LOCATIONS SHOWN OF EXISTING UTILITIES ARE APPROXIMATE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE CORRECT LOCATIONS TO AVOID DAMAGE OR DISTURBANCE.
6. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN STREET USE AND OTHER RELATED PERMITS PRIOR TO ANY CONSTRUCTION.
7. ALL GROUND COVER IS TO REMAIN UNDISTURBED OUTSIDE OF CLEARING AREAS.
8. THE TEMPORARY EROSION/SEDIMENT CONTROLS SHALL BE INSTALLED, INSPECTED, AND OPERATING BEFORE ANY GRADING OR EXTENSIVE LAND CLEARING. THESE CONTROLS MUST BE SATISFACTORILY MAINTAINED UNTIL CONSTRUCTION AND LANDSCAPING ARE COMPLETE.
9. TIE IMPERVIOUS SURFACES (ROOF, STREETS, DRIVEWAYS, ETC.) TO COMPLETED DRAINAGE SYSTEM AS SOON AS POSSIBLE.
10. A PRE-CONSTRUCTION MEETING WITH THE CONSTRUCTION DIVISION AND ALL PERMITS MUST BE COMPLETED BEFORE START OF CONSTRUCTION.
11. CLEARING LIMITS SHALL BE LOCATED BY A LICENSED CIVIL ENGINEER OR LAND SURVEYOR.
12. APPROVAL OF THIS TEMPORARY EROSION/SEDIMENTATION CONTROL (TESC) PLAN DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT ROAD OR DRAINAGE DESIGN.
13. THIS APPROVAL FOR TESC IS VALID FOR CONSTRUCTION BETWEEN MAY 1 AND SEPTEMBER 30. THIS APPROVAL FOR TESC IS NOT VALID FOR THE RAINY SEASON (OCTOBER 1 THROUGH APRIL 30).
14. REMOVE ALL TESC MEASURES ONCE ALL WORK IS COMPLETED AND SITE IS PERMANENTLY STABILIZED.

SURVEY NOTES

DATUM/BASIS OF BEARINGS

HELD A BEARING OF NORTH 16°31'23" WEST BETWEEN CITY OF REDMOND HORIZONTAL CONTROL POINTS GPS90-3E2 AND GPS90-3E4.

HORIZONTAL DATUM:
NAD '83/'91 PER CITY OF REDMOND

ORIGINATING BENCHMARK:
CITY OF REDMOND VERTICAL CONTROL POINT COR 9166.
VERTICAL DATUM: NAVD '88 PER CITY OF REDMOND
ELEVATION: 33.67'

TEMPORARY BENCHMARK:
TBM 'A'
TOP OF MONUMENT IN CASE AT THE PC OF 160TH AVE NE.
ELEVATION: 38.77'

TBM 'B'
SET MAG NAIL IN TOP SEAM OF WHEELCHAIR RAMP AT THE SOUTHERLY QUDRANT INTERSECTION OF REDMOND-WOODINVILLE ROAD AND NE 98TH ST.
ELEVATION: 124.27'

NOTES

NO EASEMENTS, RESTRICTIONS, OR RESERVATIONS OF RECORD WHICH WOULD BE DISCLOSED BY TITLE REPORT ARE SHOWN.

PRIMARY CONTROL POINTS AND ACCESSIBLE MONUMENT POSITIONS WERE FIELD MEASURED UTILIZING GLOBAL POSITIONING SYSTEM (GPS) SURVEY TECHNIQUES USING LEICA SYSTEM 1200 EQUIPMENT. MONUMENT POSITIONS THAT WERE NOT DIRECTLY OBSERVED USING GPS SURVEY TECHNIQUES WERE TIED INTO THE CONTROL POINTS UTILIZING LEICA ELECTRONIC 1201 TOTAL STATIONS FOR THE MEASUREMENT OF BOTH ANGLES AND DISTANCES. THIS SURVEY MEETS OR EXCEEDS THE STANDARDS SET BY WACS 332-130-080/090.

UTILITY LOCATIONS SHOWN HEREON ARE BASED UPON ASBUILT FIELD LOCATION OF EXISTING STRUCTURES. FIELD LOCATION OF UTILITIES BASED ON LOCATOR PAINT MARKINGS AND LOCATIONS BASED ON UTILITY MAPS FROM CITY AND UTILITY PURVEYOR'S DRAWINGS.

REFERENCES

CITY OF REDMOND SHORT PLAT SPL-00-001 RECORING NUMBER 20001017900010.

PLAT OF VALLEY VISTA DIVISION 4 VOL.100 / PGS.42-43.

LEGEND

PROPOSED

- HVF — HIGH VISIBILITY FENCE
- SILT FENCE
- INLET PROTECTION INSERT
- TREE REMOVED
- TREE TO REMAIN AND BE PROTECTED
- PROJECT LIMITS
- REMOVED TREE LAID ON TOP OF BANK
- STORM DRAIN BYPASS
- TRENCHLESS REPAIR EX. STORM DRAIN
- SAWCUT
- CONSTRUCTION ENTRANCE
- CEMENT CONCRETE DRIVEWAY
- POOL ZONE
- CASCADE ZONE

EXISTING

- POWER JUNCTION BOX
- POWER METER
- POWER VAULT
- TELECOMMUNICATIONS MANHOLE
- CATCH BASIN
- STORM DRAIN MANHOLE
- CULVERT
- ICV IRRIGATION CONTROL VALVE
- WATER VALVE
- WETLAND FLAG
- SANITARY SEWER MANHOLE
- MONITOR WELL
- TELECOMMUNICATIONS VAULT
- GAS VALVE
- SIGN
- STREET LIGHT
- FIRE HYDRANT
- 12"A ALDER
- 12"COT COTTONWOOD
- 12"D DECIDUOUS
- 12"M MAPLE
- 12"O OAK
- 12"C CEDAR
- 12"F FIR
- SET BENCHMARK
- FOUND MONUMENT IN CASE
- EXISTING RETAINING WALL
- ROCKERY
- RETAINING WALL PILE
- BUILDINGS
- CONCRETE PAVING
- GRAVEL SURFACE
- ASPHALT PAVING
- P — POWER LINE
- T — TELECOMMUNICATIONS LINE
- T — CABLE TV LINE
- G — GAS LINE
- X — CHAIN LINK FENCE LINE
- OP — OVERHEAD POWER LINE

POSSIBLE CONSTRUCTION SEQUENCE

1. PREPARE WORK ACCESS PLAN THAT WILL INCLUDE THE BYPASS AND DEWATERING PLAN AND THE TRAFFIC CONTROL PLAN. SUBMIT TO THE ENGINEER FOR REVIEW AND APPROVAL.
2. CONSTRUCTION OF PROJECT WILL START FROM THE UPSTREAM END ON REDMOND-WOODINVILLE ROAD AND CONTINUE DOWNSTREAM TOWARDS THE BIRD CAGE. EARTHWORK (BACKFILL) AND PIPE INSTALLATION WORK ON THE SLOPE SIDE MAY OCCUR CONCURRENTLY WITH THE PIPE REPLACEMENT/REPAIR WORK ON REDMOND-WOODINVILLE ROAD. THE ROUGHENED CHANNEL WORK CANNOT BE INITIATED UNTIL THE PIPE WORK IS COMPLETE. ENGINEER SHALL APPROVE ANY NECESSARY CHANGES REQUIRED TO ACCOMMODATE UNFORESEEN OBSTACLES THAT COULD BE ENCOUNTERED SUCH AS SPECIAL CHAMBER CONDITIONS, MOVEMENT IN THE SOLIDER PILE WALL, AND PRESERVATION OF TREES.
3. INITIATE APPROVED TRAFFIC CONTROL PLAN ON REDMOND-WOODINVILLE ROAD.
4. INSTALL STORM DRAIN INLET PROTECTION AS SHOWN ON THE PLANS.
5. INSTALL STORMWATER BYPASS ON REDMOND-WOODINVILLE ROAD.
6. INSTALL HIGH VISIBILITY FENCE TO DELINEATE CONSTRUCTION LIMITS, TREES AND VEGETATION THAT ARE TO BE PRESERVED WITHIN THE CONSTRUCTION LIMITS.
7. INSTALL STABILIZED CONSTRUCTION ENTRANCE.
8. SPECIAL CHAMBER.
   - a. RELINE EXISTING PIPE AND CONNECT TO STRUCTURE.
   - b. INSTALL NEW PIPE IN SPECIAL CHAMBER AND CONNECT TO PIPE AND STRUCTURE.
   - c. ABANDON SPECIAL CHAMBER IN PLACE.
9. SLOPE SIDE: BACKFILL AND PIPE.
   - a. PREPARE WORK AREA FOR BACKFILLING AND PIPE INSTALLATION FOR NEW PIPE SECTION ONLY.
   - b. BACKFILL SCOURED AREA.
   - c. RELINE EXISTING PIPE AND CONNECT TO STRUCTURE.
   - d. INSTALL NEW PIPE TO PROPOSED OUTFALL AND CONNECT TO PIPE AND STRUCTURE.
10. SLOPE SIDE: ROUGHENED CHANNEL.
    - a. PREPARE WORK AREA FOR ROUGHENED CHANNEL SECTION, INCLUDING TREE REMOVAL.
    - b. PLACE ANGULAR BACKFILL BELOW CHANNEL SECTION.
    - c. INSTALL ROUGHENED CHANNEL.
    - d. INSTALL PLANTINGS.
    - e. PLACE TREES.
11. RESTORE PROJECT AREA.

LAURA RUPERT — STATE OF WASHINGTON — 43848 — REGISTERED PROFESSIONAL ENGINEER

PERMIT SUBMITTAL - NOT FOR CONSTRUCTION

DESIGNED BY AGR
DRAWN BY TNF
CHECKED BY LCR

OSBORN CONSULTING INCORPORATED

OSBORN CONSULTING, INC.
1800 112th Ave. NE, Suite 220E Ph (425) 451-4009
Bellevue, WA. 98004 Fax (425) 451-4901

NO.	DATE	REVISION	BY

City of Redmond WASHINGTON

RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
NOTES AND LEGEND

JOB# / DWG 15-06
SCALE H: N/A V: N/A
DATE JULY 2016
SHEET 2 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_CVR.DWG
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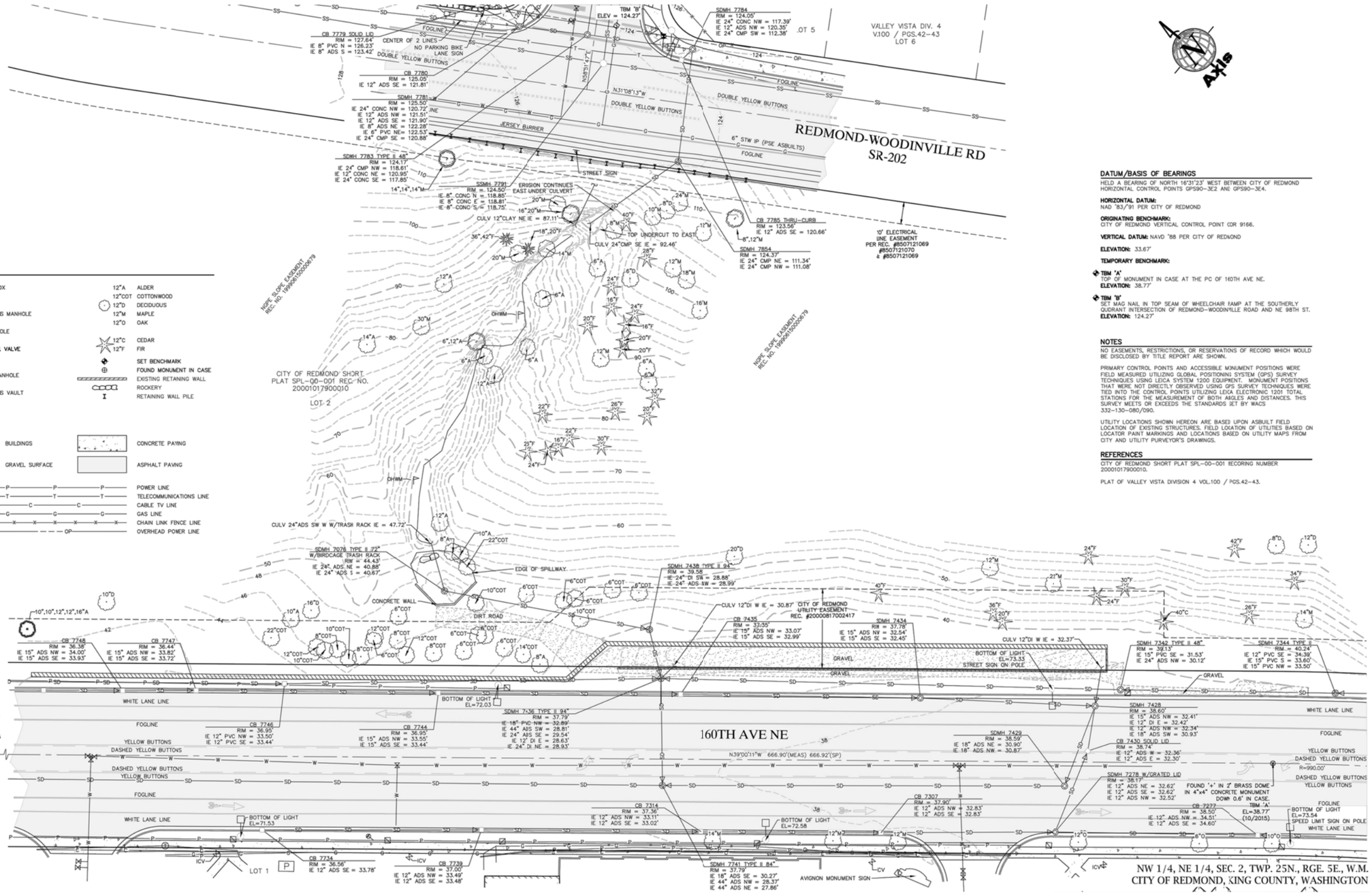

LEGEND

	POWER JUNCTION BOX	12"A	ALDER
	POWER METER	12"COT	COTTONWOOD
	POWER VAULT	12"D	DECIDUOUS
	TELECOMMUNICATIONS MANHOLE	12"M	MAPLE
	CATCH BASIN	12"O	OAK
	STORM DRAIN MANHOLE		
	CULVERT	12"C	CEDAR
ICV	IRRIGATION CONTROL VALVE	12"F	FIR
	WATER VALVE		SET BENCHMARK
	WETLAND FLAG		FOUND MONUMENT IN CASE
	SANITARY SEWER MANHOLE		EXISTING RETAINING WALL
	MONITOR WELL		ROCKERY
	TELECOMMUNICATIONS VAULT		RETAINING WALL PILE
	GAS VALVE		
	SIGN		
	STREET LIGHT		
	FIRE HYDRANT		
	BUILDINGS		CONCRETE PAVING
	GRAVEL SURFACE		ASPHALT PAVING
P	POWER LINE		
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C	CABLE TV LINE		
G	GAS LINE		
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REFERENCES

CITY OF REDMOND SHORT PLAT SPL-00-001 RECORING NUMBER 20001017900010.

