Drainage Report
Hunter Road Development

Submitted to
Vic Jansen
P.O. Box 57
Moses Lake, Washington 98837

February 2, 2024

Submitted by
Simpli Civil, LLC
1800 Rd K NE
Moses Lake, WA 98837
253.579.2212

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PROJECT ENGINEER'S CERTIFICATE

I hereby certify that this Drainage Report has been prepared by me or under my direct supervision and meets minimum standards of care and expertise which is usual and customary in this community for professional engineers. I understand that the Kittitas County does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

02.02.2024

Trav Story, PE

PROJECT OVERVIEW

Project Objective
Construction of roadway and irrigation system to serve single family lots.

Location
Site Address
Hunter Rd
Ellensburg, WA 98926

Parcel(s)
21465 - 21506 | Kittitas County
21508 - 21528 | Kittitas County
086433 | Kittitas County
076433 | Kittitas County
066433 | Kittitas County
056433 | Kittitas County
046433 | Kittitas County

Project Description
The proposed project will construct 22 ft wide gravel roadways with BST surfacing to serve 60 new residential lots. An irrigation system with services to the lots will also be constructed.

Stormwater Summary
Project Type: New Development
Manual: Stormwater Management Manual for Eastern WA (SWMMEW) | 2019

Developed Surface Table

	Onsite (ac)	Offsite (ac)	Total (ac)
PROJECT SITE			
Total	480	0	480
Land Disturbing Activity	26.89	0	26.89
NEW SURFACES			
PGHS	12.00	0	12.00
Non-PGHS	14.89	0	14.89

CORE ELEMENTS

The following is a summary of the minimum requirements and the corresponding approach to fulfill each requirement.

Core Element #1: Preparation of a Stormwater Site Plan
Guidelines
All projects, including those proposed by local jurisdiction departments and agencies, that are subject to Core Elements #2 through #8 are expected to complete an SSP.

Approach
This report, and the accompanying construction drawings, describe the existing conditions for the project and the plan for management of stormwater for the proposed development conditions.

Core Element #2: Construction Stormwater Pollution Prevention
Guidelines
Project proponents are responsible for preventing erosion and discharge of sediment from the project site into surface waters of the State and must consider each of the 13 elements of pollution prevention to determine which controls are appropriate for the project site.

Approach
Construction drawings describing the proposed temporary erosion and sediment control measures that will be implemented during construction have been prepared for this project. The SWPPP is provided in Appendix C.

Core Element #3: Source Control of Pollution
Guidelines
Following construction, projects shall apply all known, available and reasonable source control BMPs. Source control BMPs shall be selected, designed, and maintained according to this manual.

Approach
All stormwater treatment facilities will have the capacity to treat all anticipated pollutants. No additional source control measures will require implementation.

Core Element #4: Preservation of Natural Drainage Systems
Guidelines
To the maximum extent practicable, discharge stormwater in the same manner, at the same location, and at the same flow rate and volume as under the conditions that existed prior to development.

Approach
Runoff characteristics from the existing vegetation will not be changed. Runoff from the new roadway will be dispersed to mitigate the impacts of the new impervious surface allowing the flow patterns of natural drainage system to remain intact.

Core Element #5: Runoff Treatment
Guidelines
Runoff treatment BMPs shall be selected, designed, sized, constructed, operated and maintained in accordance with the guidance in Chapter 4 - Hydrologic Analysis and Design and Chapter 5 - Runoff Treatment BMP Design.

Basic Treatment Requirements:
Basic Treatment Requirements Runoff treatment is required for all projects creating ≥ 5,000 sf of new pollution-generating impervious surfaces (PGIS) and replaced PGIS unless the discharge is to (1) a UIC well or (2) satisfies the requirements for full dispersion and is not a high use site.

Metals Treatment Requirements:
Metals treatment is required for new development projects on moderate- and high-use sites, discharge to a nonexempt surface water and meet any of the definitions described under "Metals Treatment Requirements" in Section 2.7.6 of the SWMMEW (2019).

Oil Control Requirements:
Oil control is required for all high-use sites and high-ADT areas.

Phosphorus Treatment Requirements:
Phosphorus treatment is required only where federal, state, or local jurisdiction has determined that a water body is sensitive to phosphorus and that a reduction in phosphorus from new development and redevelopment is necessary to achieve the water quality standard to protect its beneficial uses.

Approach
Per Figure 2.3 of the SWMMEW, Basic Treatment is required for this project (see Appendix A). The project will utilize dispersion to provide runoff treatment. The proposed dispersion BMPs are described within the Stormwater Facilities section of this report. These facilities have been designed in accordance with the applicable thresholds, standards, and requirements outlined in the SWMMEW.

Core Element #6: Flow Control

Guidelines

Flow control BMPs shall be selected, designed, constructed, operated, and maintained according to the criteria in Chapter 4 - Hydrologic Analysis and Design and Chapter 6 - Flow Control BMP Design.

Approach

The project will utilize dispersion to provide flow control. The proposed stormwater flow control facilities are described within the Stormwater Facilities section of this report. These have been designed in accordance with the applicable thresholds, standards, and requirements outlined in the SWMMEW.

Core Element #7: Operation and Maintenance

Guidelines

Where structural BMPs are required, projects shall operate and maintain the facilities in accordance with an O&M manual that is prepared in accordance with the provisions in Chapter 5 - Runoff Treatment BMP Design and Chapter 6 - Flow Control BMP Design.

Approach

The Operation and Maintenance (O&M) Manual provided in Appendix C addresses all proposed permanent stormwater BMPs.

Core Element #8: Local Requirements

Guidelines

All projects, regardless of size, shall meet additional local requirements for flood control, discharges to wetlands, protection of sensitive areas, basin plans, aquifer protections, special water quality requirements based on a TMDL or water cleanup plan, or for any other purpose.

Approach

No additional local requirements have been identified for this project.

EXISTING CONDITIONS

Site Conditions

Site Use(s)

Currently the site is vacant with several unpaved farm roads through the site and numerous stock watering/irrigation ponds are located within the streams passing through the site. Old irrigation ditches are present throughout the site and the top of the hill on the site has an old wheel irrigation system.

Topography

The existing project area is undeveloped and vacant, with a few unpaved roads traversing portions of the property. The site is characterized by sloping topography on the west which slopes down to a central plateau. There is an elevated area in the center of the site, which is bounded to the north and south by two relatively well-incised canyons. The overall topography ascends from east to west for a maximum topographic relief of about 370 feet within the project area.

Vegetation

The site has a mix of shrubs and thickets of hawthorne, snowberry, small douglas firs, aspen, and substantial amounts of rose. Weedy species present include knapweed, mullein, teasel, thistle, as well as cheatgrass and pasture grasses such as quack grass and fescue.

Soils

A geotechnical evaluation of the project site was performed by Earth Solutions NW LLC (ESNW). ESNW's evaluation report is provided in Appendix B. As part of their investigation, ESNW dug 51 test pits throughout the site. As noted in their report, the native soils underlying topsoil and fill was variable across the site. Most commonly, the native soils were comprised of silty sand with and without gravel (USCS: SM) and silty gravel with sand (USCS: GM). Isolated pockets of fine-grained sandy silt and silt with sand deposits (USCS: ML)

were encountered, along with limited areas of relatively free-draining sand and gravel deposits (USCS: SW-SM, GW-GM, and GP-GM).

Soil density was generally dense to very dense, beginning near the surface and extending to the termination depth of all exploration sites. Moisture content was characterized as damp to moist at the time of exploration. Fines content within the various deposits ranged between about 5 and 78 percent, with higher fines content soils being more representative of general site soil conditions.

Based on their evaluation, ESNW concluded that infiltration via widespread, shallow, and dispersed facilities (such as permeable pavement or infiltration swales) is not feasible.

Encumbrances
None

Wetlands & Streams
Sewall Wetland Consulting, Inc. inspected the site between October 2022 and July 2023. Their report is provided in Appendix B. As noted in the report, the site is bordered on the west by the South Branch of the Taneum KRD canal. Prior to 2021, the areas along the west edge of the site and drainages were primarily artificially supported by canal leakage water. In 2021, the canal was rebuilt and refurbished with completely impervious concrete bottom and sides. This has stopped the leakage to the site from the canal. Since the canal lining was finished, a total of four streams and two wetlands were found to remain viable on the site:

Stream A – Type F stream
Stream B – Type F stream
Stream C – Type Ns stream
Stream D – Type Ns stream
Wetland A – Category III wetland
Wetland B – Category III wetland

See the Critical Area report in Appendix B for a complete description of the onsite streams and wetlands.

Fish and Wildlife Habitat Conservation Areas
Per the Critical Area report, the WDFW Priority Habitats mapping of the site depicts nearly the entire site as "shrub steppe," as well as within the Township which the golden eagle and gray wolf are present. No fish were observed within the streams.

Frequently Flooded Areas
The scope of this project is not within any areas of frequent flooding.

Geologically Hazardous Areas
A geotechnical evaluation of the project site performed by Earth Solutions NW LLC (ESNW) identified isolated landslide hazard areas (areas exceeding 40 percent slope and 10 feet in height). These are generally outside the proposed road alignment and should not affect project development. ESNW did not recommend special requirements for working in or near critical areas, however their report noted that based on subsurface observations of predominantly dense to very dense native soil and bedrock, the steep onsite slopes are generally considered to be in a stable condition.

Critical Recharge Area
None

Wellhead Protection Areas
None

Cultural Resources
None known.

Stormwater Facilities

Collection Facilities

None

Conveyance Facilities

Culverts are located at the unpaved road / stream crossings.

Treatment Facilities

None

Flow Control Facilities

None

An Existing Conditions Exhibit is provided in Appendix A.

DEVELOPED CONDITIONS

The developed site consists of roadways and an irrigation system to serve 60 single family lots. Stormwater runoff from the new roadways will be mitigated by dispersion BMPs as described below.

STORMWATER FACILITIES

Roadside Dispersion

Overview

Description	Sheet Flow Dispersion (BMP F6.41) and Channelized Flow Dispersion (BMP F6.43)
Type	Treatment Flow Control

Design Storm

Duration (hrs)	24 hours
Recurrence Interval (yrs)	100 years
Type	Type 1A
Precipitation (in)	2.5

Calculations

Sizing Program	For roadways with a resultant slope ≤ 9.4%, sheet flow dispersion directly from the road surface was utilized and no sizing program was necessary. See the Notes section below for the sizing of the dispersion area width. For roadways with a resultant slope > 9.4%, the HydroCAD program was used to calculate the flow rate tributary to roadside ditches that are routed to dispersion facilities (the calculations are provided in Appendix A). There are three sections of roadway that are steeper than 9.4%. See the Developed Conditions Exhibit in Appendix A for the location of the dispersion facilities.
Capacity	Up to 150 feet of roadway width.
Assumptions	2% roadway cross slope For roadways with a resultant slope ≤ 9.4%, runoff will be dispersed from the road surface through a 15 ft vegetated flow path. Slopes within the 15 ft flow path are ≤ 8%. For roadways with a resultant slope > 9.4%, runoff will be collected in a roadside ditch and routed to a discharge point where it will be dispersed (using either a rock pad or a dispersion trench) into native vegetation.

Notes	The width of the sheet flow dispersion area was sized per Option 3 of BMP F6.41: Dispersion width = 10 ft (for up to 20 ft of roadway width, plus 5 ft for each additional 20 ft of width or fraction thereof. The roadway width is 22 ft, therefore the dispersion width required is 15 ft. For channelized flow dispersion, discharge points with up to 0.2 cfs discharge for the 100-year design flow may use rock pads with a 50 ft vegetated flow path or dispersion trenches with a 25 ft vegetated flow path to disperse flows. Discharge points with design flows between 0.2 and 0.5 cfs for the 100-year design flow must use only dispersion trenches to disperse flows. For all roadway sections that utilize channelized flow dispersion, the design flow rate is < 0.2 cfs. Rock pads are provided for two sections of the roadway with an available vegetated flow path of 50 ft. For the third section which has an available flow path of 25 ft, a dispersion trench is provided.

APPENDIX A

CHARTS/EXHIBITS/CALCULATIONS

Figure 2.1: Flow Chart for Determining Applicable Core Elements for New Development Projects