PLAT OF VALLEY VISTA DIVISION 4 VOL.100 / PGS.42-43.

PERMIT SUBMITTAL - NOT FOR CONSTRUCTION

LAURA RUPPERT
STATE OF WASHINGTON
43848
REGISTERED PROFESSIONAL ENGINEER

DESIGNED BY AGR	OSBORN CONSULTING INCORPORATED	OSBORN CONSULTING, INC.	NO.	DATE	REVISION	BY
DRAWN BY TNF		1800 112th Ave. NE, Suite 220E Ph (425) 451-4009				
CHECKED BY LCR		Bellevue, WA. 98004 Fax (425) 451-4901				

City of Redmond WASHINGTON

RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
EXISTING CONDITIONS

JOB# / DWG	DATE
15-06	JULY 2016
SCALE H: N/A V: N/A	SHEET 3 of 9

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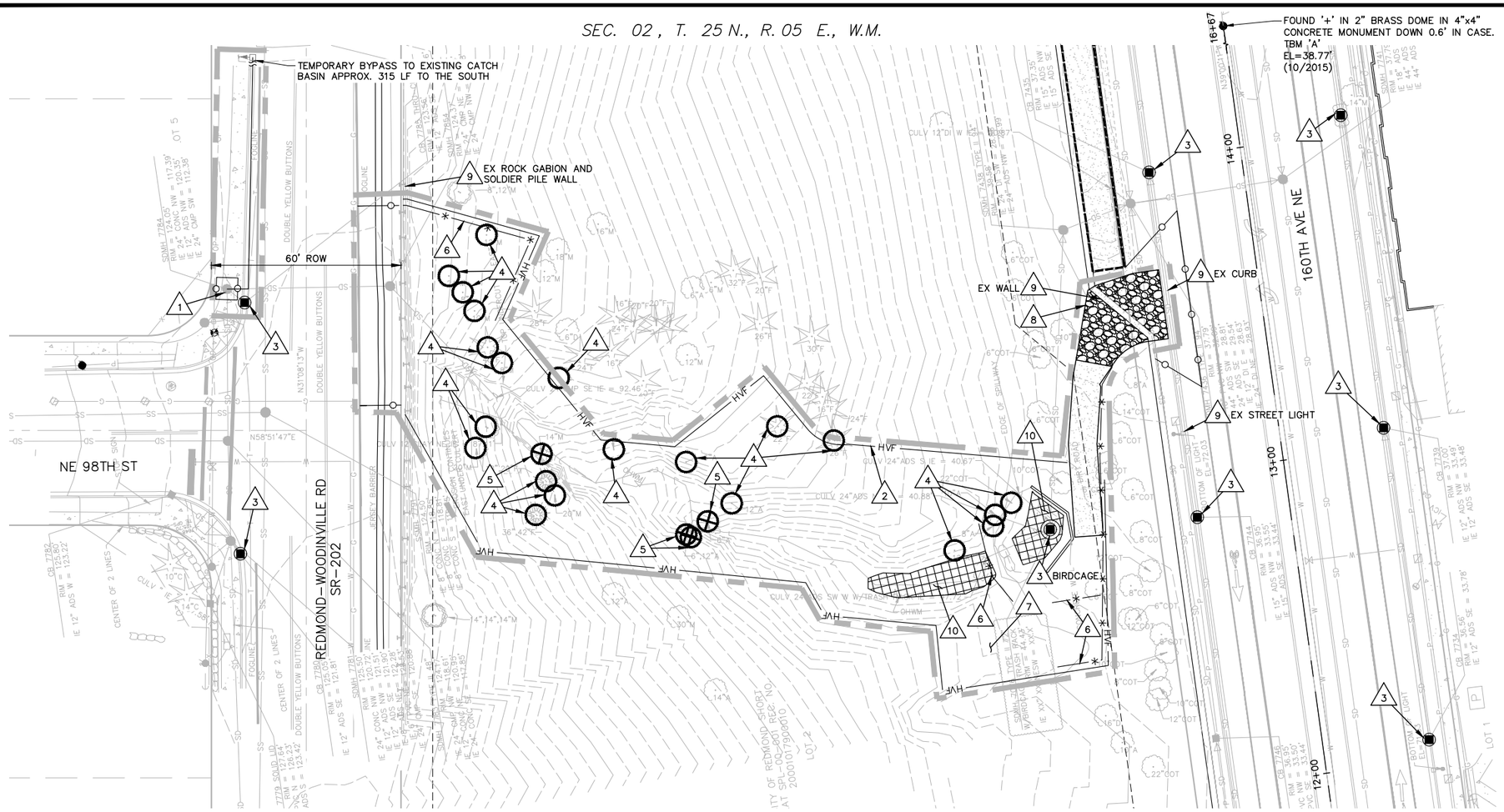

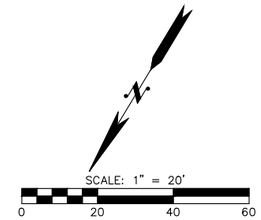

GENERAL NOTES:

1. REFER TO THE TECHNICAL SPECIFICATIONS FOR LEGAL DESCRIPTIONS, EASEMENT EXHIBITS, AND CCTV REPORTS.
2. THE CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL THE WORK ACCESS PLAN. THE WORK ACCESS PLAN SHALL ADDRESS METHODS TO COMPLETE THE TRENCHLESS PIPE REPAIR AND REPLACEMENT WORK ON REDMOND-WOODINVILLE ROAD, THE TRENCHLESS PIPE REPAIR AND REPLACEMENT WORK ON THE STEEP SLOPE, AND THE ROUGHENED CHANNEL. THE WORK ACCESS PLAN SHALL INCLUDE THE BYPASS AND DEWATERING PLAN THAT ADDRESSES METHODS OF CONTROLLING WATER DURING CONSTRUCTION AND THE TRAFFIC CONTROL PLAN. ALL WORK REQUIRED TO COMPLETE THE PIPE REPLACEMENT AND REPAIRS BELOW REDMOND-WOODINVILLE ROAD SHALL BE LIMITED TO THE SHOULDER OF THE ROAD.

TESC NOTES:

1. INSTALL STORMWATER BYPASS PUMP AND DISCHARGE TO LOCATION INDICATED ON PLAN.
2. MARK PROJECT LIMITS IN ACCORDANCE WITH WSDOT STANDARD PLAN 1-10.10-01 HIGH VISIBILITY FENCE.
3. INSTALL INLET PROTECTION PER WSDOT STANDARD PLAN 1-40.20-00 STORM DRAIN INLET PROTECTION.
4. EXISTING TREE/VEGETATION TO REMAIN PER REDMOND ZONING CODE RCZ 21.72.070. TREE LIMBS LESS THAN 1-INCH DIAMETER CAN BE REMOVED WITH APPROVAL FROM THE CITY OF REDMOND. TREE BRANCHES TRIMMED AS NEEDED.
5. REMOVE TREE AND SALVAGE FOR USE ALONG ROUGHENED CHANNEL. SEE SHEET 5 FOR PLACEMENT LOCATIONS.
6. INSTALL FILTER FENCE PER CITY OF REDMOND STANDARD DETAIL 502 FILTER FABRIC FENCE.
7. APPROXIMATE LOCATION FOR MATERIALS STAGING. EXISTING SPOILS PILE TO BE REMOVED PRIOR TO STAGING.
8. INSTALL TEMPORARY STABILIZED CONSTRUCTION ENTRANCE PER CITY OF REDMOND STANDARD DETAIL 503.
9. PROTECT EXISTING UTILITY, STRUCTURE, OR WALL. PROTECT CURB, GUTTER, AND SIDEWALK. RESTORE ANY PANELS CRACKED OR DAMAGED PER CITY OF REDMOND STANDARD DETAIL 303. STREET LIGHTS MUST REMAIN IN OPERATION AT ALL TIMES OR A TEMPORARY LIGHTING PLAN PROPOSED.
10. DREDGE POOL AREA AS PART OF EROSION CONTROL MEASURES AS DIRECTED IN THE FIELD BY CITY OF REDMOND REPRESENTATIVE.

LAURA RUPERT
STATE OF WASHINGTON
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PROFESSIONAL ENGINEER

PERMIT SUBMITTAL - NOT FOR CONSTRUCTION

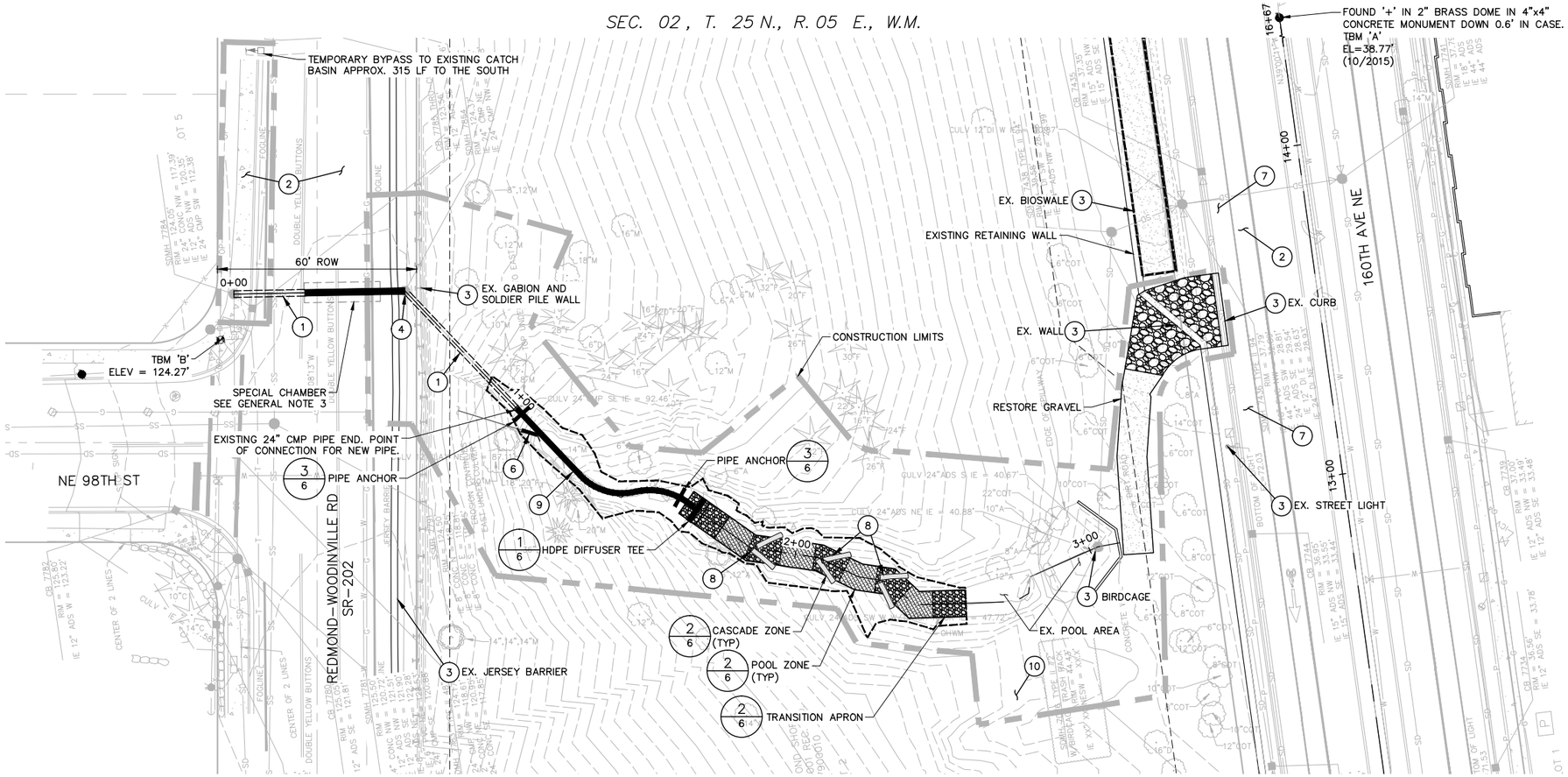
DESIGNED BY AGR	OSBORN CONSULTING INCORPORATED	OSBORN CONSULTING, INC.	NO.	DATE	REVISION	BY
DRAWN BY TNF		1800 112th Ave. NE, Suite 220E Ph (425) 451-4009				
CHECKED BY LCR		Bellevue, WA. 98004 Fax (425) 451-4901				

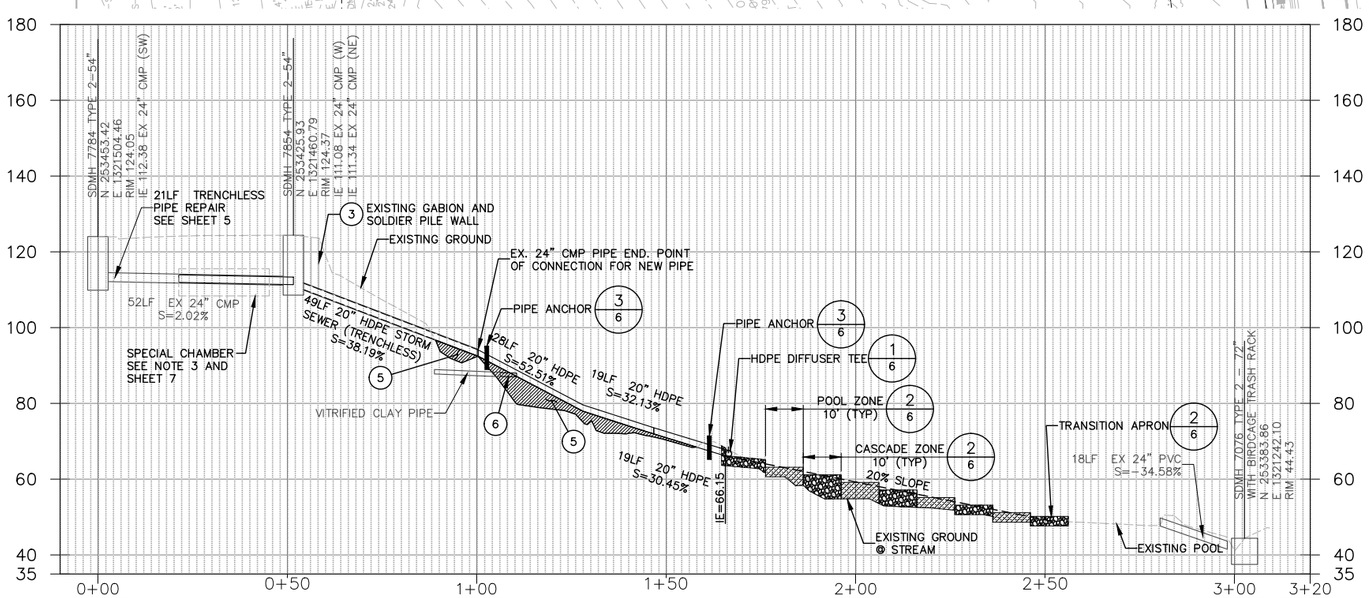
City of Redmond WASHINGTON

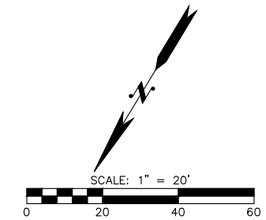
RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
TEMPORARY EROSION AND SEDIMENT CONTROL PLAN (TESC)

JOB# / DWG	DATE
15-06	JULY 2016
SCALE H: 1"=20' V: 1"=20'	SHEET 4 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_TESC.DWG
PLOT TIME: 8/16/2016 9:02 AM
USER NAME: TRAVIS FRANKLIN







GENERAL NOTES:

1. REFER TO THE TECHNICAL SPECIFICATIONS FOR LEGAL DESCRIPTIONS, EASEMENT EXHIBITS, AND CCTV REPORTS.
2. THE CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL THE WORK ACCESS PLAN. THE WORK ACCESS PLAN SHALL ADDRESS METHODS TO COMPLETE THE TRENCHLESS PIPE REPAIR AND REPLACEMENT WORK ON REDMOND-WOODINVILLE ROAD, THE TRENCHLESS PIPE REPAIR AND REPLACEMENT WORK ON THE STEEP SLOPE, AND THE ROUGHENED CHANNEL. THE WORK ACCESS PLAN SHALL INCLUDE THE BYPASS AND DEWATERING PLAN THAT ADDRESSES METHODS OF CONTROLLING WATER DURING CONSTRUCTION AND THE TRAFFIC CONTROL PLAN. ALL WORK REQUIRED TO COMPLETE THE PIPE REPLACEMENT AND REPAIRS BELOW REDMOND-WOODINVILLE ROAD SHALL BE LIMITED TO THE SHOULDER OF THE ROAD.
3. LOCATE EXISTING SPECIAL CHAMBER AND VERIFY THAT STORM PIPING MAY BE INSTALLED IN COMPLIANCE WITH ORIGINAL DESIGN AND INVERTS. SEE SHEET 7 FOR DESIGN.
4. REMOVE AND SALVAGE OR DISPOSE EXISTING STORM DRAIN PIPE WHERE NEW PIPE IS PROPOSED. WITH ENGINEER'S APPROVAL, CONTRACTOR MAY ABANDON THE EXISTING COLLAPSED PIPE WITHIN THE SPECIAL CHAMBER PROVIDED THAT THE EXISTING ALIGNMENT AND INVERTS REMAIN APPROXIMATELY THE SAME. BRACING BLOCKS SHALL BE USED TO PREVENT FLOTATION OR DISPLACEMENT.

(##) CONSTRUCTION NOTES:

1. ALL PIPE REPAIR AND REPLACEMENT WORK SHALL BE COMPLETED USING TRENCHLESS METHOD(S) PER THE WORK ACCESS PLAN PROVIDED BY THE CONTRACTOR.
2. PROVIDE CONTINUOUS PEDESTRIAN, BIKE LANE, AND TRAFFIC ACCESS ALONG CORRIDOR. BIKE LANE, SIDEWALK, AND ONE TRAVEL LANE IN EACH DIRECTION SHALL REMAIN OPEN AT ALL TIMES.
3. PROTECT EXISTING UTILITY, STRUCTURE, OR WALL. PROTECT CURB, GUTTER, AND SIDEWALK. RESTORE ANY PANELS CRACKED OR DAMAGED PER CITY OF REDMOND STANDARD DETAIL 303. STREET LIGHTS MUST REMAIN IN OPERATION AT ALL TIMES OR A TEMPORARY LIGHTING PLAN PROPOSED.
4. CONNECT TO EXISTING STRUCTURE.
5. COMPACT SUB-ANGULAR ROCK BACKFILL PER GEOTECHNICAL REPORT RECOMMENDATIONS.
6. LOCATE AND EXTEND THE EXISTING VITRIFIED CLAY PIPE WITH AND DISCHARGE TO THE APPROXIMATE LOCATION SHOWN. PIPE TO DAYLIGHT ABOVE THE ANGULAR BACKFILL.
7. TEMPORARILY RESTRICT STREET PARKING IN LOCATION SHOWN.
8. PLACE REMOVED TREES.
9. ADDITIONAL PIPE ANCHOR LOCATIONS PER MANUFACTURER RECOMMENDATIONS.
10. SPOILS TO BE REMOVED PRIOR TO SETTING UP STAGING AREA.

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LAURA RUPPERT
STATE OF WASHINGTON
43848
REGISTERED PROFESSIONAL ENGINEER

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CHECKED BY LCR		Bellevue, WA. 98004 Fax (425) 451-4901	

NO.	DATE	REVISION	BY

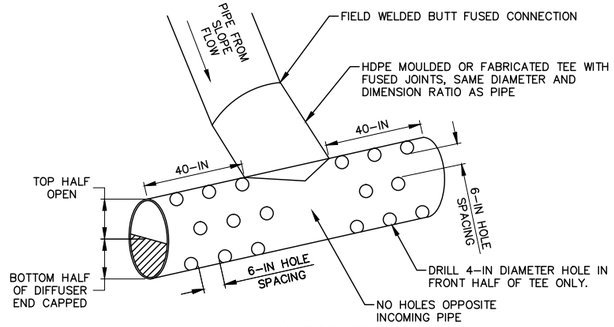
City of Redmond WASHINGTON

RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
OVERALL SITE PLAN AND PROFILE

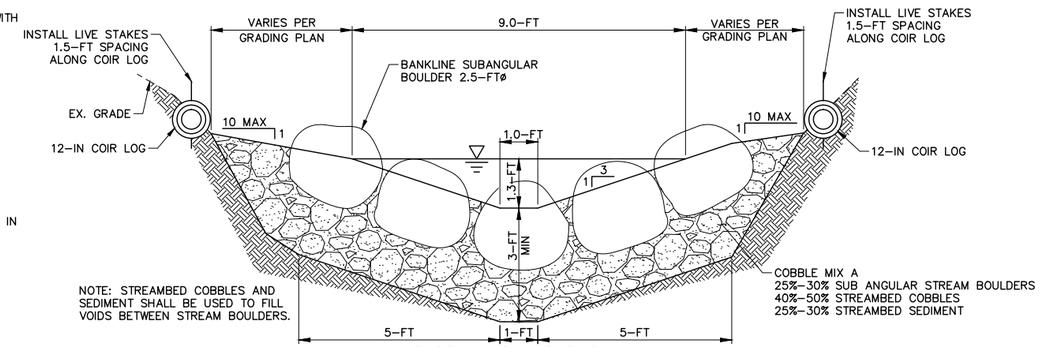
JOB# / DWG	DATE
15-06	JULY 2016
SCALE H: 1"=20' V: 1"=20'	SHEET 5 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_OVPP.DWG
PLOT TIME: 8/16/2016 9:02 AM
USER NAME:TRAVIS FRANKLIN

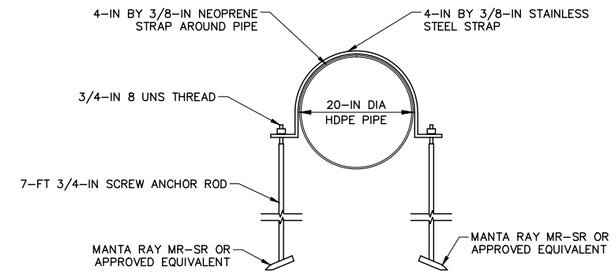
SEC. 02 , T. 25 N., R. 05 E., W.M.



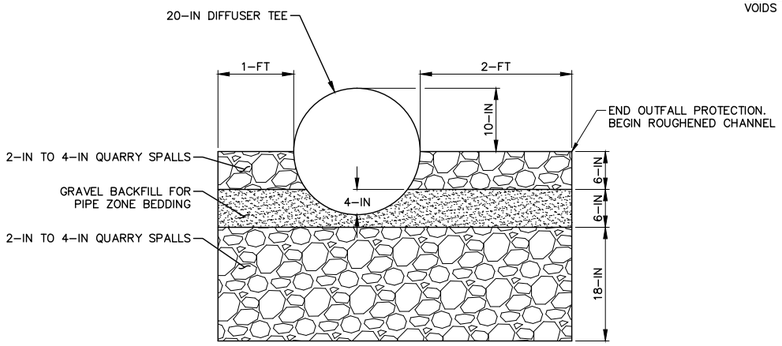
HOLE SPACING



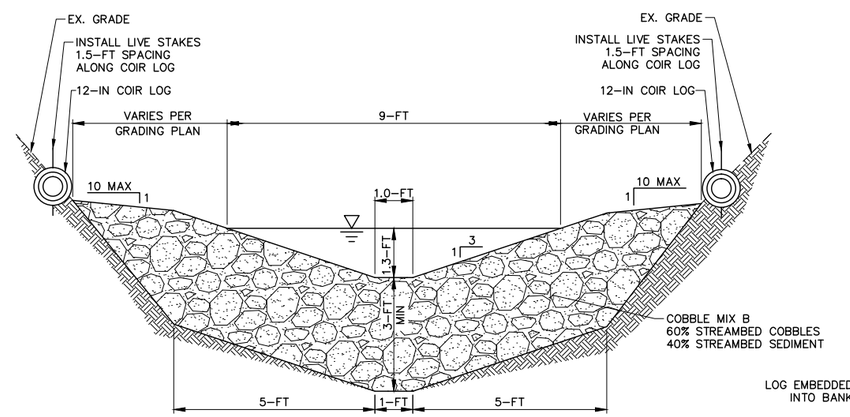
CASCADE ZONE - SECTION A



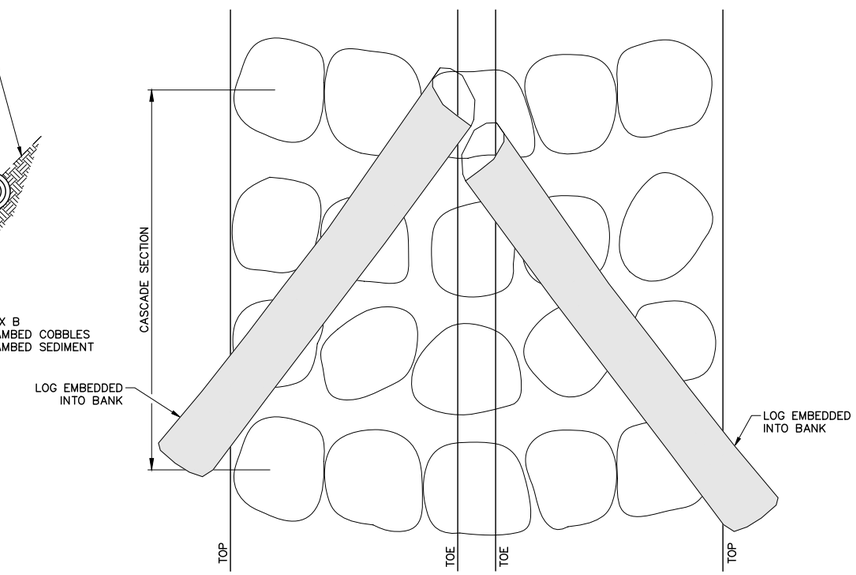
3/5 **PIPE ANCHOR**
N.T.S.



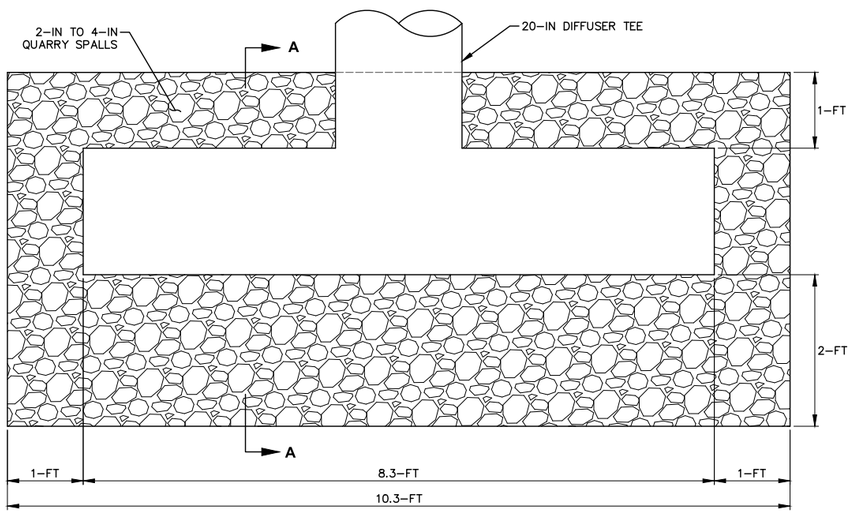
SECTION A-A



POOL ZONE - SECTION B

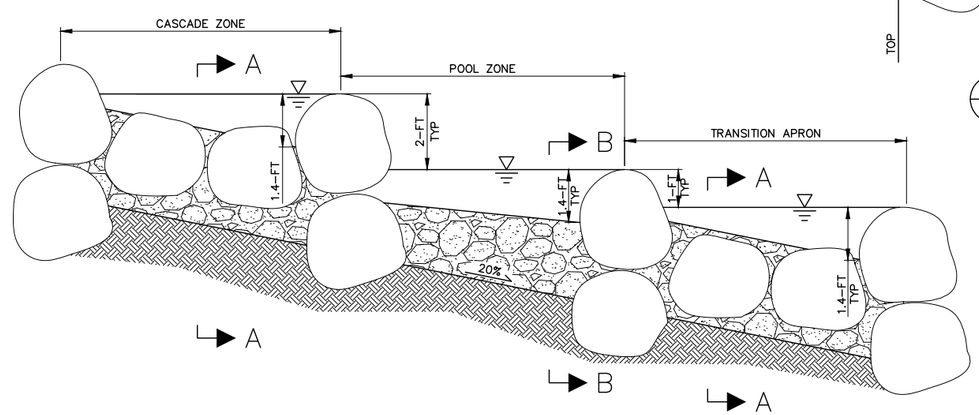


4/5 **LOG**
N.T.S.