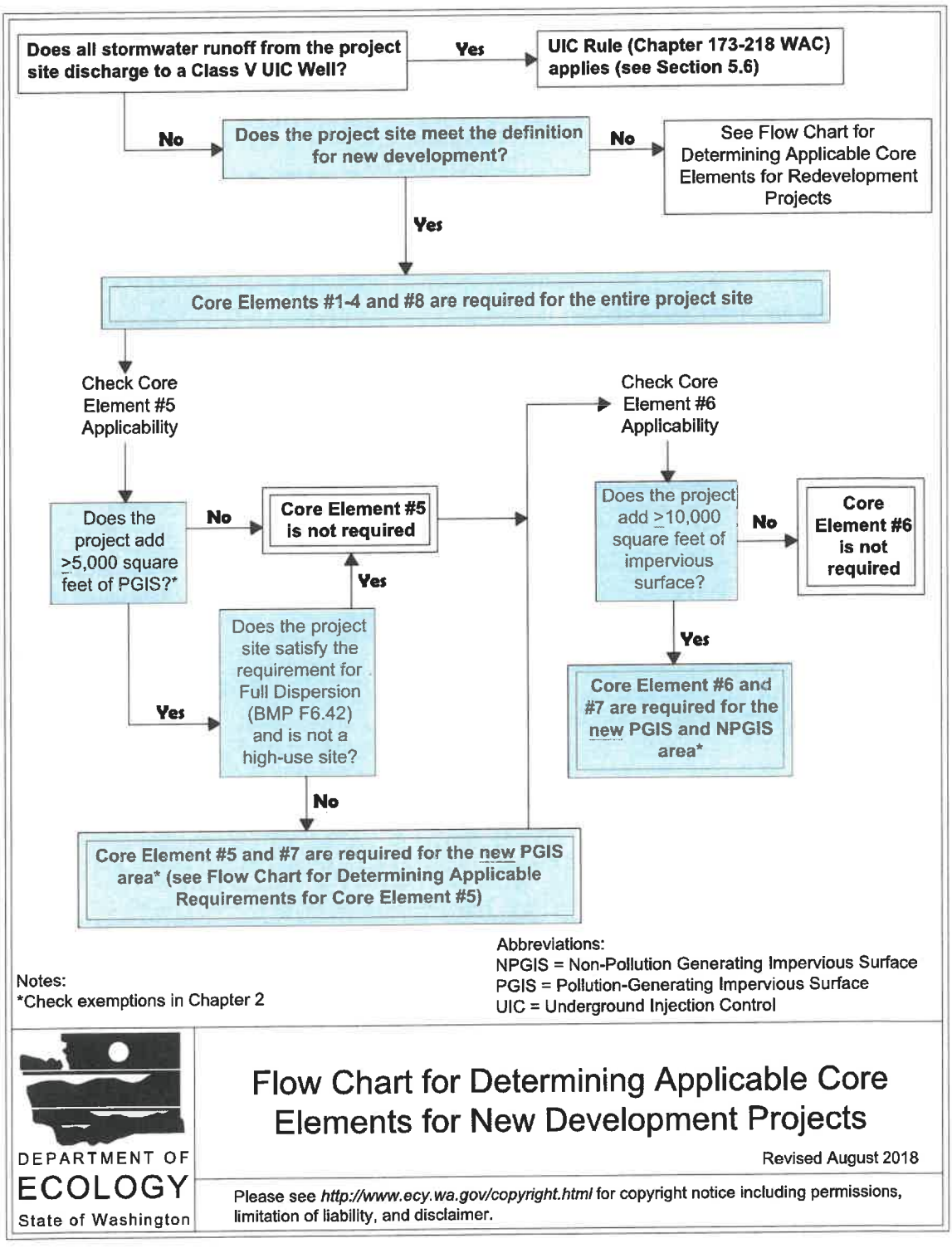
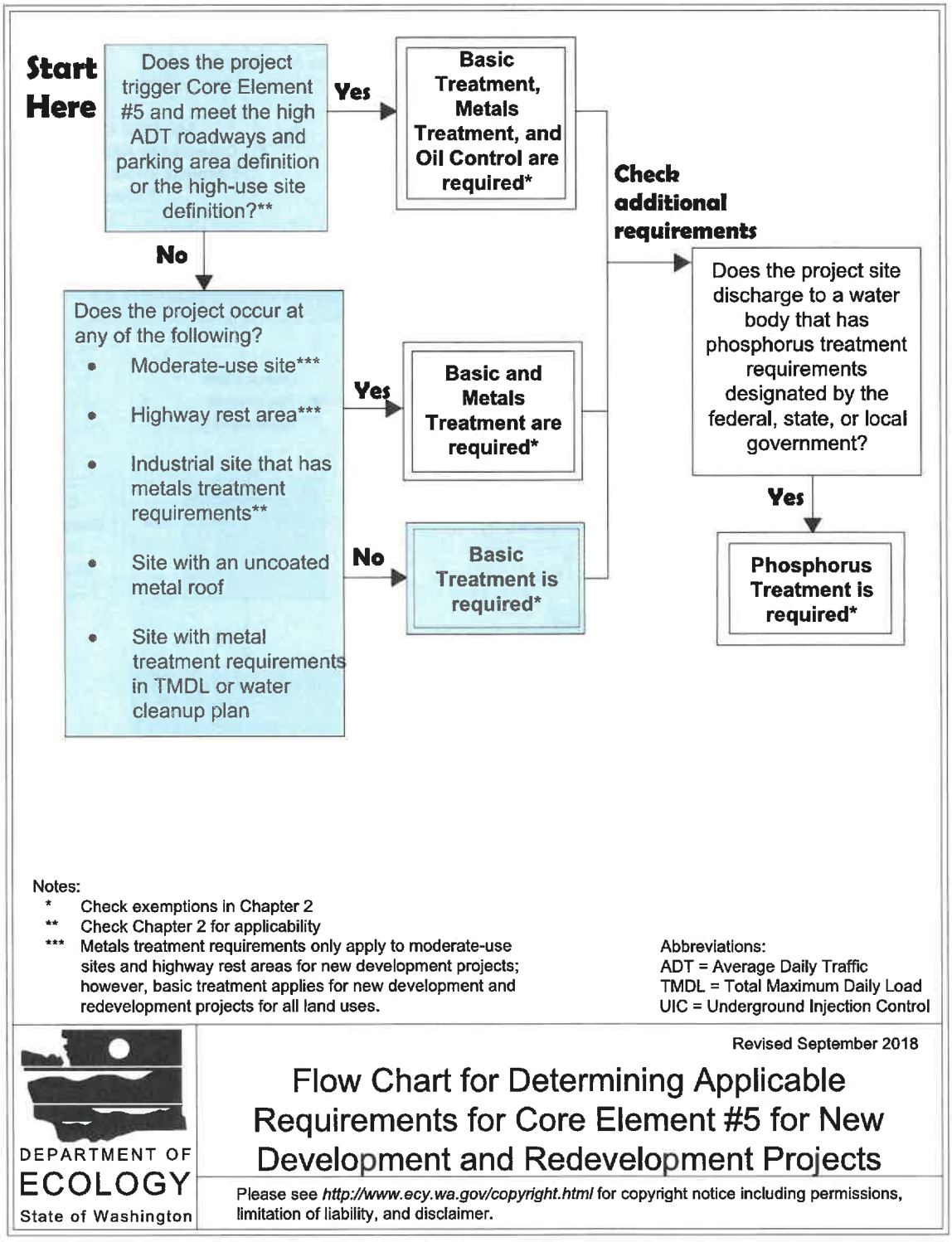
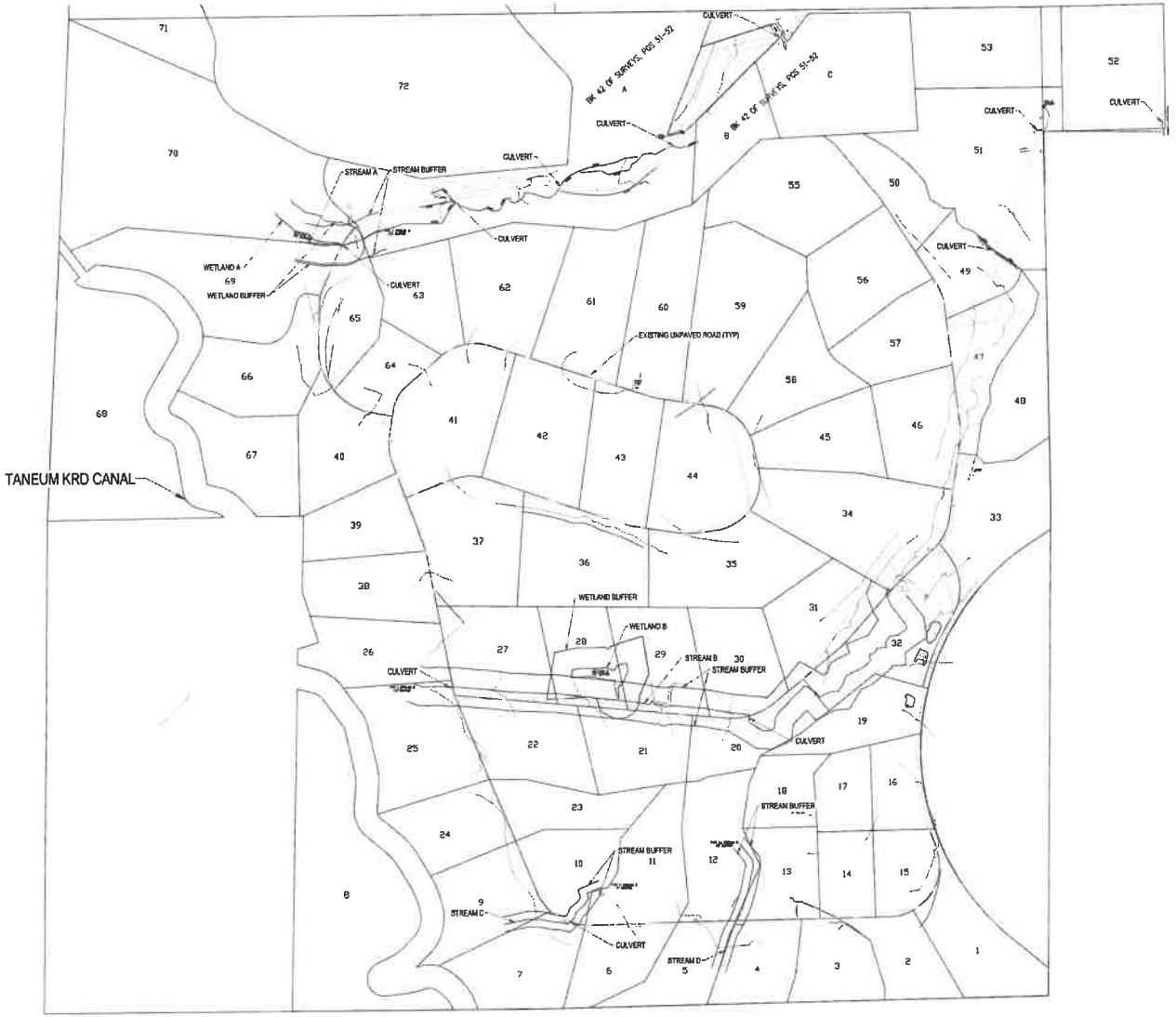


Figure 2.3: Flow Chart for Determining Applicable Requirements for Core Element #5 for New Development and Redevelopment Projects





MARK	REVISION DESCRIPTION	BY	APP.	DATE

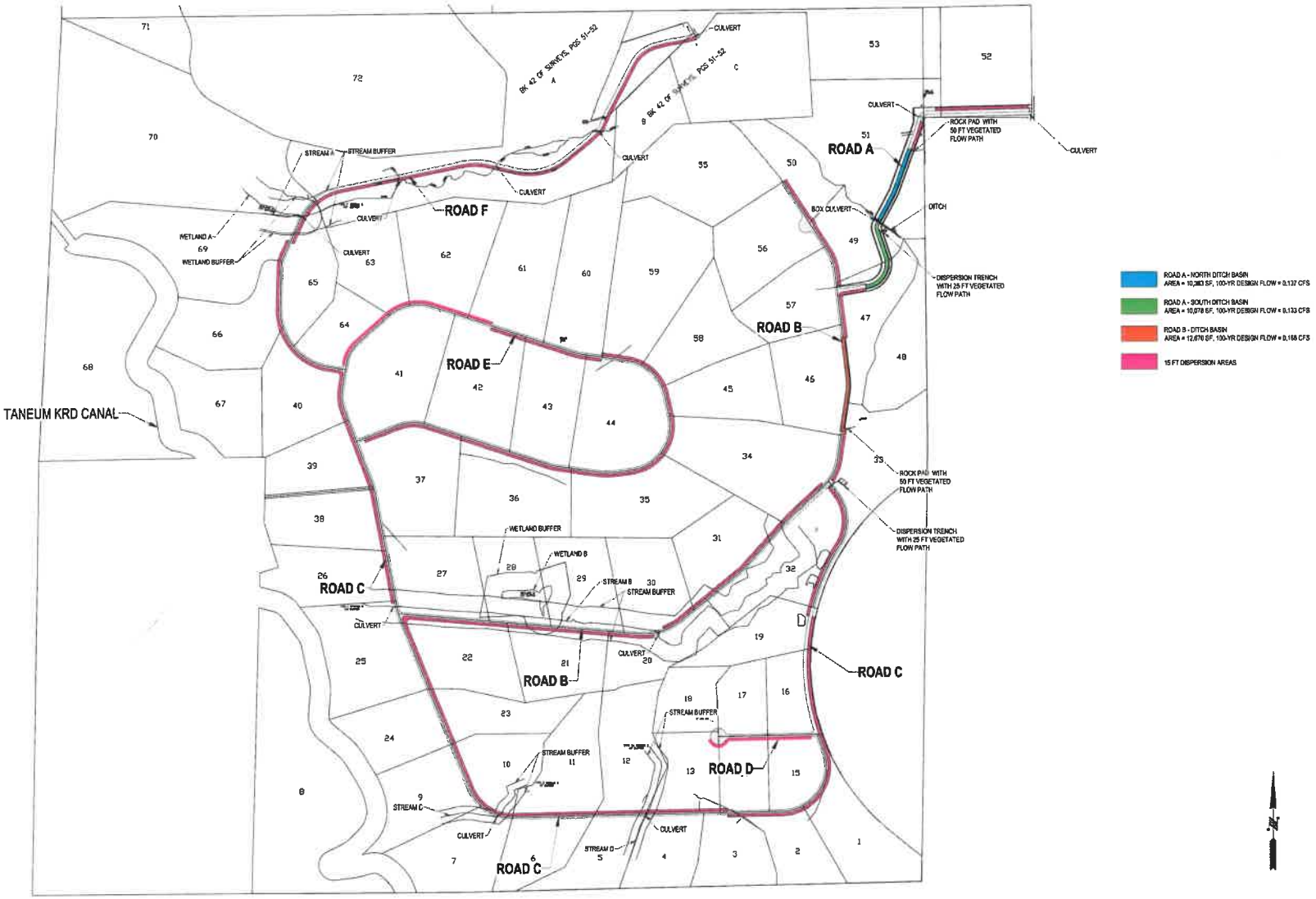
simpliCIVIL
253.678.2212 | PO Box 745, Hoses Lake, WA 98837