PLAN

1/5 **DIFFUSER TEE**
N.T.S.



2/5 **ROUGHENED CHANNEL DETAIL**
N.T.S.

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LAURA RUPPERT STATE OF WASHINGTON 43848 REGISTERED PROFESSIONAL ENGINEER

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CHECKED BY LCR		Bellevue, WA. 98004 Fax (425) 451-4901	

NO.	DATE	REVISION	BY

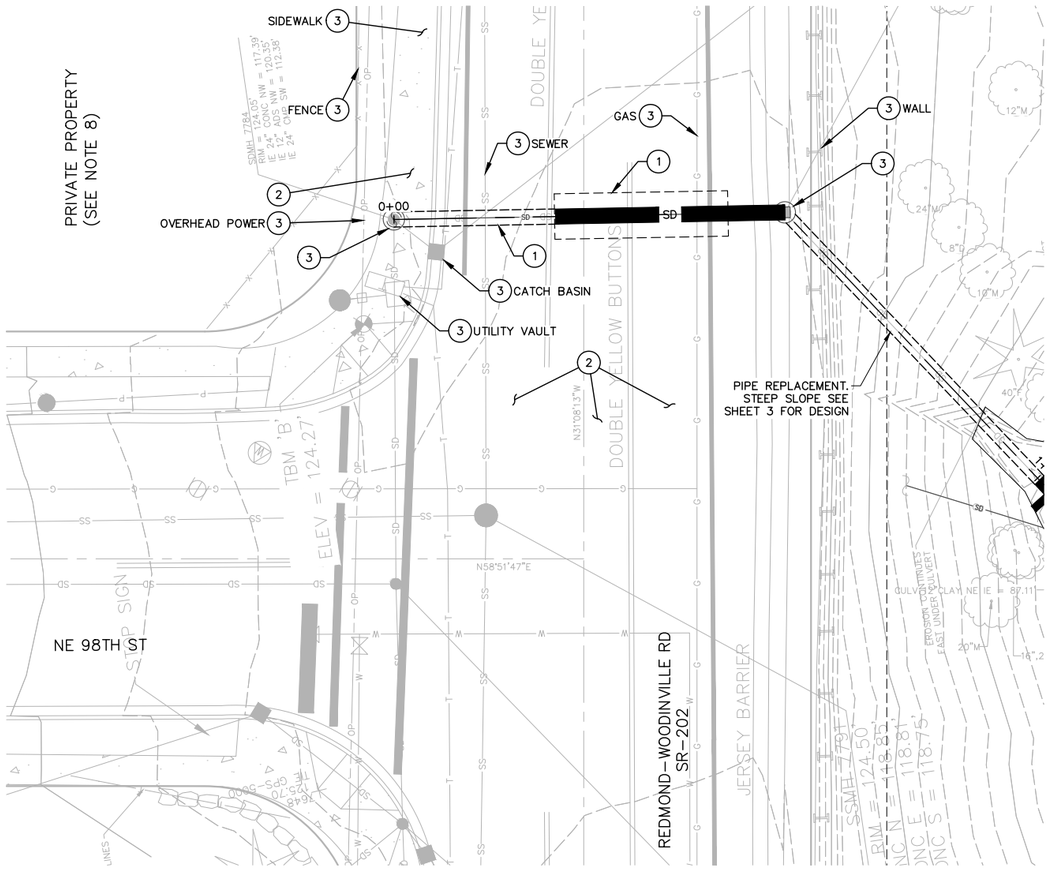
City of Redmond WASHINGTON

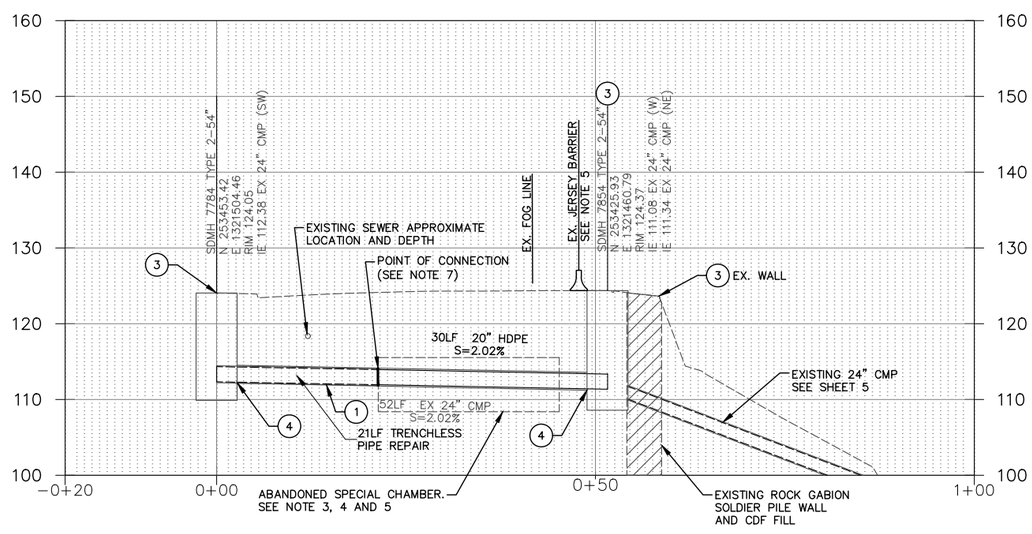
RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
STREAM SECTION AND DETAILS

JOB# / DWG	DATE
15-06	JULY 2016
SCALE H: 1"=20' V: N/A	SHEET 6 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_DTL.DWG
PLOT TIME: 8/16/2016 9:02 AM
USER NAME:TRAVIS FRANKLIN

SEC. 02 , T. 25 N., R. 05 E., W.M.





GENERAL NOTES:

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4. REMOVE AND SALVAGE OR DISPOSE EXISTING STORM DRAIN PIPE WHERE NEW PIPE IS PROPOSED. WITH ENGINEER'S APPROVAL, CONTRACTOR MAY ABANDON THE EXISTING COLLAPSED PIPE WITHIN THE SPECIAL CHAMBER PROVIDED THAT THE EXISTING ALIGNMENT AND INVERTS REMAIN APPROXIMATELY THE SAME. BRACING BLOCKS SHALL BE USED TO PREVENT FLOTATION OR DISPLACEMENT DURING FILLING ACTIVITIES. FILL VOID IN SPECIAL CHAMBER WITH CDF.
5. UPON COMPLETION OF PIPE INSTALLATION CONTRACTOR SHALL PROVIDE CCTV OF NEW PIPE TO ENGINEER. PRIOR TO AND AFTER FILLING ACTIVITIES TO CONFIRM PIPE ALIGNMENT AND WATER TIGHTNESS.
6. ALL PIPE REPAIR AND REPLACEMENT WORK ON REDMOND-WOODINVILLE ROAD SHALL BE LIMITED TO THE SHOULDER OF THE ROAD. EXISTING CONCRETE BARRIER MAY BE RELOCATED TO THE SHOULDER LIMITS AS NEEDED FOR CONSTRUCTION AND STAGING.
7. CONTRACTOR SHALL PROVIDE CONTINUOUS PIPE SIZE AND MATERIAL AT POINT OF CONNECTION.
8. NO WORK SHALL BE PERFORMED ON PRIVATE PROPERTY.

(##) CONSTRUCTION NOTES:

1. ALL PIPE REPAIR AND REPLACEMENT WORK SHALL BE COMPLETED USING TRENCHLESS METHOD(S) PER THE WORK ACCESS PLAN PROVIDED BY THE CONTRACTOR.
2. PROVIDE CONTINUOUS PEDESTRIAN, BIKE LANE, AND TRAFFIC ACCESS ALONG CORRIDOR.
3. PROTECT EXISTING UTILITY, STRUCTURE, OR WALL.
4. CONNECT TO EXISTING STRUCTURE.

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Know what's below.
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LAURA RUPPERT
STATE OF WASHINGTON
43848
REGISTERED
PROFESSIONAL ENGINEER

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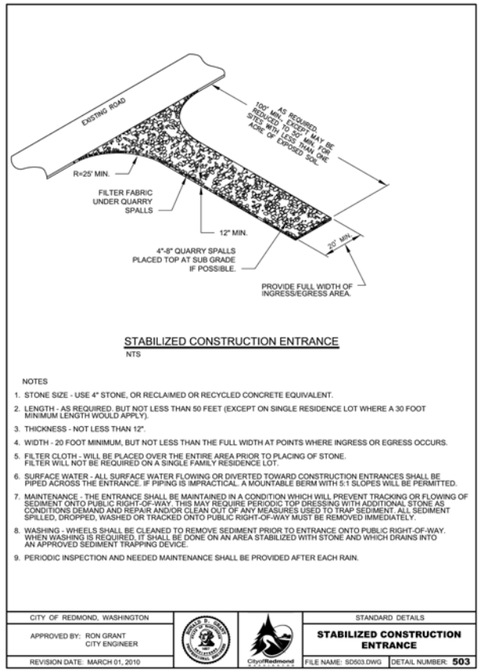
DESIGNED BY AGR DRAWN BY TNF CHECKED BY LCR	OSBORN CONSULTING INCORPORATED	OSBORN CONSULTING, INC. 1800 112th Ave. NE, Suite 220E Ph (425) 451-4009 Bellevue, WA. 98004 Fax (425) 451-4901	NO. / DATE / REVISION / BY	City of Redmond WASHINGTON	RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST CITY OF REDMOND SPECIAL CHAMBER PLAN AND PROFILE

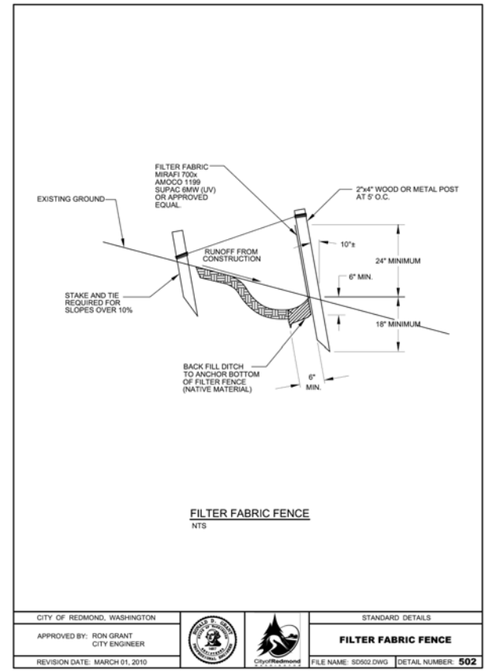
JOB# / DWG: 15-06 | DATE: JULY 2016 | SCALE: H: 1"=10' V: 1"=10' | SHEET 7 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_SCPP.DWG
PLOT TIME: 8/16/2016 9:03 AM
USER NAME:TRAVIS FRANKLIN

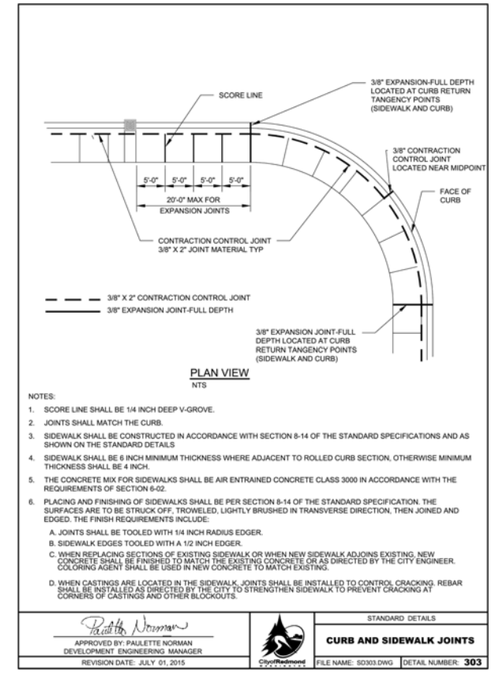
SEC. 02 , T. 25 N., R. 05 E., W.M.



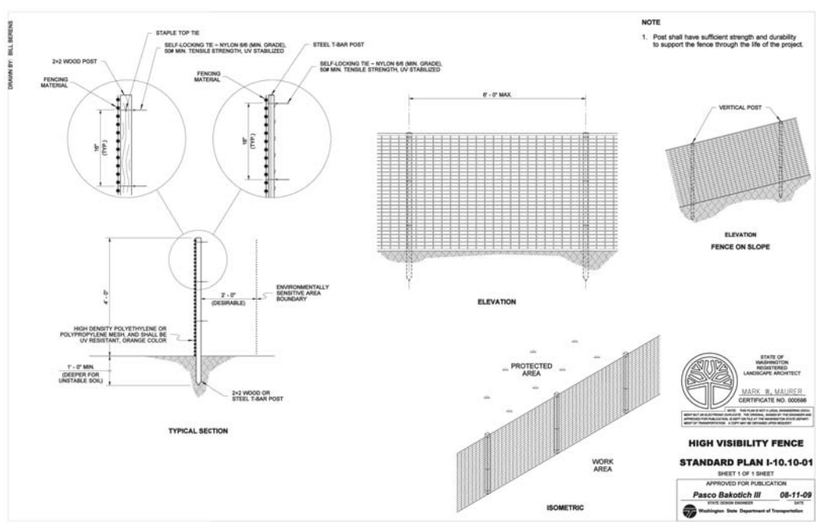
1/4 **STABILIZED CONSTRUCTION ENTRANCE**
N.T.S.



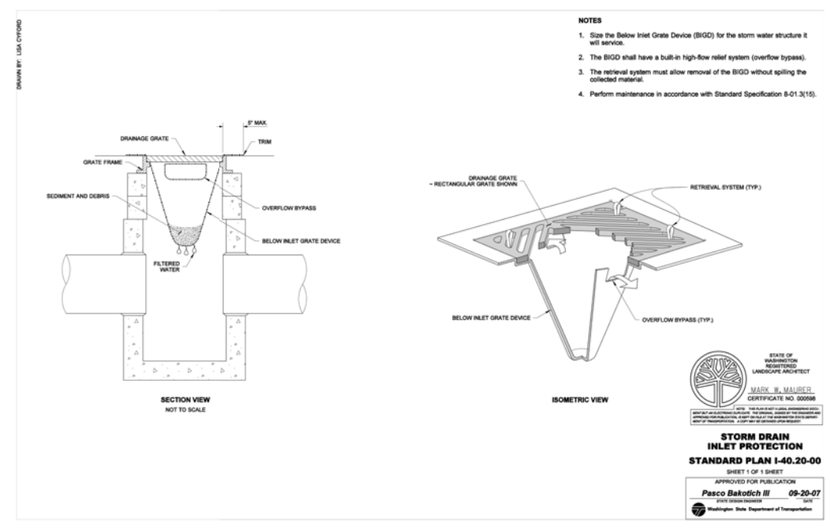
2/4 **FILTER FABRIC FENCE**
N.T.S.



5/4 **CURB AND SIDEWALK JOINTS**
N.T.S.



3/4 **HIGH VISIBILITY FENCE**
N.T.S.



4/4 **STORM DRAIN INLET PROTECTION**
N.T.S.

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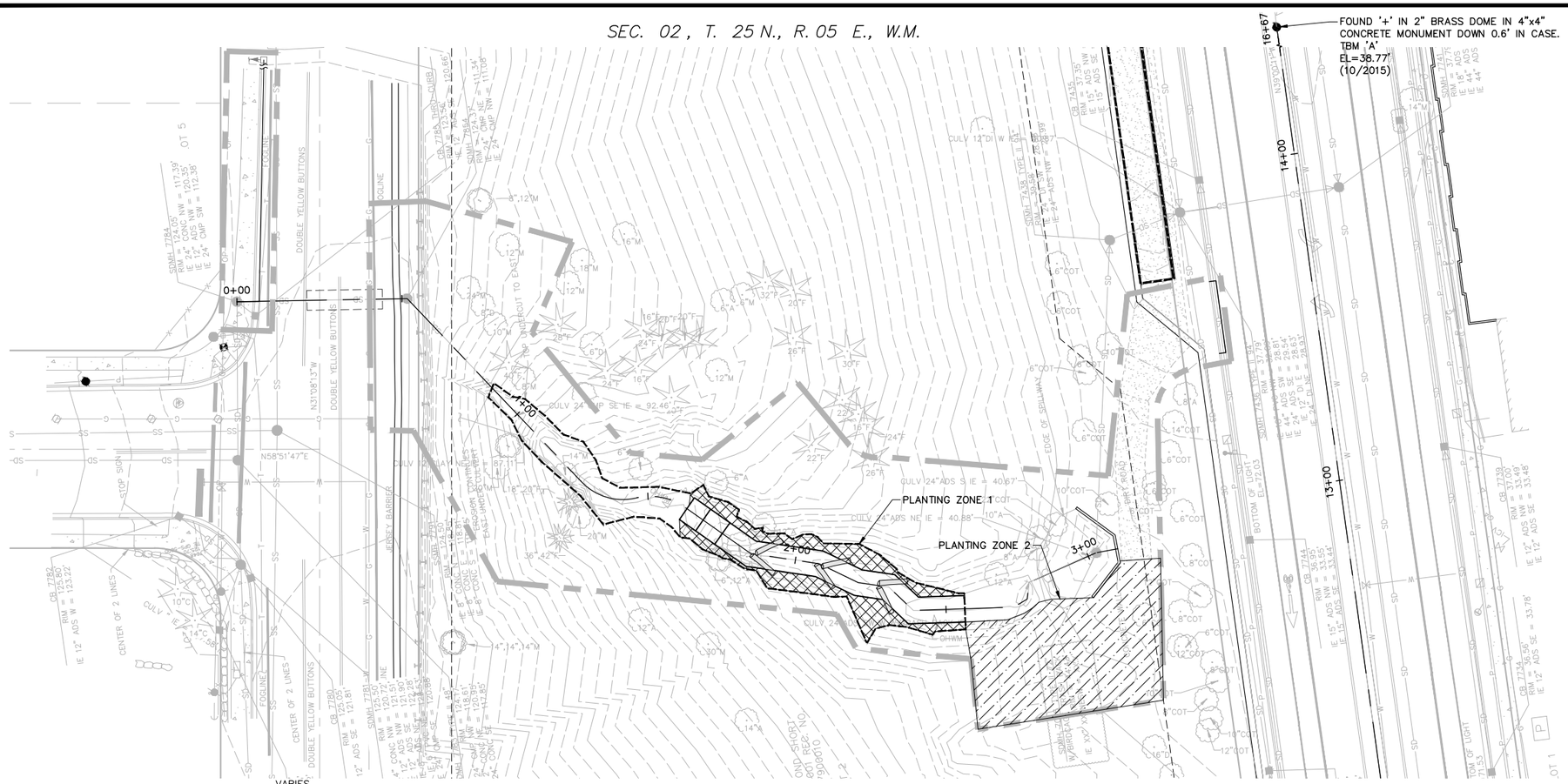
DRAWN BY TNF		1800 112th Ave. NE, Suite 220E Ph (425) 451-4009				
CHECKED BY LCR		Bellevue, WA. 98004 Fax (425) 451-4901				

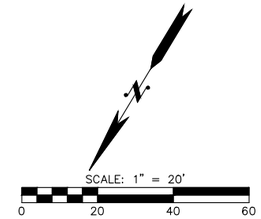
City of Redmond WASHINGTON

RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
STANDARD DETAILS

JOB# / DWG 15-06
DATE JULY 2016
SCALE H: 1"=20' V: N/A
SHEET 8 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_DTL.DWG
PLOT TIME: 8/16/2016 9:03 AM
USER NAME:TRAVIS FRANKLIN





GENERAL NOTES:

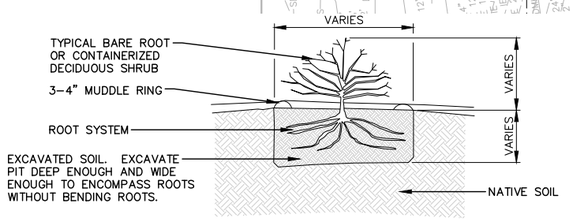
1. PLANTS LOCATED ON PLAN ARE SCHEMATIC AND MAY NEED ADJUSTMENT TO MEET ACTUAL FIELD CONDITIONS. WHEN A CONFLICT WITH FIELD CONDITION IS APPARENT, CONSULT WITH THE BIOLOGIST.
2. REMOVE ENGLISH IVY, HIMALAYAN BLACKBERRY, YELLOW IRIS, HOLLY, AND OTHER NON–NATIVE VEGETATION FROM PLANTING ZONES.
3. PLANT SPECIES PER PLANTING SCHEDULE. OFFSETTING PLANTS FORM EXISTING VEGETATION IS APPROPRIATE PRIORITIZING IN AREAS THAT HAD INVASIVE REMOVED.

ZONE 1
AREA: 675 SQ FT

ZONE 2
AREA: 2,120 SQ FT

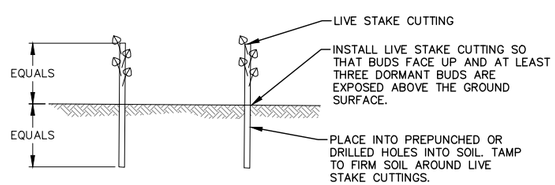
PLANTING MATERIAL LIST

PLANT	SCIENTIFIC NAME	MINIMUM HEIGHT	SPACING	ZONE 1	ZONE 2
TREES					
RED ALDER	ALNUS RUBRA	18"	4'		11
DOUGLAS FIR	PSEUDOTSUGA MENZIESII	18"	4'		11
WESTERN RED CEDAR	THUJA PLICATA	18"	4'		11
PACIFIC WILLOW	SALIX LUCIDA	36"	4'	6	
SCOULER'S WILLOW	SALIX SCOULERIANA	36"	4'	5	
TOTAL				11	33
SHRUBS					
BLACK TWINBERRY	LONICERA INVOLUCRATA	12"	4'	11	
SALMONBERRY	RUBUS SPECTABILIS	12"	4'	11	
REDOSIER DOGWOOD	CORNUS SERICEA	12"	4'	11	
SNOWBERRY	SYMPHORICARPOS ALBUS	12"	4'		25
INDIAN PLUM	OEMLERIA CERASIFORMIS	12"	4'		25
VINE MAPLE	ACER CIRCINATUM	12"	4'		25
SWORD FERN	POLYSTICHUM MUNITUM	12"	4'		25
TOTAL				33	100
TOTAL				44	133



BARE ROOT OR CONTAINERIZED SHRUB DETAIL

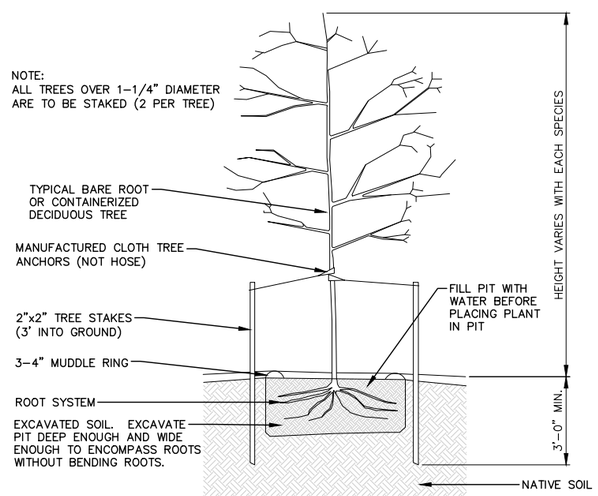
N.T.S.



NOTE:
LIVE STAKE CUTTING SHALL BE A MINIMUM 36 INCHES IN LENGTH.

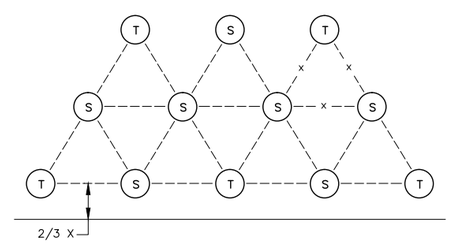
LIVE STAKE INSTALLATION

N.T.S.



BARE ROOT OR CONTAINERIZED TREE DETAIL

N.T.S.



NOTE:
GROUP LIKE SHRUBS IN GROUPS OF 3 TO 5.
TREES SHOULD NOT BE PLACED NEXT TO EACH OTHER.

TYPICAL PLANT SPACING

X = PLANT SPACING (SEE PLANTING PLAN)

(S) = SHRUB

(T) = TREE

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LAURA RUPPERT
STATE OF WASHINGTON
43848
REGISTERED
PROFESSIONAL ENGINEER

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DRAWN BY TNF
CHECKED BY LCR

OSBORN CONSULTING INCORPORATED

OSBORN CONSULTING, INC.
1800 112th Ave. NE, Suite 220E Ph (425) 451–4009
Bellevue, WA. 98004 Fax (425) 451–4901

NO.	DATE	REVISION	BY

City of Redmond WASHINGTON

RED-WOOD RD CHANNEL STABILIZATION AND CULVERT REPAIR AT NE 98TH ST
CITY OF REDMOND
PLANTING PLAN AND DETAILS

JOB# / DWG 15–06
DATE JULY 2016
SCALE H: 1"=20' V: 1"=20'
SHEET 9 of 9

FILE NAME: P:\10-120043 REDMOND ON-CALL 2013-2015\TASK ORDER #15-06 9800 RAVINE\3 CADD\SHEETS\P_10-120043-15-06_PLNT.DWG
PLOT TIME: 8/16/2016 9:04 AM
USER NAME:TRAVIS FRANKLIN

Appendix B - Site Photos

Photo 1. Upper portion of ravine with failed pipe, looking upstream.

Photo 2. Current lower end of pipe and undercut bank.

Photo 3. Erosion in ravine below pipe outflow.

Photo 4. Forest habitat on south side of ravine near pipe outlet.

Photo 5. Waterflow from pipe during rainstorm.

Photo 6. Lower third of ravine.

Photo 7. Birdcage at base of ravine, looking upstream.

Photo 8. Habitat at base of ravine, including site of temporary construction access (flat area behind birdcage) and 160th Ave NE (in background behind alders).

Photo 9. Vegetation on north side of ravine, looking uphill from birdcage structure.

Photo 10. Vegetation along lower end of ravine.

Photo 11. Retaining wall below project area and Wetland A; this wetland is 150 feet northwest of birdcage structure, viewed from 160th Avenue NE.

Photo 12. Sloughing on slope adjacent to ravine.

Appendix C - Wetland Determination Memo

Northwest
Environmental Consulting, LLC

3639 Palatine Avenue North
Seattle, Washington 98103
(206) 234-2520

TECHNICAL MEMORANDUM

To: **City of Redmond**

From: Emily Drew, Northwest Environmental Consulting, LLC

Date: November 1, 2015

Subject: **Wetland Determination**

Project: Red-Wood Road Channel Stabilization and Culvert Repair at NE 98th St

This memorandum summarizes site visits on September 25 and October 12, 2015 to the culvert and ravine between Redmond-Woodinville Road NE (Red-Wood Road; also State Route 202) and 160th Avenue NE, at Red-Wood Road's intersection with NE 98th Street in Redmond, Washington (Figure 1). The ravine contains a failed 24-inch CMP pipe, erosion, and sediment deposition, and the City of Redmond is assessing the current concerns and possible solutions. The project is in Section 02, Township 25N, Range 05E.

The site visit was conducted to investigate the potential presence of wetlands flanking the ravine.

Methods

Northwest Environmental Consulting (NWEC) biologist Emily Drew reviewed the relevant National Wetland Inventory (NWI) maps and the U.S. Department of Agriculture (USDA) Soil Survey, King County Area Washington to see whether these sources indicated the presence of wetlands or hydric soils at the site. NWEC then visited the site to walk the ravine between the upstream culvert and the birdcage structure downstream, as well as portions of the slope within 200 feet of the ravine.

The wetland determination used the "Routine Method" described in the Washington State Wetlands Identification and Delineation Manual (Ecology 1997), the Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987), and the Western Mountains, Valleys and Coast Region Interim Regional Supplement to the Corps of Engineers Delineation Manual (U.S. Army Corps of Engineers 2008).

Results

Document Review

The NWI map for the area does not indicate wetlands between Redwood Road and 160th at the NE 98th location (Figure 2). NWI maps a large area west of 160th as palustrine emergent seasonally flooded wetland; this wetland no longer exists. The location now contains the housing units and properties directly west of 160th, the 160th street itself, and a strip of land east of the road at the base of the ravine's slope below the birdcage structure. This wetland appears to have been mapped prior to the development of the housing community.

The USDA Soil Survey for King County maps all soils around the ravine site as Alderwood gravelly sandy loam, 15-30 percent slopes (Figure 3). The Alderwood series is made up of moderately well drained soils, which are considered upland soils. Soils west of 160th are mapped as Snohomish silt loam, thick surface variant.