DRAWN BY	JB / KB
DESIGN BY	TS
CHECK BY	TS
PROJECT MGR	TS

HUNTER ROAD DEVELOPMENT

EXISTING CONDITIONS EXHIBIT

DRAWING NO.	
PROJECT NO.	20.022
DATE:	02/02/24
SHEET NO.	1 OF 1



MARK	REVISION DESCRIPTION	BY	APP.	DATE

simpliCIVIL
253.579.2212 | PO Box 745, Moses Lake, WA 98837

DRAWN BY	JB / KB
DESIGN BY	TS
CHECK BY	TS
PROJECT MGR	TS

HUNTER ROAD DEVELOPMENT

DEVELOPED CONDITIONS EXHIBIT

DRAWING NO.	
PROJECT NO.	20.022
DATE:	02/02/24
SHEET NO.	1 OF 1

Summary for Subcatchment 1S: Road A - North Ditch

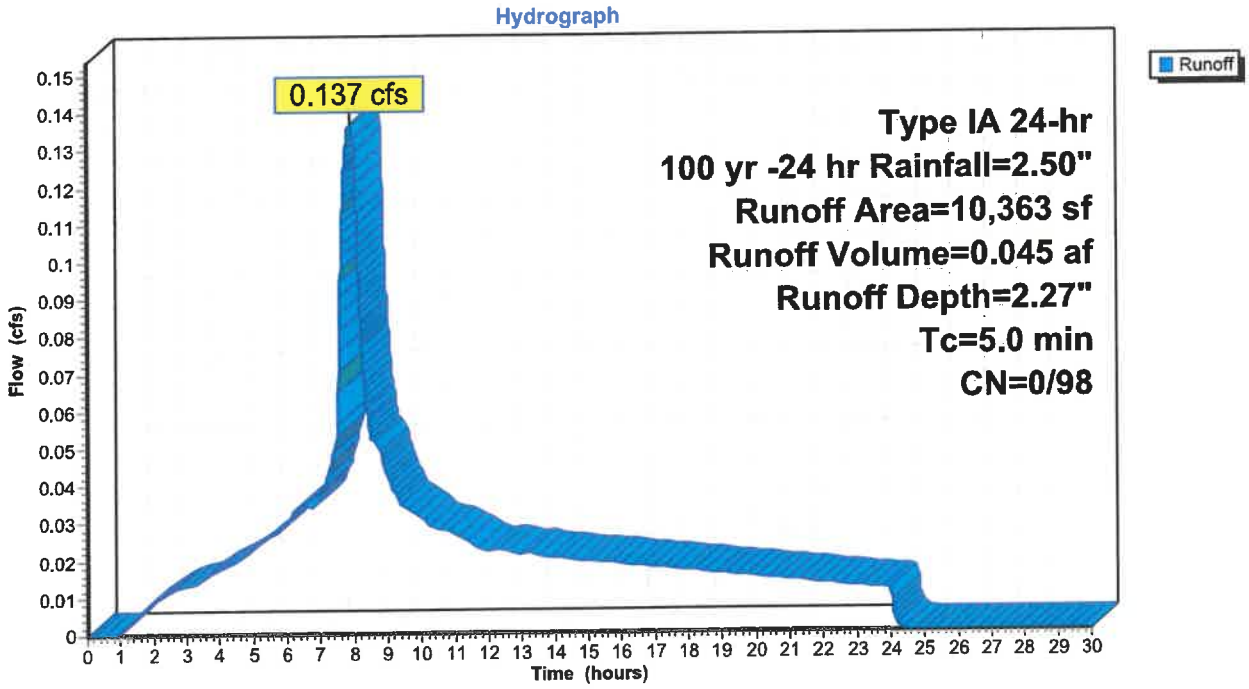
Runoff = 0.137 cfs @ 7.88 hrs, Volume= 0.045 af, Depth= 2.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr -24 hr Rainfall=2.50"

	Area (sf)	CN	Description
*	10,363	98	Roadway
	10,363	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment 1S: Road A - North Ditch



Summary for Subcatchment 2S: Road A - South Ditch

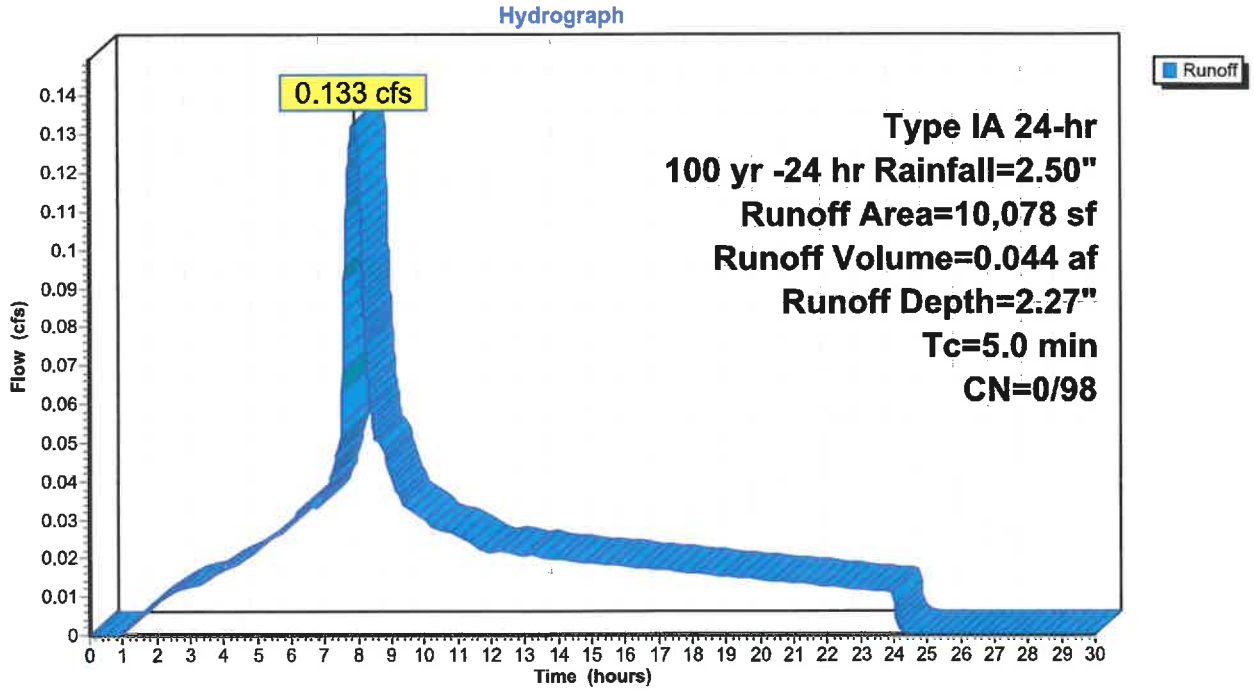
Runoff = 0.133 cfs @ 7.88 hrs, Volume= 0.044 af, Depth= 2.27"
Routed to nonexistent node 4P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr -24 hr Rainfall=2.50"

	Area (sf)	CN	Description
*	10,078	98	Roadway
	10,078	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 2S: Road A - South Ditch



Summary for Subcatchment 3S: Road B - Ditch

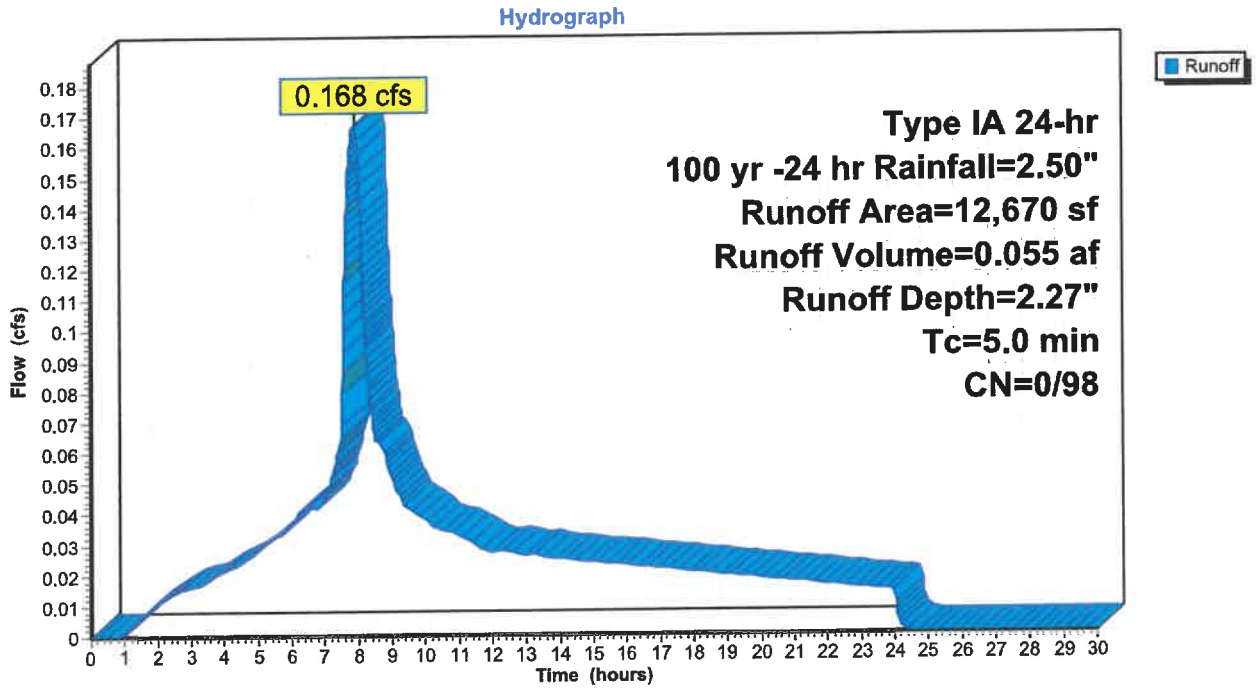
Runoff = 0.168 cfs @ 7.88 hrs, Volume= 0.055 af, Depth= 2.27"
Routed to nonexistent node 4P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100 yr -24 hr Rainfall=2.50"

	Area (sf)	CN	Description
*	12,670	98	Roadway
	12,670	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 3S: Road B - Ditch



APPENDIX B

GEOTECHNICAL EVALUATION LETTER
CRITICAL AREA REPORT

Earth Solutions NW LLC

Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

December 5, 2023
ES-9453

Vic Jansen
P.O. Box 579
Moses Lake, Washington 98837

Subject: **Geotechnical Evaluation**
Hunter Road Development
2XX Hunter Road
Kittitas County (Ellensburg), Washington

Dear Vic:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this geotechnical evaluation letter report for the proposed project. ESNW performed the work outlined in this letter report in general accordance with the scope of services outlined in our proposal, which was authorized on September 20, 2023. A summary of the subsurface exploration, laboratory analyses, and recommendations with respect to the proposed road construction are provided herein.

Project & Site Description

The subject site is located on the south side of Hunter Road and in the general area between Kittitas Reclamation District Road and the Taneum Ditch, in the Ellensburg area of unincorporated Kittitas County, Washington. The development envelope consists of portions of 68 different tax parcels (Kittitas County Parcel Nos. 21-465 through -506, 21-508 through -528, 086433, 076433, 066433, 056433, and 046433), totaling nearly 480 acres of land area and encompassing most of PLSS Section 22 within Township 18 North, Range 17 East. The approximate site location is depicted on Plate 1 (Vicinity Map).

Based on observations made during the fieldwork and supplemental satellite imagery, the project area is undeveloped and vacant, with few primitive roads traversing portions of the property. Site topography can generally be characterized as an elevated "knob" which is bounded to the north and south by two relatively well-incised canyons. The northern canyon is referred to as Page Canyon per local mapping resources, and the southern canyon appears to be unnamed. The site encompasses a region where the Kittitas Valley floor meets the southern valley wall, and overall topography ascends from east to west for a maximum topographic relief of about 370 feet within the project area.

The Kittitas County online GIS resource depicts hazardous slopes and critical aquifer recharge areas around the margins of the topographic "knob," and several small streams are mapped crosscutting the project area.

Based on review of the referenced road plans and related information provided to us, we understand the project area will be developed with 60 new residential lots, new and improved access roadways, and associated improvements. A small bridge will be constructed to cross the existing canal at Road A.

A preliminary road plan illustrating the proposed roadway alignment was provided to ESNW for review. However, specific grading and/or construction plans were not available at the time this letter report was prepared. The focus of this geotechnical investigation was to explore the subsurface as it relates to road and bridge design, including formulating recommendations for aggregate sections and infiltration feasibility for the new roadway and associated stormwater flows. Lot-specific subsurface exploration and recommendations for the proposed residential structures were not included in this scope of services.

Subsurface Conditions

An ESNW representative observed, logged, and sampled 51 test pits advanced at accessible locations within the proposed road alignment on September 28 and 29, 2023, using a trackhoe and operator provided by the client. The test pits were completed to assess and classify the site soils and to characterize the groundwater conditions within areas proposed for new road improvements. The maximum exploration depth was approximately nine feet below the existing ground surface (bgs).

The approximate locations of the test pits are illustrated on Plate 2 (Test Pit Location Plan). Please refer to the attached test pit logs for a more detailed description of subsurface conditions. Representative samples collected at the exploration locations were analyzed in accordance with Unified Soil Classification System (USCS) and United States Department of Agriculture (USDA) methods and procedures.

Topsoil and Fill

Surficial topsoil was generally encountered within the upper two to six inches of existing grades at the test pit locations. Organic topsoil was completely absent at several test locations, presumably as a result of previous grading activity associated with the existing primitive road alignment. Deeper or shallower pockets of topsoil may be encountered in localized areas of the site. The topsoil was characterized by its dark brown color, the presence of fine organic material, and small root intrusions.

Fill was encountered at test locations TP-42, -43, and -51 extending between about one and four feet bgs. At all locations, the fill was classified as silty gravel with sand (USCS: GM) in a dense to very dense, damp to moist condition. At test locations TP-42 and -43, the fill was associated with an elevated primitive road surface adjacent to the Taneum Ditch. At test location TP-51, the fill appeared to be associated with a stabilized site access drive lane but contained abundant organics within the upper one foot.

Native Soil

Underlying topsoil and fill, native soils were variable across the site. Most commonly, the native soils were comprised of silty sand with and without gravel (USCS: SM) and silty gravel with sand (USCS: GM). Isolated pockets of fine-grained sandy silt and silt with sand deposits (USCS: ML) were encountered, along with limited areas of relatively free-draining sand and gravel deposits (USCS: SW-SM, GW-GM, and GP-GM).

Soil density was generally dense to very dense, beginning near surface and extending to the termination depth of all exploration sites. Moisture content was characterized as damp to moist at the time of exploration. Fines content within the various deposits ranged between about 5 and 78 percent, with higher fines content soils being more representative of general site soil conditions.

Geologic Setting

Local geologic mapping indicates the site is underlain by five distinct geologic units: Thorp Gravel mainstream alluvium (Ttm), Grand Ronde basalt (Tgn2), Ellensburg Formation volcaniclastic rocks (Tev), Kittitas Drift – Swauk Prairie subdrift, mainstream outwash (Qksm), and alluvial fan deposits (Qf).

Thorp Gravel mainstream alluvium is described as weakly cemented, moderately sorted cobble to pebble gravel with thin interbeds of sand, silt, and tephra. Gravel clasts are subangular to rounded and include diverse rock types dominated by durable silicic volcanic rocks evidently derived from the underlying Ellensburg formation.