Site Description

The ravine below Redwood Road is a narrow gulch descending through fairly steep terrain. Stormwater has eroded the channel down to the hardpan along the banks (Photo 1). At the base of the ravine, the slope eases and water is collected into a culvert through a bird-cage structure uphill of NE 160th Street. The steep slope and up- and downstream structures make fish use unlikely.

The riparian community along the stream consists of a red alder (*Alnus rubra*), bigleaf maple (*Acer macrophyllum*) and Douglas-fir (*Psuedotsuga menzeisii)* canopy. Shrubs include thick coverage of Himalayan blackberry (*Rubus armeniacus*), especially along the lower half of the ravine, growing directly adjacent to the stream and covering nearby slopes. Also present are Indian plum (*Oemleria cerasiformis*) growing along the eroded areas along the stream (with many dying individuals where erosion has recently occurred), salmonberry (*Rubus spectabilis*), and trailing blackberry (*Rubus ursinus*). One patch of willows (Salix sp.) is present on the north slope of the lower half of the ravine. The herb layer is sparse, mostly consisting of sword fern (*Polystichum munitum*) growing right up to the eroded sections along the stream, and small patches of reed canarygrass (*Phalaris arundinaceae*).

An area northwest of the ravine, at the base of the slope, contains a small (approximately 30 by 20 foot) patch of reed canarygrass and cattails (*Typha latifolia*).

Wetland Test Plots

Two test-plots (TP-1 and TP-2) were established along the ravine during the site visits, at small benches above the stream on the north side, where facultative wetland plant species (reed canarygrass and willows) were present. NWEC excavated a test-pit in each area.

- TP-1 is not in a wetland. Though a facultative wetland plant species (reed canarygrass, FACW) is present in a small 10 by 10-foot patch, most other dominant species present are facultative upland species. Wetland hydrology is not present, aside from the geomorphic position of the reed canarygrass on a small bench below a steeper slope. Hydric soils are also not present. The test pit contained no water or saturation during the survey, and contained gravelly sandy loam to at least 13 inches. See photos 2, 3 and 4.
- TP-2 is not in a wetland. The plot contains hydrophytic vegetation (dominant willow trees) though it is primarily dominated by a thick cover of a facultative upland species (Himalayan blackberry). Wetland hydrology is not present, aside from the geomorphic position of the reed canarygrass on a small bench below a steeper slope. Hydric soils are also not present. The test pit contained no water or saturation, and contained gravelly sandy loam to at least 13 inches. See photos 5, 6 and 7.

NWEC also established two test plots in and near the patch of reed canarygrass and cattails northwest of the ravine, as cattails are a wetland obligate species. The first test plot (TP-3) was placed in the center of the cattail patch. The second (TP-4) was placed midway between

the cattail patch and the nearest point of the stream (at the ravine's birdcage structure and near TP-2).

- TP-3 is in a wetland. The plot contains hydrophytic vegetation (dominant reed canarygrass and obligate wetland plants such as cattails, and purple loosestrife). Non-obligate species (red alder and cherry trees) rooted in the wetland area appear to be stressed. Wetland hydrology is present (at the time of the site visit, soils were saturated). Water appears to seep from the bottom of the slope and pool at the retaining wall built east of 160th, at this location. Hydric soils are also present (histosols in the form of muck). Due to the well-developed soils, this wetland was likely present prior to development of 160th Street and the local housing.
- TP-4 is not in a wetland. The plot contains hydrophytic vegetation (reed canarygrass and a partial canopy of willows), though facultative upland species such as bitter cherry and Himalayan blackberry also dominate the site. Wetland hydrology is not present. Hydric soils are also not present.

Wetland Categorization and Regulations

NWEC categorized the wetland northwest of the ravine as Category III according to the Washington State Department of Ecology's Western Washington wetland rating system (Ecology 2006). Based on King County municipal code (21A.24.325), this wetland would require a 75-foot buffer based on its Category III rating, rating score of 39 points, and presence within the King County Urban Growth Area. The estimated border of this wetland is approximately 150 feet (50 meters) from the nearest point of the ravine's stream (at the birdcage). The wetland's edge was estimated based on the results of Test Plot 4 and the distribution of upland vegetation (thick Himalayan Blackberry). See attached wetland determination datasheets.

Conclusion

The small benches on the slopes above the ravine are not wetlands, as they lack dominant hydric soils and wetland hydrology other than geomorphic position. Upland vegetation at the site grows directly adjacent to the stream itself.

The small, approximately 600-square-foot wetland northwest of the ravine is not hydraulically connected to the ravine's stream. The wetland is about 150 feet from the birdcage structure, and requires a 75-foot buffer. Restoration work in the ravine will involve approach from the south, and should not affect the wetland or its buffer. Should restoration require approach from the north or northwest along 160th Avenue NE, this wetland should be precisely delineated and further permitting and mitigation could be required.

Works Cited

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

U.S. Army Corps of Engineers, 2008. Western Mountains, Valleys and Coast Region Interim Regional Supplement to the Corps of Engineers Delineation Manual. Report ERDC/EL TR-08-13. April.

USDA Soil Conservation Service (SCS). 2016. Survey of King County Area Washington.

Washington Department of Ecology, 1997. Washington State Wetlands Identification and Delineation Manual. Ecology Publication 96-94.

Washington State Department of Ecology, 2006. Wetland Rating Form – Western Washington. July 2006.

Figures

U.S. Fish and Wildlife Servic

National Wetlands Inventory

Vicinity of 160th St Culvert

Sep 25, 2015

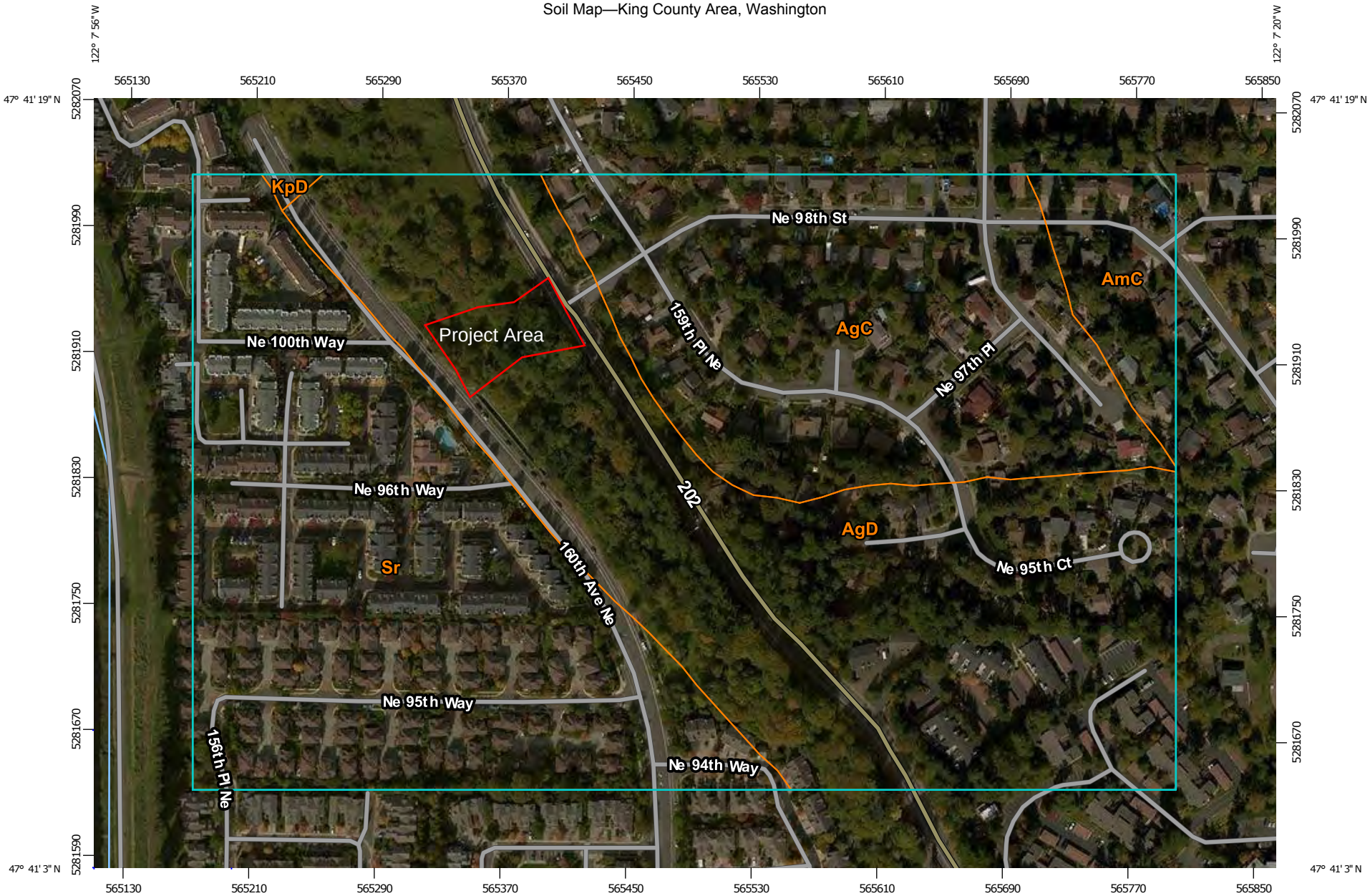
Wetlands

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

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

User Remarks:

Figure 1 - NWI Wetland Map



Map Scale: 1:3,440 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

Figure 2 - Soils Map

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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: http://websoilsurvey.nrcs.usda.gov
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: King County Area, Washington
Survey Area Data: Version 10, Sep 30, 2014

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

Date(s) aerial images were photographed: Aug 31, 2013—Oct 6, 2013

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.

Figure 2 - Soils Map

Map Unit Legend

King County Area, Washington (WA633)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes	14.6	24.1%
AgD	Alderwood gravelly sandy loam, 15 to 30 percent slopes	23.5	38.7%
AmC	Arents, Alderwood material, 6 to 15 percent slopes	2.5	4.2%
KpD	Kitsap silt loam, 15 to 30 percent slopes	0.1	0.2%
Sr	Snohomish silt loam, thick surface variant	20.0	32.9%
Totals for Area of Interest		**60.7**	**100.0%**

Figure 2 - Soils Map

Site Photos

Photo 1. Test Plot 1

Photo 1. Vegetation on north side of ravine, looking uphill from birdcage structure. Test Plot 2 is below willow tree in middle of photo.

Photo 3. Vegetation along lower end of ravine at Test Plot 2.

Photo 4. Wetland A (and test plot 3 location).

Wetland Determination Forms

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

Project/Site: Redwood culvert at NE 98th St City/County: Redmond, King Co. Sampling Date: Sept 25, 2015
Applicant/Owner: City of Redmond State: WA Sampling Point: TP1
Investigator(s): Emily Drew Section, Township, Range: S2, T25N, R5E
Landform (hillslope, terrace, etc.): Hillslope, ravine Local relief (concave, convex, none): Concave, slope Slope (%): 5-15%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: Alderwood gravelly sandy loam 15-30% slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x 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 x	**Is the Sampled Area within a Wetland?**	**Yes ___ No x**
Hydric Soil Present?	Yes ___	No x		
Wetland Hydrology Present?	Yes ___	No x		

Remarks: Small 10x10' bench with slight slope change from hill above , and patch of reed canarygrass

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	60	y	FAC
2. Pseudotsuga menzeisii	20	y	FACU
3. Acer macrophyllum	45	y	FACU
4.			
	125	= Total Cover	

Sapling/Shrub Stratum (Plot size: 30')			
1. Rubus armeniacus	75	y	FACU
2. Rubus spectabilis	5		FAC
3.			
4.			
5.			
	80	= Total Cover	

Herb Stratum (Plot size: 10')			
1. Polystichum munitum	15	Y	FACU
2. PHalaris arundinacea	45	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	60	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1. Rubus ursinus	15	Y	FACU
2.			
	15	= Total Cover	

% Bare Ground in Herb Stratum 10%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	8	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	37	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	45	x 2 =	90
FAC species	65	x 3 =	195
FACU species	170	x 4 =	680
UPL species		x 5 =	
Column Totals:	280 (A)		965 (B)

Prevalence Index = B/A = 3.5

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No x

Remarks: Sword ferns grow scattered throughout the grass patch

SOIL

Sampling Point:

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 %	Type[1]	Loc[2]	Texture	Remarks
0-1”								Surface detritus
1-13”	7.5YR	100	-	-	-	-	Sandy loam	Contained cobbles

[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** x

Remarks: Soil is very dry despite recent rains

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

Wetland Hydrology Present? **Yes** ___ **No** x

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

Remarks: Only hydrology indicator (secondary) present is position on slight step below steeper slope

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

Project/Site: Redwood culvert at NE 98th St City/County: Redmond, King Co. Sampling Date: Sept 25, 2015
Applicant/Owner: City of Redmond State: WA Sampling Point: TP2
Investigator(s): Emily Drew Section, Township, Range: S2, T25N, R5E
Landform (hillslope, terrace, etc.): Hillslope, ravine Local relief (concave, convex, none): slope Slope (%): 5-15%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: Alderwood gravelly sandy loam 15-30% slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x 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	x	No	
Hydric Soil Present?	Yes		No	x
Wetland Hydrology Present?	Yes		No	x

Is the Sampled Area within a Wetland? **Yes** ___ **No** x

Remarks: Slope to N of lower end of ravine, with willows present and small benches present on ground under willows

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	15	y	FAC
2. Salix sp.	45	y	FACW
3.			
4.			
	60	= Total Cover	

Sapling/Shrub Stratum (Plot size: 30')			
1. Rubus armeniacus	95	y	FACU
2.			
3.			
4.			
5.			
	95	= Total Cover	

Herb Stratum (Plot size: 10')			
1. Epilobium ciliatum.	5		FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	2	(A)
Total Number of Dominant Species Across All Strata:	3	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	66	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species	45	x 2 =	90
FAC species	15	x 3 =	45
FACU species	95	x 4 =	380
UPL species		x 5 =	
Column Totals:	170 (A)		515 (B)

Prevalence Index = B/A = 3.0

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- x 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** x **No** ___

Remarks: Blackberry is thick at ground and waist-high level, including under willow canopy and around willow stems

SOIL

Sampling Point: TP2

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 %	Type[1]	Loc[2]	Texture	Remarks
0-12”	7.5YR	100	-	-	-	-	Sandy loam	Contained cobbles