The mapped Grande Ronde Basalt includes the upper flows of normal magnetic polarity; it is locally subdivided, but specific subdivisions are not mapped at the subject site.

Ellensburg Formation volcaniclastic rocks are characterized as mostly sandstone and siltstone, including conglomerate, diamictite of probably laharic origin, and very minor amounts of micaceous feldspathic siltstone. It is weakly lithified. The volcaniclastic detritus is mostly andesitic and dacitic, and clasts are commonly pumiceous. The volcanic debris was probably freshly erupted from volcanoes in the Cascade Range. This unit is interbedded with and overlying the Grand Ronde Basalt.

The Kittitas Drift – Swauk Prairie subdrift, mainstream outwash unit consists of gravel deposits similar to alluvium of the Yakima River and forms a distinct terrace along the southern side of the Yakima River valley.

Alluvial fan deposits include poorly sorted boulder gravel to gravelly sand. Gravel clasts are subangular and are generally of one or two rock types. This unit forms fans of distinctly steeper gradient than the floor of sidestream or trunk-stream valleys, but in many places merges gradationally with other local alluvium deposits.

In our opinion, the native soils observed during the subsurface exploration are generally consistent with the geologic mapping resources outlined in this section.

Groundwater

Groundwater was not observed during the September 2023 subsurface exploration. Based on the crowned and sloping surface topography and numerous drainage gullies in the project vicinity, it is likely that most incoming stormwater sheet flows as surficial runoff down gradient to accumulate in the existing drainages. Any stormwater that does infiltrate into the subsurface is likely to be transient and will similarly follow the surface topography, flowing down gradient.

ESNW noted that the Taneum Ditch is an un-lined irrigation conveyance which is likely to influence local soil moisture conditions. Elevated moisture contents were observed within test pit excavations immediately adjacent to the ditch, and seepage zones may be present at depths greater than what was explored.

In general, groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. Groundwater seepage flow rates are typically higher during the winter, spring, and early summer months or during periods of peak irrigation.

Geologically Hazardous Areas

ESNW reviewed Chapter 17A.06 of the Kittitas County Code (KCC) and the online COMPAS mapping resource to determine if geologically hazardous areas are present at the subject site. KCC 17A.06.020 provides designation and definition criteria for identifying specific geologically hazardous areas and developing appropriate site development plans which will not adversely impact the site or surrounding properties. Per the KCC, geologically hazardous areas include landslide, erosion, alluvial fan, seismic, and mine hazard areas.

Based on our review, the site contains potential landslide hazard areas, potential erosion hazard areas, and alluvial fan hazard areas. However, risk associated with the identified hazard areas is considered relatively low in relation to the proposed road construction. Further discussion is provided in the following sections.

Potential Landslide Hazard Areas

Based on our review of surface topography depicted on the referenced road plans and mapping data illustrated on the COMPAS resource, the development area (generally outside of the proposed road alignment) contains isolated areas exceeding 40 percent slope and 10 feet in height, meeting the KCC definition of potential landslide hazard areas.

Based on our subsurface observations of predominantly dense to very dense native soil and bedrock, steep slopes on site are generally considered to be in a stable condition despite having steep slope gradients.

The proposed road alignment does not appear to directly traverse the identified and mapped steep slope areas, and in our opinion, road construction across the site is unlikely to influence global slope stability. Structural (vehicular) loading from the proposed roadway will be temporary in nature and constrained to relatively light vehicle loads, to our understanding. Grade cuts at the toe of steeply sloping areas have the potential to undermine the slope, and fills at the top of steeply sloping areas have the potential to surcharge the slope. Both cuts and fills near the toe and top of steep slope areas, respectively, have the potential to reduce global slope stability and should be avoided. The proposed grading plan should be reviewed by ESNW prior to the final design and/or acceptance stages of the project.

Potential landslide hazard areas will likely influence the proposed residential construction and siting of new residential structures, and local landslide hazard evaluations will likely need to be completed on a case-by-case basis during future residential construction. In our opinion, the proposed road alignment and construction should not be subject to KCC landslide hazard area regulations.

Potential Erosion Hazard Areas

Slopes exceeding 40 percent are classified as erosion hazard areas in Kittitas County. As noted in the section above, the proposed road alignment does not appear to directly traverse the identified steep slope areas, and in our opinion, the proposed alignment is unlikely to create erosion hazards during construction. Furthermore, soil exposure will be temporary as the project proposes permanent surface stabilization via bituminous surface treatment (BST) of the proposed roadways. Disturbed areas outside of the BST footprint should be stabilized with native vegetation or other appropriate measures.

Alluvial Fan Hazard Areas

As defined in the KCC, alluvial fan hazard areas include those areas on alluvial fans where debris flows, debris floods, or clear water floods have the potential to significantly damage or harm the health or welfare of the community. They include the areas generally corresponding to the path of potential flooding, channel changes, sediment and debris deposition, or debris flow paths as determined by analysis of watershed hydrology and slope conditions, topography, valley bottom and channel conditions, potential for channel changes, and surface and subsurface geology.

Geologic mapping of the area indicates alluvial fan deposits are present across significant portions of the site, generally constrained in the topographically lower "channelized" areas between Kittitas Reclamation District Road and the Kittitas Valley floor. The mapping of alluvial fans is generally consistent with our subsurface observations of the native soil deposits. West of the subject site and at higher elevations, numerous well-incised drainage gullies are evident on readily available LiDAR mapping resources.

Based on the existing surface topography and alluvial fan deposits, there is clear potential for additional sediment deposition within the bounds of the project area. However, the mode of deposition is heavily dependent on upslope (and off-site) surface conditions, hydrology, and weather. Surface exposures of bare sediments (indicating recent sedimentation) were not observed during the fieldwork, and the surface was generally vegetated with established plant life typical of eastern Washington ecosystems. In our opinion, active sedimentation in an alluvial fan depositional environment is not occurring—the subject site is located within a relatively mature landscape, and it is our opinion that a catastrophic debris flow inundating the subject site is a low probability event.

In any case, the potential risk to the health or welfare of the community is considered low as it relates to the proposed road construction and alignment. Siting of new residential structures should consider potential flow paths of a debris flow event, however unlikely, and should be positioned at higher elevations of the site to avoid potential inundation by earth debris.

Geotechnical Considerations

In our opinion, the proposed road construction is feasible from a geotechnical standpoint. The geotechnical recommendations, conclusions, and considerations provided in the following sections are intended to support the proposed construction.

In-situ and Imported Soil

The in-situ soils encountered at the subject site generally have a high sensitivity to moisture and were generally in a damp to moist condition at the time of exploration. Soils anticipated to be exposed on site will degrade if exposed to wet weather and construction traffic. Compaction of the soils to the levels necessary for use as structural fill may be difficult or impossible during wet weather conditions. Soils encountered during site excavations that are excessively over the optimum moisture content will likely require aeration or treatment prior to placement and compaction. Conversely, soils that are substantially below the optimum moisture content will require moisture conditioning (by adding water) prior to use as structural fill. An ESNW representative should be contacted to evaluate the suitability of in-situ soils for use as structural fill at the time of construction.

Imported soil intended for use as structural fill should be evaluated by ESNW during construction. The imported soil must be workable to the optimum moisture content, as determined by the Modified Proctor Method (ASTM D1557), at the time of placement and compaction. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

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

Stripping

Topsoil was generally encountered within the upper two to six inches of existing grades at the test pit locations. Vegetation and organic-rich topsoil should be stripped from the proposed road alignment and segregated into a stockpile for later use on site or to haul off site. The material remaining immediately below the topsoil may have some root zones and will likely have variable moisture content and composition. Depending on the time of year stripping occurs, the soil exposed below the topsoil may be too wet to attain adequate compaction when used as structural fill and will likely need to be aerated or treated.

ESNW should be retained to observe site stripping activities at the time of construction so that the degree of required stripping may be assessed. Over-stripping should be avoided, as it is unnecessary and may result in increased project development costs. Topsoil and organic-rich soil are neither suitable for foundation support nor for use as structural fill. Topsoil and organic-rich soil may be used in non-structural areas, if desired.

Road Subgrade Preparation

Following site stripping, ESNW should observe the subgrade to confirm soil conditions are as anticipated and to provide supplementary recommendations for subgrade preparation, as necessary. In general, ESNW recommends that the entirety of the exposed roadway subgrade is compacted in situ to a minimum depth of six inches using large vibratory compaction equipment (such as a drum roller or sheepsfoot roller, where appropriate), as the performance of site roadways is largely related to the condition of the underlying subgrade.

To ensure adequate roadway performance, the subgrade should be in a firm and unyielding condition when subjected to proof rolling with a loaded dump truck. Structural fill in road areas should be compacted to the specifications previously detailed in this report. Soft, wet, or otherwise unsuitable or yielding subgrade conditions will require remedial measures, such as overexcavation and/or placement of thick crushed rock or structural fill sections, prior to placement of road base material.

Wet Weather Grading

The moisture-sensitive native soils may require additional measures to protect road subgrade stability and soil intended for reuse as structural fill. Specific recommendations can be provided at the time of construction and may include leaving cut areas several inches above design subgrade elevations, covering working surfaces with crushed rock, limiting construction traffic over prepared subgrade surfaces, and protecting structural fill soil from adverse moisture conditions.

Preliminary BST Road Design

We understand the proposed access road will be privately owned and surfaced using BST. At the time of this letter report, it was understood that the access road would be subjected primarily to passenger vehicle traffic.

Private road design requirements and criteria are provided in KCC Chapter 12.4. Per Table 4-4A, a minimum crushed rock surfacing thickness of six inches is required for new BST roadways in accordance with the referenced WSDOT Standard Specifications. Additional crushed rock surfacing may be necessary if surface deflections and subgrade instability are observed during proofrolling.

BST specifications are provided in Chapter 5-02 of the referenced WSDOT Standard Specifications. Upon preparation of a competent and compacted subgrade and placement of the crushed rock surfacing course, the BST should be installed in accordance with the requirements for "new construction" outlined therein, including the minimum number of applications of emulsified asphalt and aggregate, materials, equipment, roadway surface preparation, patching and correction of defective work, weather condition restraints, et cetera. Regarding application rates, the following minimum quantities are recommended for application during new construction:

- Undiluted emulsified asphalt — 0.35 gal/yd^2 (first application)
0.35 gal/yd^2 (second application)
- Aggregate — 25 lb/yd^2

ESNW should be retained during construction to observe, document, and test PST surfacing placement. Supplementary recommendations may be provided at the time of construction depending on observed conditions.

Preliminary Box Culvert Footing Design

We understand the proposed roadway will cross the Taneum Ditch in the northeastern portion of the project area at Road A, and an improved crossing is proposed. The improved crossing will likely include a pre-cast concrete box culvert to support vehicular traffic and allow irrigation water to flow freely beneath the roadway within the Taneum Ditch. Project-specific culvert designs were not available for review at the time of letter report preparation. However, based on our subsurface observations, the proposed box culvert is preliminarily feasible from a geotechnical standpoint.

The following recommendations should be incorporated into the design and construction of the culvert footings:

- Conventional footings should bear on competent, undisturbed, and dense native soil deposits, which are anticipated to be exposed within about one to four feet of existing grades. Provided competent soils are exposed at the design subgrade elevations, the following parameters for footing design may be used:

  - Allowable soil bearing capacity 2,000 psf
  - Passive earth pressure 200 pcf
  - Coefficient of friction 0.40

- Temporary excavations for culvert footings should be sloped no steeper than one horizontal to one vertical (1H:1V). If groundwater seepage is exposed during excavation, temporary excavations must be graded to a maximum slope gradient of one-and-one-half horizontal to one vertical (1.5H:1V).

ESNW notes that Taneum Ditch is an earthen canal with a subgrade composed of natural materials, and elevated moisture contents were observed at depth adjacent to the ditch. Disturbed soils will likely be over the optimum moisture content irrespective of the time of year, and compaction of the soils to the levels necessary for use as structural fill may be difficult or impossible without aeration or treatment.

Additional recommendations may be provided as project designs progress, particularly as it relates to erosion, scour prevention, and drainage surrounding the culvert footings.

ESNW should be retained to observe the culvert construction, as well as related grading and earthwork activities, in order to confirm subgrade conditions are as anticipated in this letter report. Supplementary recommendations may be provided at the time of construction, as warranted.

Drainage

Groundwater seepage will likely be encountered within site excavations depending on the time of year grading operations take place, particularly in proximity to the proposed box culvert bridge. Elevated moistures were observed at depth within test pits excavated immediately adjacent to Taneum Ditch, even in late summer after a relatively long stretch of hot and dry weather. Increased moisture content should be expected during and after the wet season extending through the early summer months, particularly in downslope areas of the site and downgradient of the Taneum Ditch.

Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches, interceptor swales, and sumps. ESNW should be consulted during preliminary grading to identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from structures. Water must not be allowed to pond adjacent to structures. The grade adjacent to buildings should be sloped away at a gradient of at least 2 percent for a horizontal distance of at least four feet.

On-site Stormwater BMP Feasibility

In general, the widespread, predominantly fine-grained, very dense, and cemented native soils exhibit very poor infiltration characteristics, and infiltration should be considered infeasible from a geotechnical standpoint in our opinion. Section 5.4.4 of the referenced 2019 Stormwater Management Manual for Eastern Washington (2019 SWMMEW) provides a list of screening criteria for infiltration BMP feasibility. The final screening criterion states that infiltration may be deemed infeasible where potential infiltration sites have a long-term saturated hydraulic conductivity of less than 0.5 in/hr. Based on our field observations and laboratory analyses, it is our opinion that a large majority of the fine-grained native soils observed across the site will fall below the 0.5 in/hr threshold for saturated hydraulic conductivity, and as such, infiltration via widespread, shallow, and dispersed facilities (such as permeable pavement or infiltration swales) may be considered infeasible from a geotechnical standpoint.

One or more large-scale, concentrated infiltration facilities may be more practical when targeting isolated pockets of more favorable soils. ESNW would be pleased to further assist in infiltration feasibility and design, upon request.