[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** x

Remarks: Soil is very dry despite recent rains

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)
x 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 x Depth (inches): _____
Water Table Present? Yes ___ No x Depth (inches): _____
Saturation Present? (includes capillary fringe) Yes ___ No x Depth (inches): _____

Wetland Hydrology Present? **Yes** ___ **No** x

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

Remarks: Only hydrology indicator (secondary) present is position on slight step below steeper slope

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

Project/Site: Redwood culvert at NE 98th St City/County: Redmond, King Co. Sampling Date: Sept 25, 2015
Applicant/Owner: City of Redmond State: WA Sampling Point: TP3
Investigator(s): Emily Drew Section, Township, Range: S2, T25N, R5E
Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): slope-concave Slope (%): 0-5%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: Alderwood gravelly sandy loam 15-30% slopes NWI classification: PEMC
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x 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	x	No	
Hydric Soil Present?	Yes	x	No	
Wetland Hydrology Present?	Yes	x	No	

Is the Sampled Area within a Wetland? Yes x No ___

Remarks: Site is east of 160th next to sidewalk and 3' retaining wall.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	80	Y	FAC
2. Prunus emarginata	10	Y	FACU
3.			
4.			
	90	= Total Cover	

Sapling/Shrub Stratum (Plot size: 30')			
1. Rubus armeniacus	15	Y	FACU
2.			
3.			
4.			
5.			
	15	= Total Cover	

Herb Stratum (Plot size: 10')			
1. Phalaris arundinacea	95	Y	FACW
2. Equisetum sp. (arvense)	5	Y	FAC
3. Typha latifolia	10	Y	OBL
4. Lythrum salicaria	5	Y	OBL
5. Pteridium aquilinum	1	N	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	116	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	5	(A)
Total Number of Dominant Species Across All Strata:	7	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	71	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	15	x 1 =	15
FACW species	95	x 2 =	190
FAC species	85	x 3 =	255
FACU species	26	x 4 =	104
UPL species	0	x 5 =	0
Column Totals:	221 (A)		564 (B)

Prevalence Index = B/A = 2.5

Hydrophytic Vegetation Indicators:

- x 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- x 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Purple loosestrife on site are dead (possibly from weed treatments). Blackberries are along outskirts of wetland and may reflect transition to nonwetland conditions. Alder and cherry are single trees that appear stressed possibly due to changed hydrology after installation of the retaining wall and 160th Street.

SOIL

Sampling Point: TP3

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 %	Type[1]	Loc[2]	Texture	Remarks
0-24”	10YR 2/2	100					Muck	Saturated

[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.)

- x 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** x **No** ___

Remarks: Muck may extend deeper than 24”. All soil was saturated during color test.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- x High Water Table (A2)
- x 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)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes	___	No	x	Depth (inches): ___
Water Table Present?	Yes	x	No	___	Depth (inches): 8”
Saturation Present? (includes capillary fringe)	Yes	x	No	___	Depth (inches): Surface

Wetland Hydrology Present? **Yes** x **No** ___

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

Remarks: Wetland is at base of slope against a retaining wall that blocks groundwater flow.

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

Project/Site: Redwood culvert at NE 98th St City/County: Redmond, King Co. Sampling Date: Sept 25, 2015
Applicant/Owner: City of Redmond State: WA Sampling Point: TP4
Investigator(s): Emily Drew Section, Township, Range: S2, T25N, R5E
Landform (hillslope, terrace, etc.): Hillslope, ravine Local relief (concave, convex, none): slope Slope (%): 5-15%
Subregion (LRR): Lat: Long: Datum:
Soil Map Unit Name: Alderwood gravelly sandy loam 15-30% slopes NWI classification: None
Are climatic / hydrologic conditions on the site typical for this time of year? Yes x No ___ (If no, explain in Remarks.)
Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes x 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	x	No	
Hydric Soil Present?	Yes		No	x
Wetland Hydrology Present?	Yes		No	x

Is the Sampled Area within a Wetland? Yes ___ No x

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	50	Y	FAC
2. Salix lucida	30	Y	FACW
3. Prunus emarginata	30	Y	FACU
4.			
	110	= Total Cover	

Sapling/Shrub Stratum (Plot size: 30')			
1. Rubus armeniacus	95	Y	FACU
2.			
3.			
4.			
5.			
	95	= Total Cover	

Herb Stratum (Plot size: 10')			
1. Phalaris arundinacea	25	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	25	= Total Cover	

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 25

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC:	3	(A)
Total Number of Dominant Species Across All Strata:	5	(B)
Percent of Dominant Species That Are OBL, FACW, or FAC:	60	(A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	55	x 2 =	110
FAC species	50	x 3 =	150
FACU species	125	x 4 =	500
UPL species	0	x 5 =	0
Column Totals:	230 (A)		760 (B)

Prevalence Index = B/A = 3.3

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- x 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes x No ___

Remarks: Blackberry is thick at ground and waist-high level. Site meets dominance but fails prevalence and will also fail FAC neutral test.

SOIL

Sampling Point: TP4

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 %	Type[1]	Loc[2]	Texture	Remarks
0-5”	10YR 3/2	100					sandy loam	
5-12”	10YR 4/3	95	5YR 4/6	5	C	M	sandy loam	Color may be from parent materials

[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** x

Remarks: Soil is very dry despite recent rains. No saturation. Mottles of redder material may be from parent material (gravels and stones within soil). Matrix does not meet hydric soil indicator of depleted matrix.

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 x Depth (inches): _____
Water Table Present? Yes ___ No x Depth (inches): _____
Saturation Present? (includes capillary fringe) Yes ___ No x Depth (inches): _____

Wetland Hydrology Present? **Yes** ___ **No** x

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

Remarks: No hydrology indicators. Test plot is at microsite with slightly shallower slope than surrounding areas.

Wetland Rating Form

Wetland name or number _____

WETLAND RATING FORM - WESTERN WASHINGTON

Version 2 - Updated July 2006 to increase accuracy and reproducibility among users

Name of wetland (if known): N/A Date of site visit: 10/12/15

Rated by Brad Theile Trained by Ecology? Yes ☑ No ☐ Date: 12/15/15

SEC: 2 TWNSHP: 25N RNGE: 5E Is S/T/R in Appendix D? Yes ☐ No ☑

Map of wetland unit: Figure 1 **Estimated size** **600 sq. ft.**

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I ☐ **II** ☐ **III** ☐ **IV** ☐

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score <30

Score for Water Quality Functions	22
Score for Hydrologic Functions	2
Score for Habitat Functions	15
TOTAL score for functions	**39**

Category based on SPECIAL CHARACTERISTICS of wetland

I ☐ **II** ☑ **Does not Apply** ☐

Final Category **(choose the "highest" category from above)** **III**

Check the appropriate type and class of wetland being rated.

Wetland Type	
Estuarine	☐
Natural Heritage Wetland	☐
Bog	☐
Mature Forest	☐
Old Growth Forest	☐
Coastal Lagoon	☐
Interdunal	☐
None of the above	☐

Wetland Class	
Depressional	☐
Riverine	☐
Lake-fringe	☐
Slope	☐
Flats	☐
Freshwater Tidal	☐
Check if multiple HGM classes are present	☐

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below, you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Special Protection (in addition to the protection recommended for its category)		YES	NO
SP1.	*Has the wetland been documented as a habitat for any federally listed Threatened or Endangered (T/E) plant or animal species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.	☐	☑
SP2.	*Has the wetland been documented as habitat for any state listed Threatened or Endangered plant or animal species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands.	☐	☑
SP3.	*Does the wetland contain individuals of Priority species listed by the WDFW for the state?*	☐	☑
SP4.	*Does the wetland have a local significance in addition to its functions?* For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.	☐	☑

To complete the next part of the data sheet, you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Classification of Vegetated Wetlands in Western Washington

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, indentify which hydrologic criteria in questions 1-7 apply and go to Question 8.

1. Are the water levels in the wetland usually controlled by tides (i.e., except during floods)?

☑ NO - go to 2 ☐ YES - the wetland class is **Tidal Fringe**

If YES, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ YES - **Freshwater Tidal Fringe** ☐ NO - **Saltwater Tidal Fringe (Estuarine)**

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 rated as an Estuarine wetland. Wetlands that were called estuarine in the first and second editions of the rating system are called Saltwater Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is being kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p. xx).

2. Is the topography within the wetland flat and precipitation is only source (>90%) of water to it?

☐ 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 wetland **meet both** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of open water (without any vegetation on the surface) where at least 20 acres (8 ha) are permanently inundated (ponded or flooded);

☐ At least 30% of the open water area is deeper than 6.6 feet (2 m)?

☐ NO - go to 4 ☐ YES - the wetland class is **Lake-fringe (Lacustrine Fringe)**

4. Does the wetland **meet all** of the following criteria?

☐ The wetland is on a slope (*slope can be very gradual*);

☐ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks.

☐ The water leaves the wetland **without being impounded**?
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 feet in diameter and less than 1 foot deep).*

☑ NO - go to 5 ☐ YES - the wetland class is **Slope**

5. Is the wetland in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river? The flooding should occur at least once every two years, on the average, to answer "yes." *The wetland can contain depressions that are filled with water when the river is not flooding.*

☑ NO - go to 6 ☐ YES - the wetland class is **Riverine**

6. Is the wetland in a topographic depression in which water ponds, or is saturated to the surface, at some time of 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 wetland located in a very flat area with no obvious depression and no stream or river running through it and providing water? The wetland seems to be maintained by higher ground water 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 seems to be difficult to classify. 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. Sometimes we find characteristics of several different hydrogeomorphic classes within one wetland boundary. Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within your wetland. 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 being rated. If the area of the second class is less than 10%, classify the wetland using the first class.

HGM Classes Within a Delineated Wetland Boundary	***Class to Use in Rating***	
Slope + Riverine	Riverine	☐
Slope + Depressional	Depressional	☑
Slope + Lake-fringe	Lake-fringe	☐
Depressional + Riverine along stream within boundary	Depressional	☐
Depressional + Lake-fringe	Depressional	☐
Saltwater Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics	☐

If you are unable still to determine which of the above criteria apply to your wetland, or you have more than 2 HGM classes within a wetland boundary, classify the wetland as **Depressional** for the rating.

D Depressional and Flats Wetlands		
WATER QUALITY FUNCTIONS - Indicators that wetland functions to improve water quality.		
D 1.	**Does the wetland have the <u>potential</u> to improve water quality? *(see p. 38)***	**Points**
D 1.1	Characteristics of surface water flows out of the wetland: ☐ Wetland is a depression with no surface water leaving it (no outlet) **Points = 3** ☑ Wetland has an intermittently flowing, or highly constricted permanently flowing outlet. **Points = 2** ☐ Wetland has an unconstricted, or slightly constricted, surface outlet. (permanently flowing) **Points = 1** ☐ Wetland is a flat depression (Q. 7 on key) or in the Flats class, with permenent surface outflow and no obvious natural outlet and/or outlet is a ditch. (If ditch is not flowing treat unit as "intermittently flowing). **Points = 1** Provide photo or drawing	2
D 1.2	The soil 2 inches below the surface (or duff layer) is clay or organic (use NRCS definitions): ☑ YES **Points = 4** ☐ NO **Points = 0**	4
D 1.3	Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class): ☑ Wetland has persistent, ungrazed vegetation >95% of area. **Points = 5** ☐ Wetland has persistent, ungrazed vegetation >1/2 of area. **Points = 3** ☐ Wetland has persistent, ungrazed vegetation >1/10 of area. **Points = 1** ☐ Wetland has persistent, ungrazed vegetation <1/10 of area **Points = 0** Map of Cowardin vegetation classes	5
D 1.4	Characteristics of seasonal ponding or inundation. *This is the area of the wetland that is ponded for at least 2 months, but dries out sometime during the year. Do not count the area that is permanently ponded. Estimate area as the average condition 5 out of 10 years.* ☐ Area seasonally ponded is >1/2 total area of wetland. **Points = 4** ☐ Area seasonally ponded is >1/4 total area of wetland. **Points = 2** ☑ Area seasonally ponded is <1/4 total area of wetland. **Points = 0** Map of hydroperiods	0
	Total for D 1 *Add the points in the boxes above*	11
D 2.	**Does the wetland have the <u>opportunity</u> to improve water quality? *(see p. 44)*** Answer YES if you know or believe there are pollutants in ground water or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes, or ground water downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants:* ☐ Grazing in the wetland or within 150 feet. ☐ Untreated stormwater discharges to wetland. ☐ Tilled fields or orchards within 150 feet of wetland. ☐ A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging. ☑ Residential, urban areas, golf courses are within 150 feet of wetland. ☐ Wetland is fed by ground water high in phosphorus or nitrogen. ☐ Other: _____ YES - multiplier is **2** NO - multiplier is **1**	Multiplier 2
TOTAL - Water Quality Functions	Multiply the score from D 1. by D 2. ***Add score to table on p. 1***	22

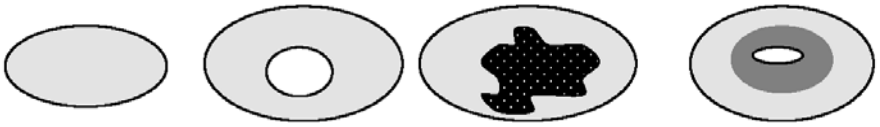
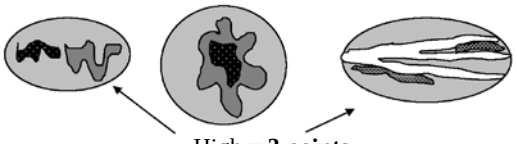
D Depressional and Flats Wetlands HYDROLOGIC FUNCTIONS - Indicators that wetland functions to reduce flooding/stream degradation.		**Points**
D 3.	**Does wetland have the <u>potential</u> to reduce flooding/erosion?** ***(see p. 46)***	
D 3.1	Characteristics of surface water flows out of the wetland: ☐ Wetland is a depression with no surface water leaving it (no outlet). **Points = 4** ☑ Wetland has an intermittently flowing, **OR** highly constricted permanently flowing outlet. **Points = 2** ☐ Wetland is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious outlet** and/or outlet is a man-made ditch. **Points = 1** ☐ Wetland has an unconstricted, or slightly constricted surface outlet (permenently flowing). **Points = 0**	2
D 3.2	Depth of storage during wet periods. *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part if dry.* ☐ Marks of ponding are 3 feet or more above the surface or bottom of outlet. **Points = 7** ☐ The wetland is a "headwater" wetland. **Points = 5** ☐ Marks of ponding between 2 feet to <3 feet from surface or bottom of outlet. **Points = 5** ☐ Marks are at least 0.5 feet to <2 feet from surface or bottom of outlet. **Points = 3** ☐ Wetland is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water. **Points = 1** ☑ Marks of ponding less than 0.5 feet. **Points = 0**	0
D 3.3	Contribution of wetland to storage in the watershed. *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland itself.* ☐ The area of the basin is <10 times the area of the wetland. **Points = 5** ☐ The area of the basin is 10 to 100 times the area of the wetland. **Points = 3** ☑ The area of the basin is >100 times the area of the wetland. **Points = 0** ☐ Wetland is in the **Flats** class (basin = wetland, by definition). **Points = 5**	0
Total for D 3	*Add the points in the boxes above*	2
D 4.	**Does wetland have the opportunity to reduce flooding/erosion?** ***(see p. 49)*** Answer YES if the wetland is in a location in the watershed where the flood storage, or reduction in water velocity, helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. Answer NO if the water coming into the wetland is controlled by a structure such as flood gate, tide gate, flap valve, reservoir, etc. OR you estimate that more than 90% of the water in the wetland is from ground water. *Note which of the following indicators of opportunity apply:* ☐ Wetland is in a headwater of a river or stream that has flooding problems. ☐ Wetland drains to a river or stream that has flooding problems. ☐ Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems. ☐ Other: _____ YES - multiplier is **2** NO - multiplier is **1**	Multiplier 1
TOTAL - Hydrologic Functions	Multiply the score from D 3. by D 4. ***Add score to table on p. 1***	2

These questions apply to wetlands of all HGM classes

HABITAT FUNCTIONS - Indicators that wetland functions to provide important habitat.