Limitations

This letter report has been prepared for the exclusive use of Vic Jansen and their representatives. The recommendations and conclusions provided in this letter report are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. A warranty is neither expressed nor implied. If the design assumptions outlined herein either change or are incorrect, ESNW should be contacted to review the recommendations provided in this letter report. ESNW should be contacted to review the final design to confirm that our geotechnical recommendations have been incorporated into the plans.

Additional Services

ESNW should have an opportunity to review the final designs with respect to the geotechnical recommendations provided in this letter report. ESNW should also be retained to provide testing and consultation services during additional design and earthwork phases of the project.

We trust this letter report meets your current needs. Should you have any questions, or if additional information is required, please call.

Sincerely,

EARTH SOLUTIONS NW, LLC

Brian C. Snow, L.G.
Senior Staff Geologist

Keven D. Hoffmann, P.E.
Associate Principal Engineer

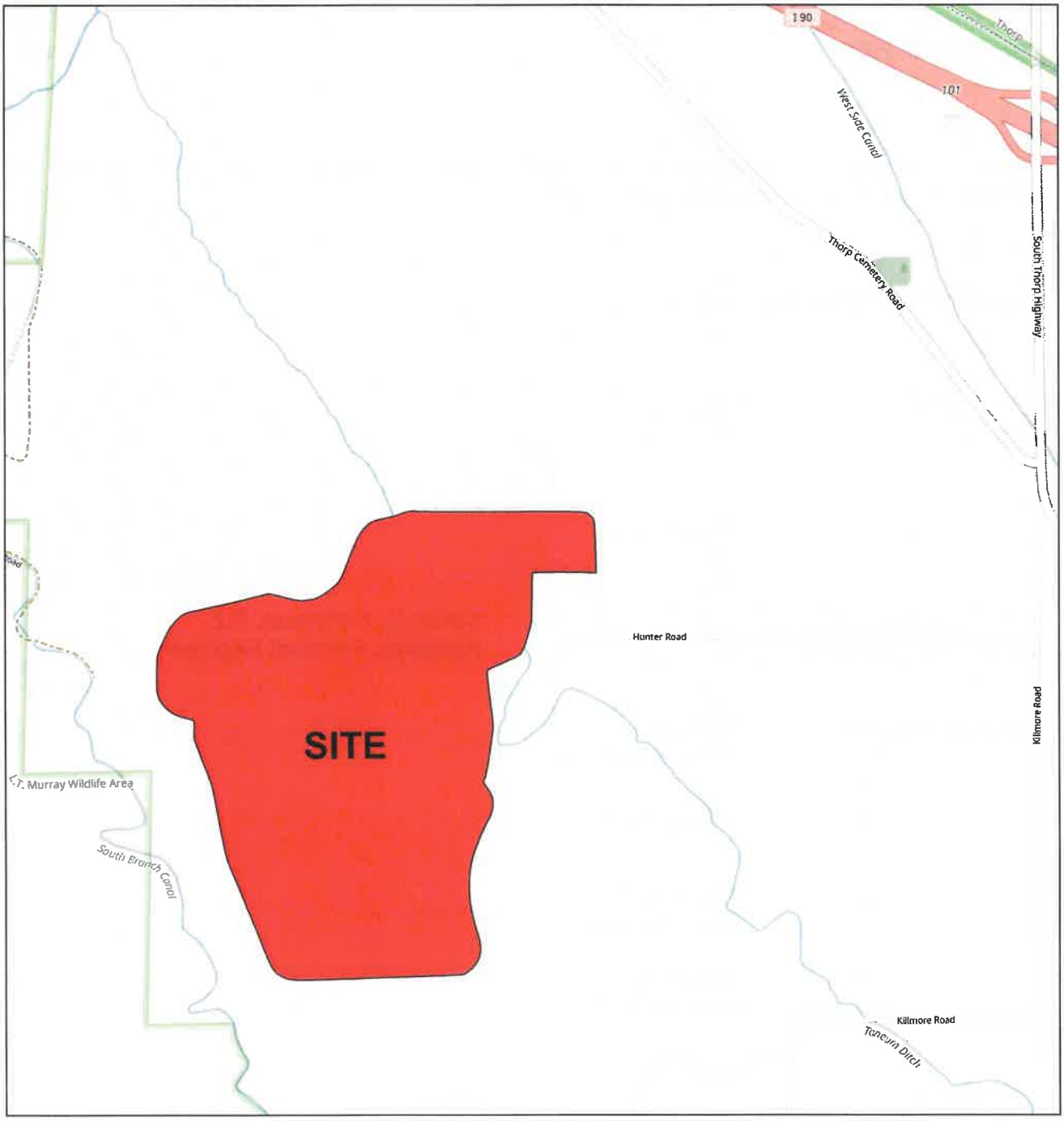
Attachments: Plate 1 – Vicinity Map
Plate 2 – Test Pit Location Plan
Test Pit Logs
Laboratory Test Results

cc: Platinum Dirt Works, LLC
Attention: Justin Donovan

Simpli Civil Engineering
Attention: Trav Story, P.E.

References:

- Preliminary Road Plans, Drawings C1.0 through C1.4, by Simpli Civil Engineering, Project No. 20.022, dated July 6, 2022
- Geologic Map of the Wenatchee 1:100,000 Quadrangle, Central Washington, by U.S. Geological Survey, dated 1982
- Kittitas County Code (KCC) – Chapter 17A.016, Chapter 12.4
- 2024 WSDOT Standard Specifications for Road, Bridge, and Municipal Construction
- 2019 Stormwater Management Manual for Eastern Washington



Reference:
Kittitas County, Washington
OpenStreetMap.org

NORTH

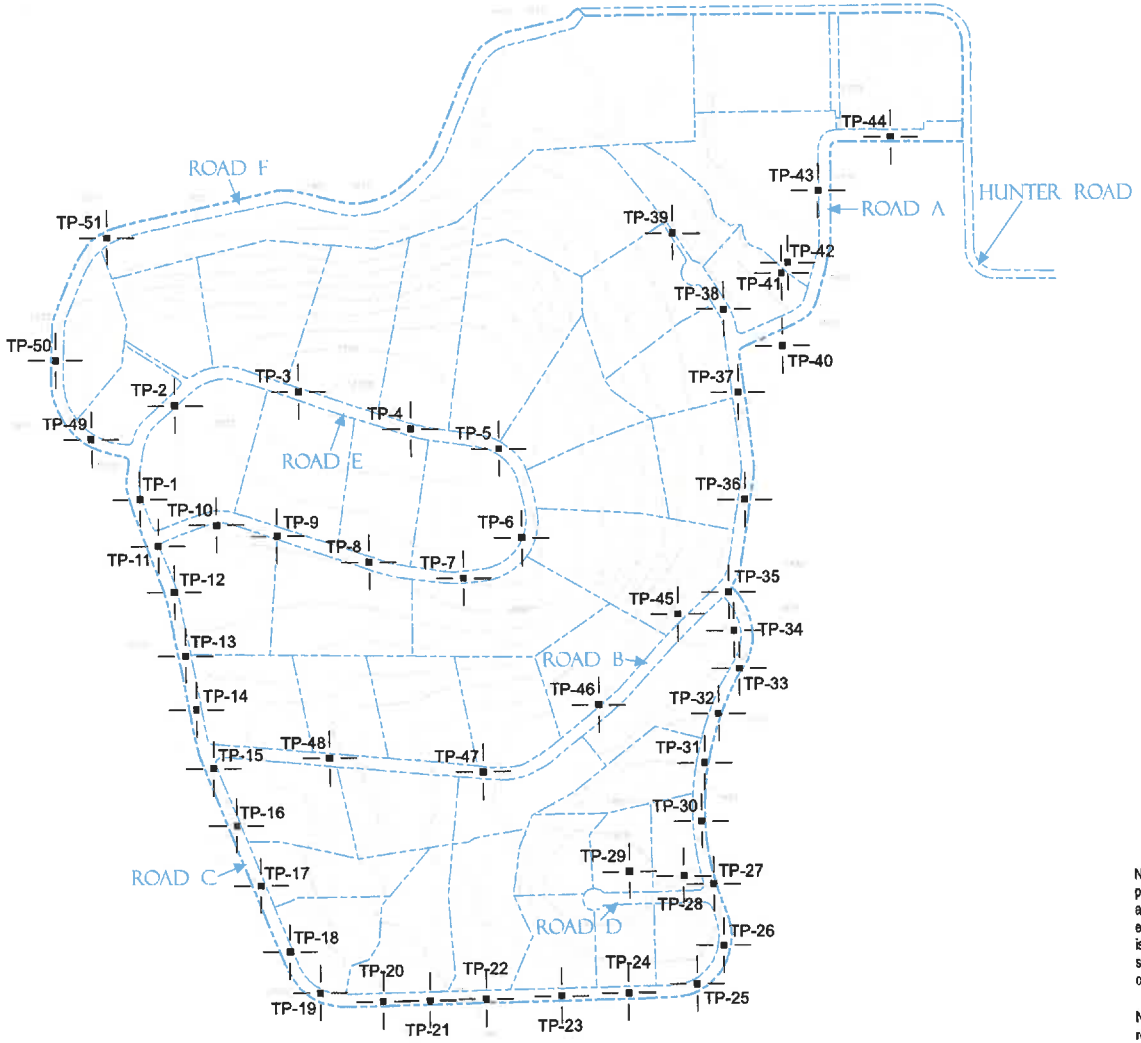
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Hunter Road Development
Kittitas County (Ellensburg), Washington

Drawn CAM	Date 11/08/2023	Proj. No. 9453
Checked BCS	Date Nov. 2023	Plate 1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-9453, Sept. 2023

Subject Site

NORTH

1"=600' 0 300 600 Scale in Feet

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

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

Test Pit Location Plan
Hunter Road Development
Kittitas County (Ellensburg), Washington

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

Drawn	CAM
Checked	BCS
Date	11/08/2023
Proj. No.	9453
Plate	2

Coarse-Grained Soils - More Than 50% Retained on No. 200 Sieve	Gravels - More Than 50% of Coarse Fraction Retained on No. 4 Sieve	< 5% Fines	GW	Well-graded gravel with or without sand, little to no fines
			GP	Poorly graded gravel with or without sand, little to no fines
		> 12% Fines	GM	Silty gravel with or without sand
			GC	Clayey gravel with or without sand
	Sands - 50% or More of Coarse Fraction Passes No. 4 Sieve	< 5% Fines	SW	Well-graded sand with or without gravel, little to no fines
			SP	Poorly graded sand with or without gravel, little to no fines
		> 12% Fines	SM	Silty sand with or without gravel
			SC	Clayey sand with or without gravel
Fine-Grained Soils - 50% or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less Than 50		ML	Silt with or without sand or gravel; sandy or gravelly silt
			CL	Clay of low to medium plasticity; lean clay with or without sand or gravel; sandy or gravelly lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt with or without sand or gravel; sandy or gravelly elastic silt
			CH	Clay of high plasticity; fat clay with or without sand or gravel; sandy or gravelly fat clay
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck, and other highly organic soils
Fill			FILL	Made Ground

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch

Damp - Perceptible moisture, likely below optimum MC

Moist - Damp but no visible water, likely at/near optimum MC

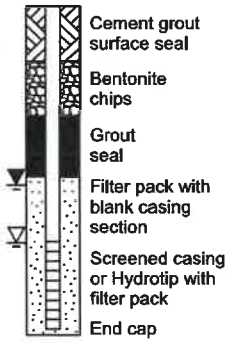
Wet - Water visible but not free draining, likely above optimum MC

Saturated/Water Bearing - Visible free water, typically below groundwater table

Symbols

ATD = At time of drilling

Static water level (date)



Terms Describing Relative Density and Consistency

Coarse-Grained Soils:

Density	SPT blows/foot
Very Loose	< 4
Loose	4 to 9
Medium Dense	10 to 29
Dense	30 to 49
Very Dense	≥ 50

Fine-Grained Soils:

Consistency	SPT blows/foot
Very Soft	< 2
Soft	2 to 3
Medium Stiff	4 to 7
Stiff	8 to 14
Very Stiff	15 to 29
Hard	≥ 30

Test Symbols & Units

Fines = Fines Content (%)

MC = Moisture Content (%)

DD = Dry Density (pcf)

Str = Shear Strength (tsf)

PID = Photoionization Detector (ppm)

OC = Organic Content (%)

CEC = Cation Exchange Capacity (meq/100 g)

LL = Liquid Limit (%)

PL = Plastic Limit (%)

PI = Plasticity Index (%)

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

Modifier Definitions

Percentage by Weight (Approx.)	Modifier
< 5	Trace (sand, silt, clay, gravel)
5 to 14	Slightly (sandy, silty, clayey, gravelly)
15 to 29	Sandy, silty, clayey, gravelly
≥ 30	Very (sandy, silty, clayey, gravelly)

Classifications of soils in this geotechnical report and as shown on the exploration logs are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates, and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D2487 and D2488 were used as an identification guide for the Unified Soil Classification System.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

EXPLORATION LOG KEY

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03665 **LONGITUDE** -120.70163
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brown silty SAND, dense to very dense, damp to moist
	GB	MC = 6.7 Fines = 46.9			[USDA Classification: slightly gravelly LOAM]
					-becomes golden brown
					-moderately abundant cobbles, scattered gravel
2.5					
	GB	MC = 12.2	SM		-becomes moist
5.0					
					-decreasing fines
	GB	MC = 9.3			
7.0					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-2

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03791 **LONGITUDE** -120.70095
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brown silty SAND, dense, moist
					-weakly cemented, blocky cuttings
	GB	MC = 11.2			
2.5			SM		
					-becomes very dense
5.0					
	GB	MC = 12.0			
				6.5	

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-3

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03813 **LONGITUDE** -120.69833
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, dense to very dense, damp
	GB	MC = 6.3			
2.5			SM		-abundant rounded cobbles of mafic (basalt) and intermediate composition
					-becomes moist
5.0					
	GB	MC = 9.2			
				6.5	

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-4

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03758 **LONGITUDE** -120.69610
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, dense to very dense, moist
			SM		-weakly cemented, blocky cuttings
2.5					
	GB	MC = 5.7 Fines = 20.2		3.0	Dark brownish gray silty GRAVEL with sand, dense to very dense, damp [USDA Classification: very gravelly sandy LOAM] -abundant rounded cobbles of mafic (basalt) and intermediate composition
5.0			GM		-becomes moist
	GB	MC = 9.1		6.5	

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-5

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03734 **LONGITUDE** -120.69431
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, dense to very dense, damp to moist
2.5	GB	MC = 7.7	SM		-weakly cemented, blocky cuttings
4.5					CONGLOMERATE (Thorp gravel), moderate reddish brown (10R 4/6), medium to coarse grained, slightly to highly weathered (Grade II to IV), very weak rock (R1)
5.0	GB	MC = 18.7	BDRK		
6.0					-calcium carbonate cement in interstitial space

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-6

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03613 **LONGITUDE** -120.69399
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, dense, damp
	GB	MC = 5.7	SM		-weakly cemented, blocky cuttings
2.5					
					3.5
	GB	MC = 9.5	GM		Brown silty GRAVEL with sand, very dense, moist
5.0					-increasing moisture
					-increasing sand content
	GB	MC = 12.0			7.0
					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-7

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03554 **LONGITUDE** -120.69508

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, dense, moist
	GB	MC = 9.3	SM		-weakly cemented, blocky cuttings
2.0					
2.5	GB	MC = 6.6	BDRK		CONGLOMERATE (Thorp gravel), dark yellowish orange (10YR 6/6), medium to coarse grained, completely weathered (Grade V), extremely weak rock (R0)
					-abundant rounded cobbles of mafic (basalt) and intermediate composition
5.0					
	GB	MC = 14.2			
6.5					Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-8

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03584 **LONGITUDE** -120.69693
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray sandy SILT, dense, damp -weakly cemented, blocky cuttings [USDA Classification: slightly gravelly LOAM]
	GB	MC = 7.6 Fines = 54.7	ML		
2.5					
					3.0
					Golden brown silty GRAVEL with sand, very dense, moist
	GB	MC = 9.3			
5.0			GM		-rounded cobbles of mafic (basalt) and intermediate composition -mainstream alluvium?
	GB	MC = 5.7			
					7.0
					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-9

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03618 **LONGITUDE** -120.69880
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
	GB	MC = 7.7			
					-weaky cemented, blocky cuttings
2.5			SM		
5.0					
	GB	MC = 10.8			
6.0					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-10

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03627 **LONGITUDE** -120.70008
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB	MC = 5.8	SM		Dark brownish gray silty SAND, dense to very dense, damp to moist
2.5			SM		-weaky cemented, blocky cuttings
4.0	GB	MC = 6.2	GM		Brown silty GRAVEL with sand, very dense, damp to moist
5.0	GB	MC = 9.0	BDRK		CONGLOMERATE (Thorp gravel), dusky yellowish brown (10YR 2/2), medium to coarse grained, slightly to highly weathered (Grade II to IV), very weak rock (R1) -calcium carbonate cement in interstitial space
6.0					Test pit terminated at 6.0 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-11

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03605 **LONGITUDE** -120.70124
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, dense, damp
	GB	MC = 5.3	SM		-weakly cemented, blocky cuttings
2.5				2.5	Brown silty GRAVEL with sand, very dense, damp
	GB	MC = 6.3	GM		
5.0					
	GB	MC = 9.3		6.0	-increasing sand and moisture content

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-12

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03536 **LONGITUDE** -120.70094
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, dense, moist
	GB	MC = 10.9			-weakly cemented, blocky cuttings
2.5			SM		
5.0					-becomes golden brown
	GB	MC = 14.6			
6.0					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-13

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03450 **LONGITUDE** -120.70083
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray SILT with sand, dense to very dense, damp to moist
	GB	MC = 11.4 Fines = 77.2			[USDA Classification: slightly gravelly LOAM]
					-weakly cemented, blocky cuttings
2.5			ML		
					-becomes golden brown, decreasing degree of cementation
5.0					
	GB	MC = 18.9			
6.5					Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-14

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03371 **LONGITUDE** -120.70048
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray poorly graded GRAVEL with silt and sand, dense to very dense, damp
					-abundant large sub-angular to sub-rounded gravels and cobbles of mafic (basalt) and intermediate composition
2.5	GB	MC = 4.7	GP-GM		
5.0					Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-15

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03295 **LONGITUDE** -120.70014
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB	MC = 8.0 Fines = 5.5	GP-GM		Gray poorly graded GRAVEL with silt and sand, dense, damp to moist [USDA Classification: extremely gravelly sandy LOAM]
2.0					
2.5	GB	MC = 10.2	GM		Golden brown silty GRAVEL with sand, dense, moist -increasing moisture content -slight decrease in density
5.0	GB	MC = 13.5			
7.0					Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-16

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03218 **LONGITUDE** -120.69970
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road/prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, dense, moist
	GB	MC = 11.9			-weakly cemented, blocky cuttings
					-becomes golden brown
2.5			SM		-decreased cementation
	GB	MC = 19.2			-increased moisture
5.0					
	GB	MC = 21.3			
				6.0	Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-17

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03125 **LONGITUDE** -120.69933
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB	MC = 9.8 Fines = 6.6	GW-GM		Gray well-graded GRAVEL with silt and sand, dense to very dense, moist [USDA Classification: extremely gravelly loamy coarse SAND] -weakly cemented -abundant gravels/cobbles
2.5					
5.0	GB	MC = 8.0		6.0	

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-18

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03046 **LONGITUDE** -120.69860
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
	GB	MC = 11.1			-weakly cemented, blocky cuttings, probed 2"
2.5					-probed 1"
			SM		-becomes golden brown
	GB	MC = 13.6			
5.0					
					6.5
			GM		Brown silty GRAVEL, very dense, moist
	GB	MC = 9.7			7.0

Test pit terminated at 7.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-19

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.02992 **LONGITUDE** -120.69808

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL with sand, dense, moist
					-abundant angular gravels, cobbles, and boulders primarily of basaltic composition
2.5			GM		
5.0	GB	MC = 10.1		5.0	Test pit terminated at 5.0 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-20

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.02977 **LONGITUDE** -120.69681
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brown poorly graded GRAVEL with silt and sand, dense, damp to moist
	GB	MC = 6.3 Fines = 8.8			[USDA Classification: extremely gravelly LOAM]
2.5					-becomes brown
	GB	MC = 9.9	GP-GM		
5.0					-decreasing grain size, increasing moisture
	GB	MC = 12.2		6.0	

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-21

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.02972 **LONGITUDE** -120.69583
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road/prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL, dense to very dense, moist
	GB	MC = 12.7			
					-becomes brown
2.5			GM		-abundant angular gravels and cobbles primarily of basaltic composition, some intermediate
5.0					-becomes wet
	GB	MC = 22.8		6.5	

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-22

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.02980 **LONGITUDE** -120.69467
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road/prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
	GB	MC = 10.3	SM		-weakly cemented, blocky cuttings
2.5				2.0	Dark brownish gray silty GRAVEL with sand, very dense, moist
			GM		-abundant sub-angular to sub-rounded gravels primarily of (vesicular) basaltic composition, some intermediate
5.0	GB	MC = 12.4		5.0	Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-23

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.02980 **LONGITUDE** -120.69314

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Graded road/prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, very dense, moist
	GB	MC = 13.1 Fines = 45.9	SM		-weakly cemented, blocky cuttings [USDA Classification: gravelly LOAM]
2.0					CONGLOMERATE (Thorp gravel), dark yellowish orange (10YR 6/6), medium to coarse grained, completely weathered (Grade V), extremely weak rock (R0)
2.5	GB	MC = 9.5	BDRK		-gravel and cobble clasts are rounded and variable in composition - mafic to intermediate
4.0					Test pit terminated at 4.0 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-24

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.02987 **LONGITUDE** -120.69183
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brown silty SAND, very dense, moist
	GB	MC = 11.7			-weakly cemented, blocky cuttings
2.5			SM		-becomes brown
5.0					-increasing moisture
	GB	MC = 20.1		6.5	

Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-25

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03002 **LONGITUDE** -120.69046
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
	GB	MC = 8.1			-weakly cemented, blocky cuttings
2.5			SM		-becomes brown
					-increasing moisture
5.0	GB	MC = 12.8			
				6.0	Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-26

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03047 **LONGITUDE** -120.68988
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray sandy SILT, very dense, damp to moist
	GB	MC = 8.0 Fines = 55.8			-weakly cemented, blocky cuttings [USDA Classification: slightly gravelly LOAM] -becomes brown
2.5			ML		
5.0	GB	MC = 9.1			
				5.5	Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-27

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03132 **LONGITUDE** -120.69002
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, damp to moist
	GB	MC = 7.2	SM		-weakly cemented, blocky cuttings
2.5					
					4.0
					CONGLOMERATE (Thorp gravel), dark yellowish orange (10YR 6/6), medium to coarse grained, completely weathered (Grade V), extremely weak rock (R0)
5.0			BDRK		
	GB	MC = 9.2			-gravel and cobble clasts are sub-angular
					6.0
					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-28

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03146 **LONGITUDE** -120.69067
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			SM		Dark brownish gray silty SAND with gravel, dense, moist
					-weakly cemented, blocky cuttings
1.0	GB	MC = 6.0			Brown well-graded SAND with silt and gravel, very dense, moist
2.5	GB	MC = 11.3 Fines = 11.6	SW-SM		[USDA Classification: very gravelly loamy coarse SAND]
5.0	GB	MC = 13.0			-heavily oxidized
6.0					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-29

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03151 **LONGITUDE** -120.69178
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
			SM		-weakly cemented, blocky cuttings
	GB	MC = 6.8 Fines = 47.6			[USDA Classification: slightly gravelly LOAM]
				1.5	Orange-ish brown silty GRAVEL with sand, very dense, moist to wet
2.5					-heavy iron oxide staining, very weak cementation
	GB	MC = 14.3			-mainstream alluvium?
			GM		-becomes gray
5.0					-increasing cobble size
					-decreasing cementation
	GB	MC = 5.6		6.0	

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-30

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03216 **LONGITUDE** -120.69029

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Graded farm road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			SM		Dark brownish gray silty SAND, very dense, moist -weakly cemented, blocky cuttings
1.0	GB	MC = 8.3	BDRK		CONGLOMERATE (Thorp gravel), dusky yellowish brown (10YR 2/2), medium to coarse grained, highly to completely weathered (Grade IV to V), extremely to very weak rock (R0 to R1)
2.5	GB	MC = 11.8		2.5	Test pit terminated at 2.5 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-31

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03295 **LONGITUDE** -120.69019
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded farm road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			SM		Dark brownish gray silty SAND, very dense, moist
					-weaky cemented, blocky cuttings
1.0					
	GB	MC = 6.3	BDRK		CONGLOMERATE (Thorp gravel), dark yellowish orange (10YR 6/6), medium grained, slightly weathered (Grade II), very weak rock (R1)
					-appears to be predominantly sand-sized clasts; sand-dominant member of Thorp gravel trace to minor calcium carbonate cement in interstitial space
	GB	MC = 11.9			
2.0					Test pit terminated at 2.0 feet below existing grade. due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-32

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/28/23 **COMPLETED** 9/28/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03366 **LONGITUDE** -120.68993
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded farm road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Brown silty GRAVEL with sand, dense to very dense, moist to wet
	GB	MC = 14.1 Fines = 12.5			[USDA Classification: extremely gravelly sandy LOAM]
2.5			GM		-abundant cobbles, boulders
5.0					-increasing moisture content
	GB	MC = 19.7			
6.0					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-33

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03428 **LONGITUDE** -120.68951

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
			TPSL		Dark brown TOPSOIL
0.5					
			SM		Dark brownish gray silty SAND, dense, moist
	GB	MC = 11.5			-weakly cemented, blocky cuttings
1.5					
			GM		Dark brown silty GRAVEL, very dense, moist
2.0					

Test pit terminated at 2.0 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-34

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03481 **LONGITUDE** -120.68962
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB	MC = 8.9	GM		Dark brownish gray silty GRAVEL with sand, very dense, moist -abundant sub-angular to sub-rounded gravels primarily of mafic (basalt) composition
2.5					
4.0					Test pit terminated at 4.0 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-35

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03534 **LONGITUDE** -120.68970
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL with sand, very dense, moist
					-abundant sub-angular to sub-rounded gravels primarily of (vesicular) basaltic composition, some intermediate
2.5			GM		
5.0	GB	MC = 4.9		5.5	

Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-36

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03660 **LONGITUDE** -120.68937
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray SILT with sand, very dense, moist
					-probed 8"
	GB	MC = 9.7 Fines = 78.1			-weakly cemented, blocky cuttings [USDA Classification: slightly gravelly LOAM]
2.5			ML		-probed 1"
5.0					-increasing moisture content
					-scattered fine gravel
	GB	MC = 15.9			
6.0					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-37

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03806 **LONGITUDE** -120.68947
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL, very dense, moist
1.0			GM		
1.5	GB	MC = 8.9	BDRK		CONGLOMERATE (Thorp gravel), moderate reddish brown (10R 4/6), medium to coarse grained, slightly to highly weathered (Grade II to IV), very weak rock (R1) -calcium carbonate cement in interstitial space

Test pit terminated at 1.5 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-38

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03918 **LONGITUDE** -120.68970
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, very dense, moist -weakly cemented, blocky cuttings
	GB	MC = 5.9	SM		
2.0					CONGLOMERATE (Thorp gravel), moderate reddish brown (10R 4/6), medium to coarse grained, slightly to highly weathered (Grade II to IV), very weak rock (R1) -trace calcium carbonate cement in interstitial space
2.5	GB	MC = 6.8	BDRK		
3.0					Test pit terminated at 3.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-39

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.04024 **LONGITUDE** -120.69072

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray sandy SILT, very dense, moist
			ML		-sub-angular to sub-rounded gravels
	GB	MC = 6.5 Fines = 59.7			[USDA Classification: gravelly LOAM]
				1.5	Brown silty GRAVEL with sand, very dense, moist
2.5			GM		-sub-angular to sub-rounded gravels and cobbles
				3.5	Test pit terminated at 3.5 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-40

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03872 **LONGITUDE** -120.68854

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					
	GB	MC = 8.1	GM		Dark brownish gray silty GRAVEL, very dense, moist -rounded gravels and cobbles primarily of mafic (basalt) composition
1.5					Test pit terminated at 1.5 feet below existing grade due to refusal. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-41