H 1.	**Does the wetland have the <u>potential</u> to provide habitat for many species?**	**Points**
H 1.1	<u>Vegetation structure</u> ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin). Size threshold for class is 1/4 acre or more than 10% of the area of the wetland if it is smaller than 2.5 acres.* ☐ Aquatic bed ☑ Emergent plants ☐ Scrub/shrub (areas where shrubs have >30% cover) ☑ Forested (areas where trees have >30% cover) ☐ Forested areas have 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) *Add the number of vegetation types that qualify. If you have:* 4 types or more **Points = 4** 3 types **Points = 2** 2 types **Points = 1** 1 type **Points = 0** Map of Cowardin classes	1
H 1.2	<u>Hydroperiods</u> ***(see p. 73)*** *Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland if less than 2.5 acres in size or 1/4 acre to count (see text for descriptions of hydroperiods).* ☐ Permanently flooded or inundated — 4 or more types present **Points = 3** ☐ Seasonally flooded or inundated — 3 types present **Points = 2** ☑ Occasionally flooded or inundated — 2 types present **Points = 1** ☑ Saturated only ☐ 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*** Map of hydroperiods	1
H 1.3	<u>Richness of Plant Species</u> ***(see p. 75)*** *Count the number of plant species in the wetland that cover at least 10 sq. ft. (different patches of the same species can be combined to meet the size threshold). 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** *List species below if you want to:* <5 species **Points = 0**	0

Total for page 2

		Points
H 1.4	Interspersion of Habitats ***(see p. 76)*** *Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1) or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.*  None = **0 points** Low = **1 point** Moderate = **2 points**  [riparian braided channels] High = **3 points** NOTE: If you have four or more vegetation types or three vegetation types and open water, the rating is always "high". **Use map of Cowardin classes**	1
H 1.5	Special Habitat Features ***(see p. 77)*** *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ☐ Large, downed, woody debris within the wetland (>4 inches in diameter and 6 feet long). ☐ Standing snags (diameter at the bottom >4 inches) in the wetland. ☐ Undercut banks are present for at least 6.6 feet (2 m) and/or overhanging vegetation extends at least 3.3 feet (1 m) over a stream (or ditch) in or contiguous with the wetland, for at least 33 feet (10 m). ☐ Stable steep banks of fine material that might be used by beaver/muskrat for denning (>30° slope) OR signs of recent beaver activity are present (*cut shrubs or trees that have not yet turned brown/gray*). ☐ At least 1/4 acre of thin-stemmed presistent vegetation 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 each stratum of plants.	0
	H 1. TOTAL Score - potential for providing habitat *Add the scores in the column above*	3

Comments:
Wetland vegetation is primarily reed canarygrass with a small patch of cattails and purple loosestrife. No woody debris, snags, or open water present.

H 2.	**Does the wetland have the opportunity to provide habitat for many species?**	**Points**
H 2.1	Buffers ***(see p. 80)*** *Choose the description that best represents condition of buffer of wetland. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* ☐ 100 m (330 feet) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within undisturbed part of buffer (*relatively undisturbed also means no grazing, no landscaping, no daily human use*). **Points = 5** ☐ 100 m (330 feet) of relatively undisturbed vegetated areas, rocky areas, or open water >50% of circumference. **Points = 4** ☐ 50 m (170 feet) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** ☐ 100 m (330 feet) of relatively undisturbed vegetated areas, rocky areas, or open water for >25% circumference. **Points = 3** ☐ 50 m (170 feet) of relatively undisturbed vegetated areas, rocky areas, or open water for >50% circumference. **Points = 3** **If buffer does not meet any of the criteria above:** ☐ No paved areas (except paved trails) or buildings within 25 m (80 feet) of wetland >95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** ☐ No paved areas or buildings within 50 m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** ☐ Heavy grazing in buffer. **Points = 1** ☐ Vegetated buffers are <2 m wide (6.6 feet) for more than 95% of the circumference (e.g., tilled fields, paving, basalt bedrock extend to edge of wetland). **Points = 0** ☐ Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	3
H 2.2 H 2.2.1	Corridors and Connections ***(see p. 81)*** Is the wetland part of a relatively undisturbed/unbroken vegetated corridor (riparian or upland) at least 150 feet wide, has at least 30% cover of shrubs, forest, or native undisturbed prairie, that connects to estuaries, other wetlands, or undisturbed uplands that are at least 250 acres in size? (*Dams in riparian corridors, heavily used gravel roads, and paved roads are considered breaks in the corridor.*) YES = **4 points** (*go to H 2.3*) NO = *go to H 2.2.2*	4
H 2.2.2	Is the wetland part of a relatively undisturbed/unbroken vegetated corridor (either riparian or upland) at least 50 feet wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands, or undisturbed uplands that are at least 25 acres in size **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = *go to H 2.2.3*	
H 2.2.3	Is the wetland: within 5 miles (8 km) of a brackish or salt water estuary **OR** within 3 miles of a large field or pasture (>40 acres) **OR** within 1 mile of a lake greater than 20 acres? YES = **1 point** NO = **0 points**	

Total for page 7

		Points
H 2.3	Near or Adjacent to Other Priority Habitats Listed by WDFW ***(see p. 82)*** Which of the following priority habitats are within 330 feet (100 m) of the wetland? NOTE: the connections do not have to be relatively undisturbed. These are WDFW definitions. Check with your local WDFW biologist is there are any questions. ☑ **Riparian**: Area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other. ☐ **Aspen stands**: Pure or mixed stands of aspen >0.8 ha (2 acres). ☐ **Cliffs**: Greater than 7.6 m (25 feet) high and occuring below 5,000 feet. ☐ **Old-growth 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 20 trees/ha (8/acre) >81 cm (32 inches) in diameter or >200 years of age. ☐ **Mature forests**: Stands with average diameters exceeding 53 cm (21 inches) dbh; crown cover may be <100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than found in old-growth; 80-200 years old west of Cascade crest. ☐ **Prairies**: Relatively undisturbed areas (indicated by dominance of native plants) where grasses/forbs form the natural climax plant community. ☐ **Talus**: Homogenous areas of rock rubble (average size 0.15 - 2.0 m [0.5 - 65 feet]), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs. ☐ **Caves**: Naturally occurring cavity, recess, void, or system of interconnected passages. ☐ **Oregon white oak**: Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is 25%. ☑ **Urban Natural Open Space**: A priority species resides within or is adjacent to the open space and uses it for breeding and/or regular feeding; and/or the open space functions as a corridor connecting other *priority habitats* , especially those otherwise isolated; and/or the open space is an isolated remnant of natural habitat >4 ha (10 acres) and is surrounded by urban development. ☐ **Estuary/estuary-like**: Deepwater tidal habitats & adjacent tidal wetlands, usually semi-enclosed by land but with open, partly obstructed, or sporadic access to open ocean; ocean water at least occasionally diluted by freshwater runoff from land. Salinity may be periodically increased above that of open ocean by evaporation. Along some low-energy coastlines, there is appreciable dilution of sea water. Estuarine habitat extends upstream and landward to where ocean-derived salts measure <0.5 ppt. during period of avg. annual low flow. Includes both estuaries and lagoons. ☐ **Marine/estuarine shorelines**: Include intertidal and subtidal zones of beaches; may also include backshore and adjacent components of the terrestrial landscape (e.g., cliffs, snags, mature trees, dunes, meadows) important to shoreline associated fish and wildlife and that contribute to shoreline function (e.g., sand/rock/log recruitment, nutrient contribution, erosion control). If wetland has: **3+** priority habitats = **4 points** **1** priority habitat = **1 point** **2** priority habitats = **3 points** No habitats = **0 points** Note: all vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4	3

		Points
H 2.4	Wetland Landscape ***(see p. 84)*** Choose the **one** description of the landscape around the wetland that best fits. ☐ There are at least 3 other wetlands within 1/2 mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development). **Points = 5** ☐ The wetland is Lake-fringe on a lake with little disturbance and there are 3 other Lake-fringe wetlands within 1/2 mile. **Points = 5** ☐ There are at least 3 other wetlands within 1/2 mile, BUT the connections between them are disturbed. **Points = 3** ☐ The wetland is Lake-fringe on a lake **with** disturbance, and there are 3 other Lake-fringe wetlands within 1/2 mile. **Points = 3** ☐ There is at least 1 wetland within 1/2 mile. **Points = 2** ☐ There are no wetlands within 1/2 mile. **Points = 0**	2
	H 2. TOTAL Score - opportunity for providing habitat *Add the scores in the column above*	12
Total Score for Habitat Functions - add the points for H 1, H2, and record the result on p. 1		15

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and choose the appropriate answers and Category.

Wetland Type *Check off any criteria that apply to the wetland. Check the appropriate Category when the appropriate criteria are met.*	**Category**
SC 1. Estuarine Wetlands *(see p. 86)* Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt. ☐ YES = *Go to SC 1.1* ☑ NO	
SC 1.1 Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park, or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ YES = **Category I** ☑ NO = *Go to SC 1.2*	
SC 1.2 Is the wetland at least 1 acre in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has <10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover >10% of the wetland, then the wetland should be given a dual rating (I/II). The area of *Spartina* would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of *Spartina* in determining the size threshold of 1 acre. ☐ At least 3/4 of the landward edge of the wetland has a 100 foot buffer of shrub, forest, or ungrazed or unmowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or continguous freshwater wetlands. ☐ YES = **Category I** ☑ NO = **Category II**	II

		Category
SC 2.	Natural Heritage Wetlands *(see p. 87)* Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland being rated in a Section/Township/Range that contains a Natural Heritage wetland? (This question is used to screen out most sites before you need to contact WNHP/DNR.) S/T/R information from Appendix D ☐ or accessed from WNHP/DNR web site ☐ ☐ YES - contact WNHP/DNR *(see p. 79)* and *go to SC 3.2* ☐ NO SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as a site with state Threatened or Endangered plant species? ☐ YES = **Category I** ☑ NO	
SC 3.	Bogs *(see p. 87)* Does the wetland (or part of the wetland) meet both the criteria for soils and vegetations in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer Yes, you will still need to rate the wetland based on its function.*** 1. Does wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic oils.) ☑ YES - *go to Q. 3* ☐ NO - *go to Q. 2* 2. Does the wetland have organic soils, either peats or mucks, that are <16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? ☐ YES - *go to Q. 3* ☐ NO - is not a bog for purpose of rating 3. Does wetland have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (>30% of total shrub and herbaceous cover consists of species in Table 3)? ☐ YES - is a bog for purpose of rating ☑ NO - *go to Q. 4* NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. 4. Is wetland forested (>30% cover) with sitka spruce, subalpine fir, western redcedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on bog species plant list in Table 3 as a significant component of the ground cover (*>30% coverage of total shrub/herbaceous cover*)? ☐ YES - **Category I** ☑ NO - is not a bog for purpose of rating	

		Category
SC 4.	Forested Wetlands ***(see p. 90)*** Does the wetland have at least 1 acre of forest that meets one of these criteria for the Department of Fish and Wildlife's forests as priority habitat? *If you answer Yes, you will still need to rate the wetland based on its functions.* ☐ **Old-growth forests**: (west of Cascade Crest) Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/acre (20/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. 200-year-old trees in wetlands will often have a smaller dbh because their growth rates are often smaller. The DFW criterion is an "OR" so old-growth forests do not necessarily have to have trees of this diameter. ☐ **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 - 200 years old OR have average diameters (dbh) exceeding 21 inches (53 cm); 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. ☐ YES = **Category I** ☑ NO	
SC 5.	Wetlands in Coastal Lagoons ***(see p. 91)*** Does the wetland meet all of the following criteria of a wtland in a coastal lagoon? ☐ The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks. ☐ The lagoon in which the wetland is located contains surface water that is saline or brackish (>.5 ppt) during most of the year in at leat a portion of the lagoon (*needs to be measured near the bottom*). ☐ YES = *go to SC 5.1* ☑ NO - not a wetland in a coastal lagoon SC 5.1 Does the wetland meet all of the following 3 conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of invasive plant species (see list of invasive species on p. 74). ☐ At least 3/4 of the landward edge of the wetland has a 100 foot buffer of shrub, forest, or ungrazed or unmowed grassland. ☐ The wetland is larger than 1/10 acre (4,350 square feet). ☐ YES = **Category I** ☑ NO = **Category II**	II

		Category
SC 6.	Interdunal Wetlands ***(see p. 93)*** Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ☐ YES - *go to SC 6.1* ☑ NO - not an interdunal wetland for rating ***If you answer Yes, you will still need to rate the wetland based on its functions.*** In practical terms, that means the following geographic areas: • Long Beach Peninsula - lands west of SR 103 • Grayland-Westport - lands west of SR 105 • Ocean Shores-Copalis - lands west of SR 1115 and SR 109. SC 6.1 Is wetland 1 acre or larger, or is it in a mosaic of wetlands that is 1 acre or larger? ☐ YES = **Category II** ☑ NO - *go to SC 6.2* SC 6.2 Is the wetland between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? ☐ YES = **Category III**	
Category of wetland based on Special Characteristics Choose the "highest" rating if wetland falls into several categories, and record on p. 1. If you answered NO for all types, enter "Not Applicable" on p. 1.		II