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03967 **LONGITUDE** -120.68859
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray sandy SILT, very dense, moist
	GB	MC = 7.3			-scattered gravel
					-strongly cemented, blocky cuttings
					-zones of white cementation/precipitate
2.5					
			ML		-decreasing degree of cementation
5.0					
	GB	MC = 11.5 Fines = 67.0			[USDA Classification: slightly gravelly LOAM]
					-increasing moisture content
7.5					
	GB	MC = 14.8			
				8.0	Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-42

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03982 **LONGITUDE** -120.68844
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL with sand, very dense, moist (Fill)
	GB	MC = 4.3	GM		-woven fabric
2.5					
				4.0	Dark brown SILT with sand, dense, wet
5.0					
	GB	MC = 18.3 Fines = 72.8	ML		[USDA Classification: slightly gravelly LOAM]
7.5					
	GB	MC = 25.7		9.0	-becomes brown

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-43

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.04078 **LONGITUDE** -120.68783
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL with sand, very dense, moist (Fill)
	GB	MC = 3.8	GM		
2.5					
					3.0
					Dark brownish gray silty GRAVEL with sand, very dense, damp to moist
			GM		
5.0					
					5.0
					Dark brown silty SAND, dense, wet
			SM		
	GB	MC = 17.4			
					6.0
					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-44

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.04154 **LONGITUDE** -120.68637

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty GRAVEL with sand, very dense, moist
	GB	MC = 4.1 Fines = 16.4	GM		[USDA Classification: extremely gravelly LOAM]
					-abundant sub-angular to sub-rounded basaltic gravels and cobbles primarily of basaltic composition
2.5					
				4.0	
			SM		Golden brown silty SAND, dense, moist to wet
5.0	GB	MC = 14.3		5.0	

Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-45

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03499 **LONGITUDE** -120.69080
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
	GB	MC = 6.8			-weakly cemented, blocky cuttings
2.5			SM		
5.0					
6.5					Test pit terminated at 6.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-46

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03379 **LONGITUDE** -120.69230

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, dense to very dense, moist
	GB	MC = 9.4			
					-weakly cemented, blocky cuttings
2.5			SM		
5.0					-few scattered cobbles/boulders
				6.0	

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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TEST PIT NUMBER TP-47

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03290 **LONGITUDE** -120.69471
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road/prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray sandy SILT, very dense, moist
	GB	MC = 7.7 Fines = 59.1	ML		[USDA Classification: slightly gravelly LOAM] -weakly cemented, blocky cuttings
2.5				2.5	Dark brownish gray silty GRAVEL, very dense, moist
			GM		-rounded cobbles -increasing moisture content
5.0	GB	MC = 13.8		6.0	

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

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
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Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-48

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03308 **LONGITUDE** -120.69784
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road/prairie grass **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND, very dense, moist
	GB	MC = 8.1			
					-weakly cemented, blocky cuttings
2.5			SM		
5.0					-increasing moisture content
	GB	MC = 16.5			
6.0					Test pit terminated at 6.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

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Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-49

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03746 **LONGITUDE** -120.70258
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, very dense, moist
					-weakly cemented, blocky cuttings
2.5			SM		-rounded gravels/cobbles
	GB	MC = 8.5			
5.0					
					5.5

Test pit terminated at 5.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-50

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development
DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**
EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.03854 **LONGITUDE** -120.70327
LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**
NOTES ▽ **AT TIME OF EXCAVATION**
SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Dark brownish gray silty SAND with gravel, very dense, moist
	GB	MC = 6.0 Fines = 35.0			-fine to small angular gravels
					[USDA Classification: gravelly sandy LOAM]
2.5			SM		-increasing abundance of cobbles and small boulders
5.0	GB	MC = 4.7		5.0	

Test pit terminated at 5.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-51

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development

DATE STARTED 9/29/23 **COMPLETED** 9/29/23 **GROUND ELEVATION**

EXCAVATION CONTRACTOR Client Provided **LATITUDE** 47.04020 **LONGITUDE** -120.70227

LOGGED BY BCS **CHECKED BY** KDH **GROUND WATER LEVEL:**

NOTES ▽ **AT TIME OF EXCAVATION**

SURFACE CONDITIONS Graded road **AFTER EXCAVATION**

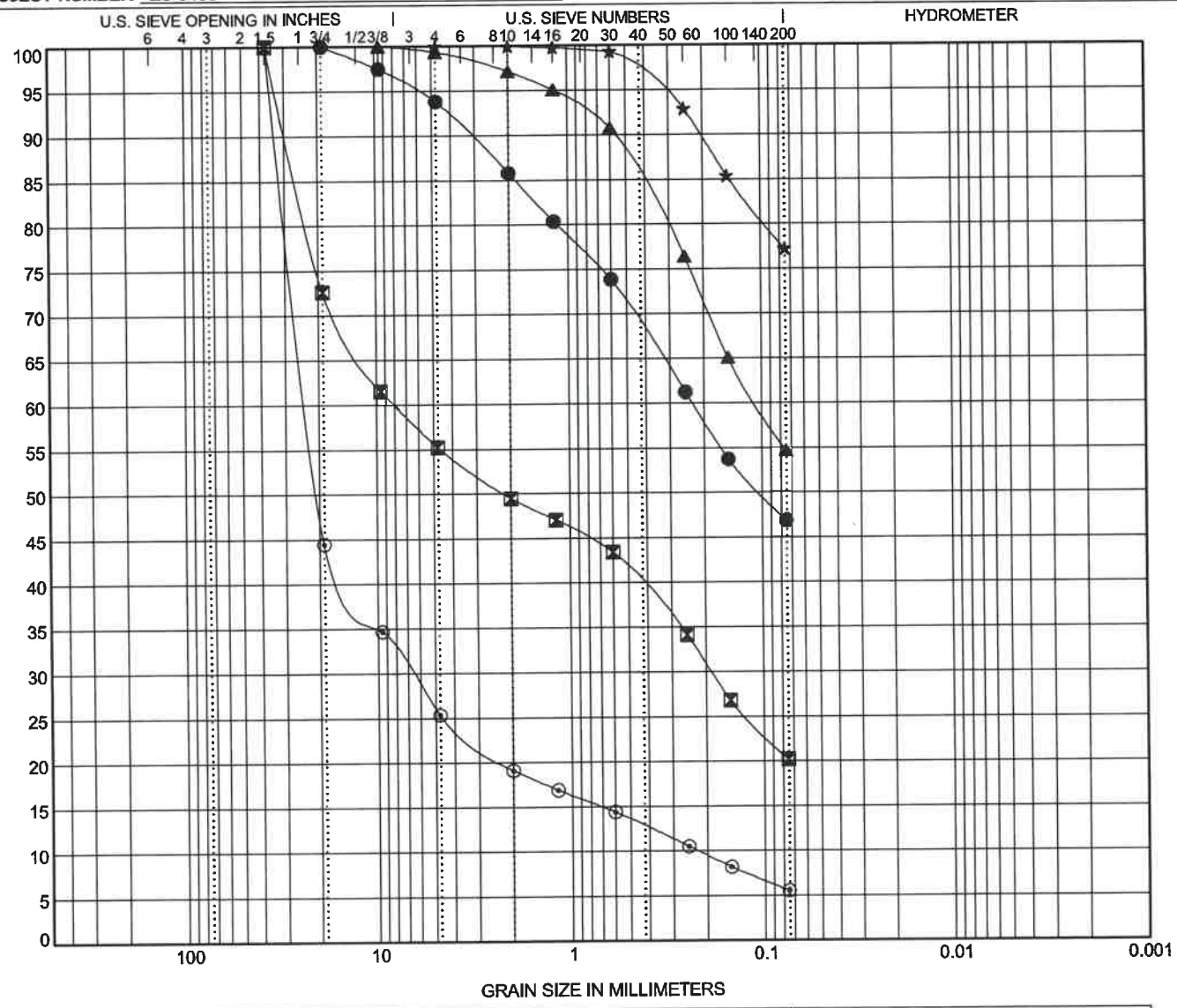
DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0			GM		Dark brown silty GRAVEL with sand, very dense, moist (Fill)
					-abundant organics
				1.0	Dark brown silty GRAVEL with sand, very dense, moist
2.5			GM		
	GB	MC = 4.8		4.0	Test pit terminated at 4.0 feet below existing grade. No groundwater encountered during excavation. No caving observed.

LIMITATIONS: Ground elevation (if listed) is approximate; the test location was not surveyed. Coordinates are approximate and based on the WGS84 datum. Do not rely on this test log as a standalone document. Refer to the text of the geotechnical report for a complete understanding of subsurface conditions.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-01	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: SM.		
⊠ TP-04	3.00ft.	USDA: Dk Brown Very Gravelly Sandy Loam. USCS: GM with Sand.		
▲ TP-08	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: Sandy ML.		
★ TP-13	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: ML with Sand.		
⊙ TP-15	1.00ft.	USDA: Gray Extremely Gravelly Sandy Loam. USCS: GP-GM with Sand.	8.77	103.02

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-01	1.0ft.	19	0.229						46.9	
⊠ TP-04	3.0ft.	37.5	8.032	0.187					20.2	
▲ TP-08	1.0ft.	9.5	0.107						54.7	
★ TP-13	1.0ft.	4.75							77.2	
⊙ TP-15	1.0ft.	37.5	22.977	6.704	0.223				5.5	

GRAIN SIZE USDA ES-9453 HUNTER ROAD DEVELOPMENT.GPJ GINT US LAB.GDT 10/20/23

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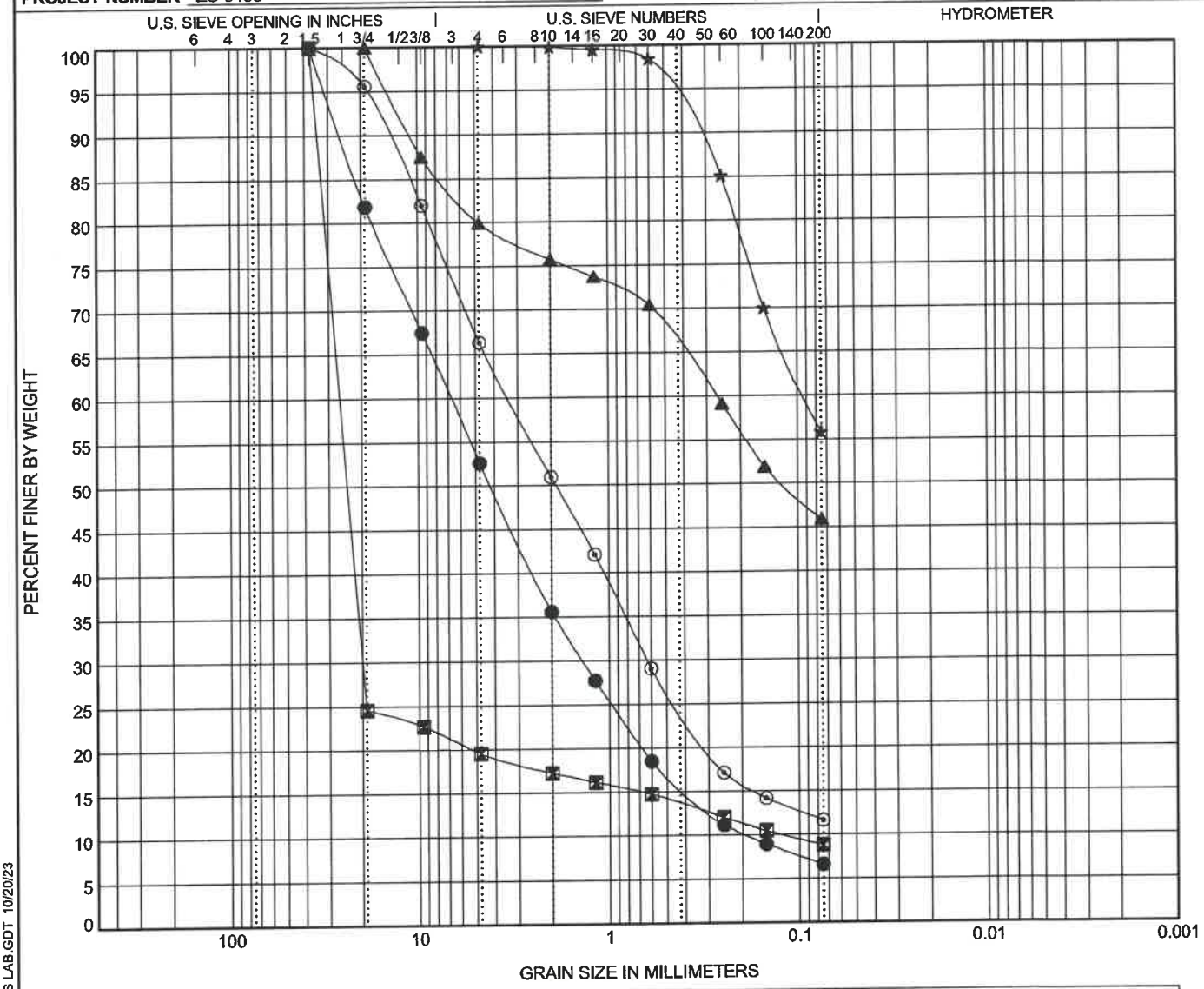
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-17	1.00ft.	USDA: Gray Extremely Gravelly Loamy Coarse Sand. USCS: GW-GM with Sand.	1.47	35.09
⊠ TP-20	1.00ft.	USDA: Dk Brown Extremely Gravelly Loam. USCS: GP-GM.	124.42	213.72
▲ TP-23	1.00ft.	USDA: Dk Brown Gravelly Loam. USCS: SM with Gravel.		
★ TP-26	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: Sandy ML.		
⊙ TP-28	3.00ft.	USDA: Brown Very Gravelly Loamy Coarse Sand. USCS: SW-SM with Gravel.	2.47	69.01

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-17	1.0ft.	37.5	6.701	1.373	0.191				6.6	
⊠ TP-20	1.0ft.	37.5	26.146	19.949	0.122				8.8	
▲ TP-23	1.0ft.	19	0.267						45.9	
★ TP-26	1.0ft.	4.75	0.092						55.8	
⊙ TP-28	3.0ft.	37.5	3.325	0.629					11.6	

GRAIN SIZE USDA ES-9453 HUNTER ROAD DEVELOPMENT.GPJ GINT US LAB.GDT 10/20/23

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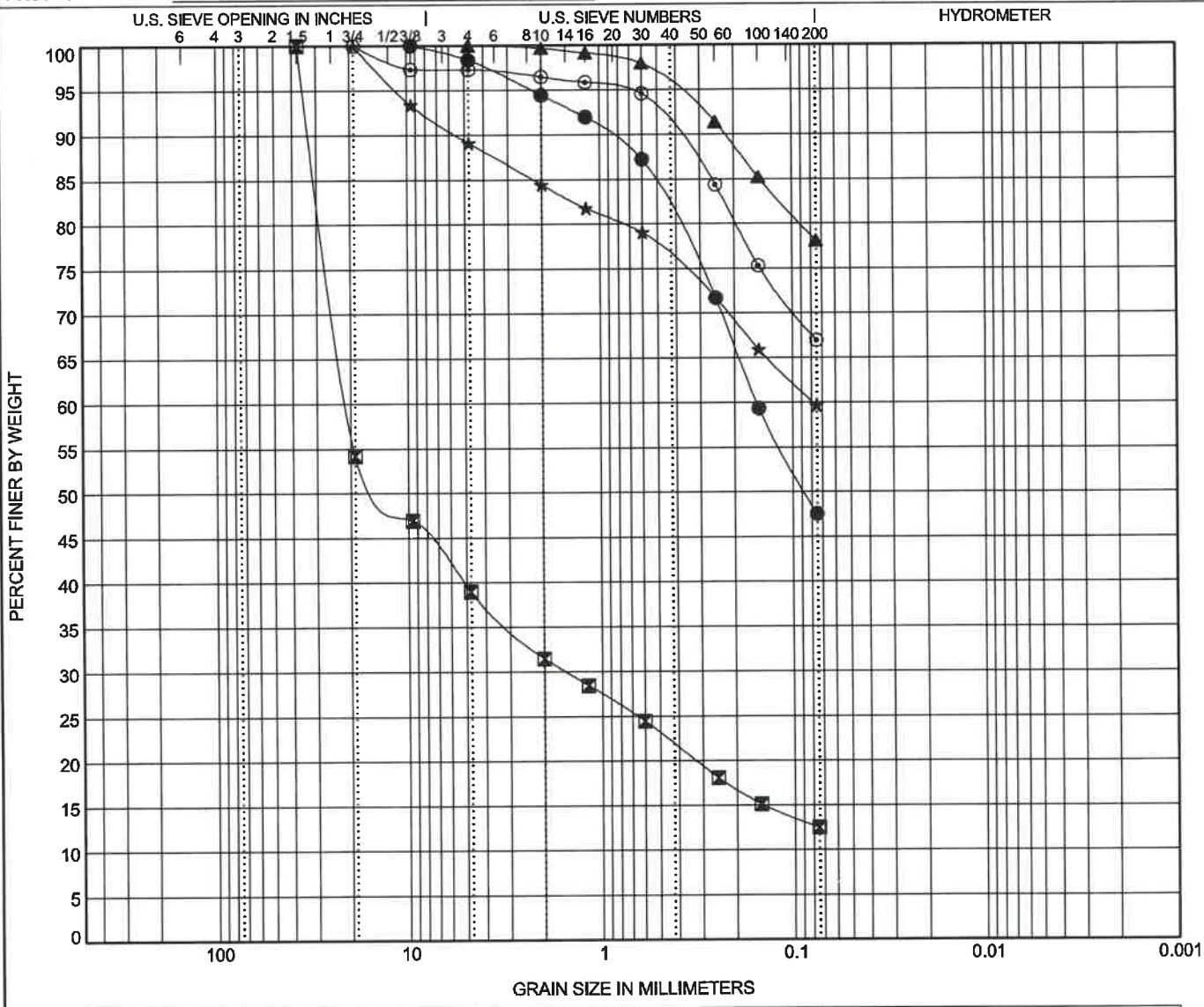
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-29	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: SM.		
⊠ TP-32	1.00ft.	USDA: Brown Extremely Gravelly Sandy Loam. USCS: GM with Sand.	2.91	526.89
▲ TP-36	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: ML with Sand.		
★ TP-39	1.00ft.	USDA: Dk Brown Gravelly Loam. USCS: Sandy ML.		
⊙ TP-41	6.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: Sandy ML.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-29	1.0ft.	9.5	0.154						47.6	
⊠ TP-32	1.0ft.	37.5	20.704	1.54					12.5	
▲ TP-36	1.0ft.	4.75							78.1	
★ TP-39	1.0ft.	19	0.078						59.7	
⊙ TP-41	6.0ft.	19							67.0	

GRAIN SIZE USDA ES-9453 HUNTER ROAD DEVELOPMENT.GPJ GINT US LAB.GDT 10/20/23

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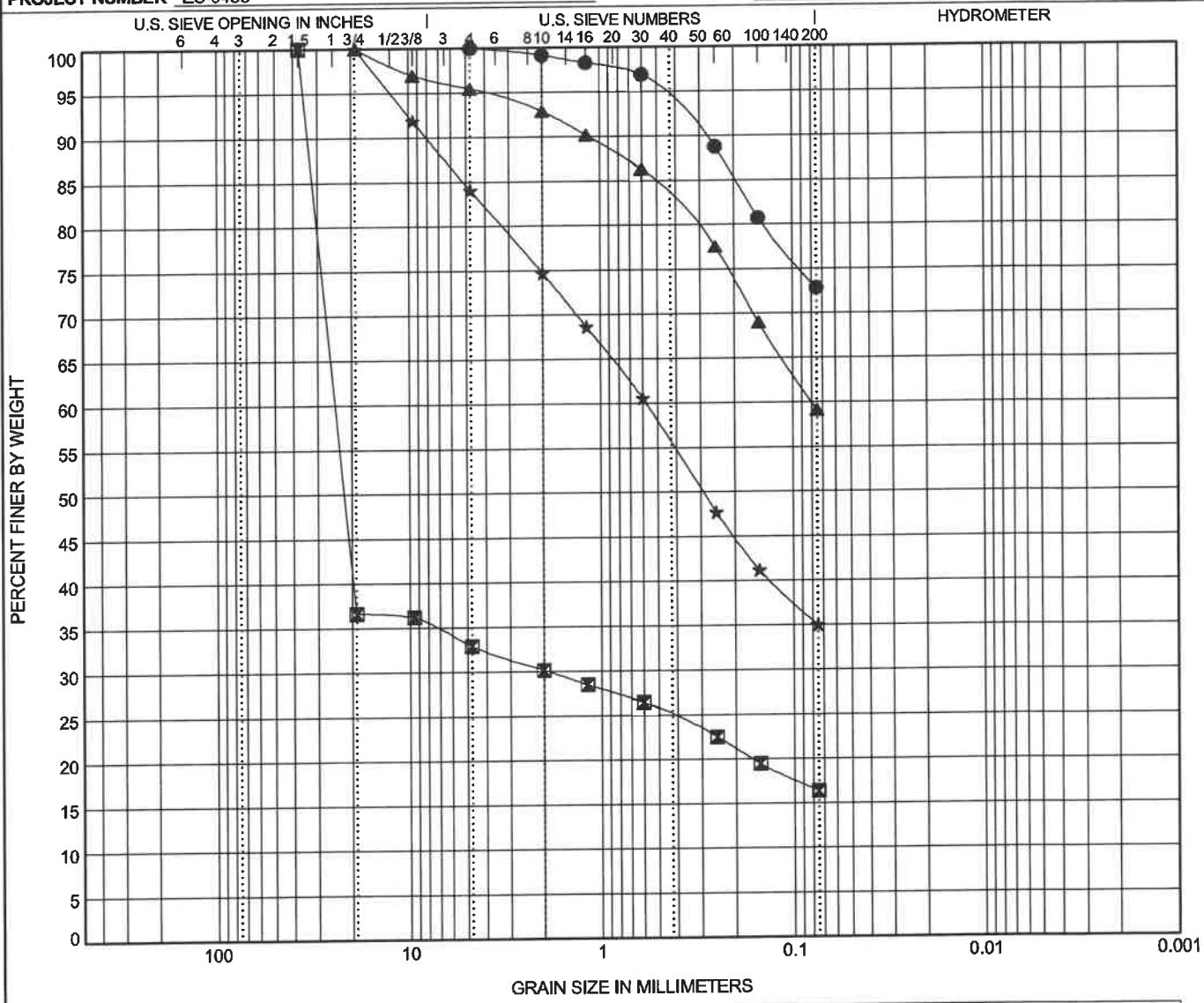
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-9453 **PROJECT NAME** Hunter Road Development



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	Cc	Cu
● TP-42	6.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: ML with Sand.		
⊠ TP-44	1.00ft.	USDA: Dk Brown Extremely Gravelly Loam. USCS: GM with Sand.		
▲ TP-47	1.00ft.	USDA: Dk Brown Slightly Gravelly Loam. USCS: Sandy ML.		
★ TP-50	1.00ft.	USDA: Dk Brown Gravelly Sandy Loam. USCS: SM with Gravel.		

Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
● TP-42	6.0ft.	4.75							72.8	
⊠ TP-44	1.0ft.	37.5	24.414	1.892					16.4	
▲ TP-47	1.0ft.	19	0.08						59.1	
★ TP-50	1.0ft.	19	0.577						35.0	

GRAIN SIZE USDA ES-9453 HUNTER ROAD DEVELOPMENT.GPJ GINT US LAB.GDT 10/20/23

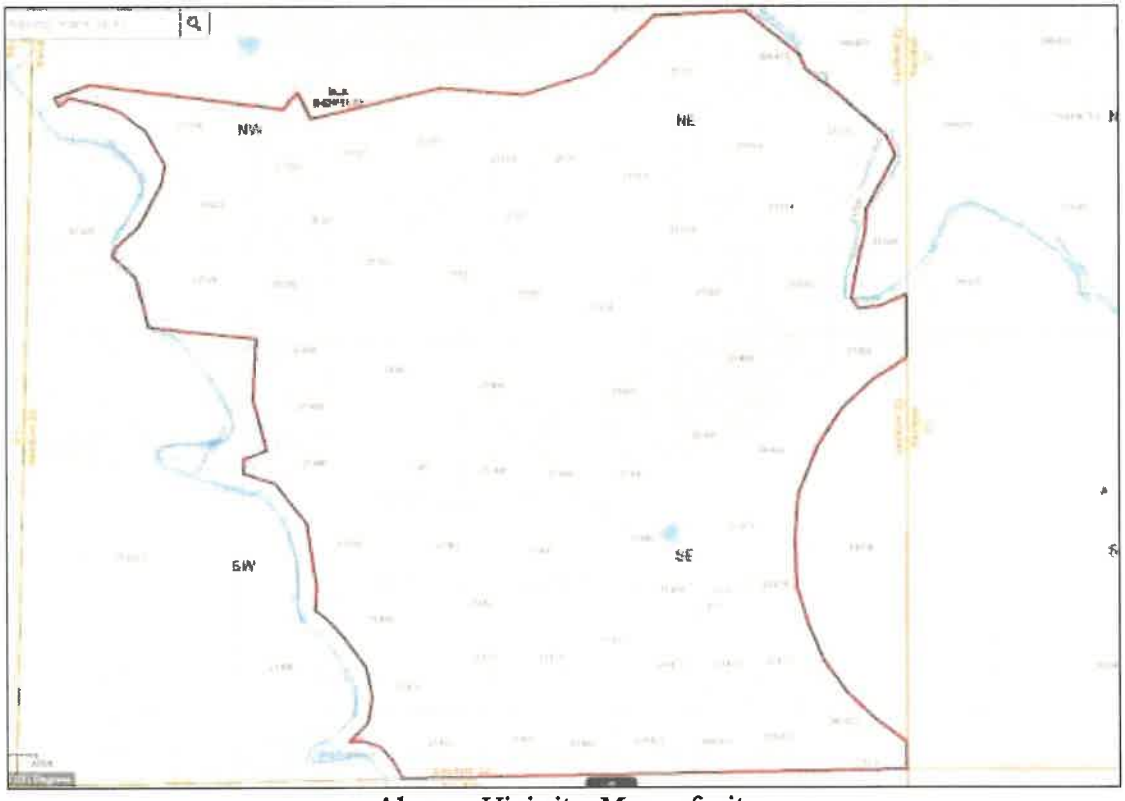
Sewall Wetland Consulting, Inc.
PO Box 880
Fall City, WA 98024
Phone: 253-859-0515

July 26, 2023

Victor Jansen
PO Box 579
Moses Lake, Washington 98837

RE: Critical Area Report – Hunter Road Property
Kittitas County, Washington
SWC Job #22-189

This report describes our observations of any jurisdictional wetlands, streams and/or buffers on or within 200' of the approximate 412 acre Hunter Road property in unincorporated Kittitas County, Washington.



Above: Vicinity Map of site

Above: Aerial photograph of the study area from Kittitas Mapsifter website. Note property lines are incorrectly depicted on this map and have been shifted to the west.

The site includes 65 existing tax parcels and is accessed off Hunter Road. The site is located within most of Section 22, Township18 North, Range 17 east of the W.M.

METHODOLOGY

Ed Sewall of Sewall Wetland Consulting, Inc. inspected the site and areas within 200' of the site between October 2022 and July of 2023.

The site was reviewed using methodology described in the ***Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0)*** (USACOE September 2008) as required by the US Army Corps of Engineers starting in June of 2009. This is the methodology currently recognized by Kittitas County for wetland determinations and delineations. The site was also reviewed using methodology described in Soil colors were identified using the 1990 Edited and Revised Edition of the ***Munsell Soil Color Charts*** (Kollmorgen Instruments Corp. 1990.

Wetlands in Kittitas County are rated using the 2014 Washington State Department of Ecology Washington State *Wetland Rating System for Eastern Washington, 2014 Update* dated June 2014 Publication No. 14-06-018.

The ordinary high water mark (OHWM) of any streams was located based upon the criteria described in the *Washington Department of Ecology publication Determining The Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State* (WADOE Publication 16-06-029, March 2010 revised October 2016).

OBSERVATIONS

Existing Site Documentation.

Prior to visiting the site, a review of several natural resource inventory maps was conducted. Resources reviewed included the Kittitas Taxsifter website, National Wetland Inventory Map, WDNR Fpars Stream Typing Map, Kittitas County critical areas mapping, and the NRCS Soil Survey online mapping and Data.

Kittitas Taxsifter Website

The Kittitas Taxsifter website with streams and wetland layers activated depicts three (3) Type N streams and two Type F streams.

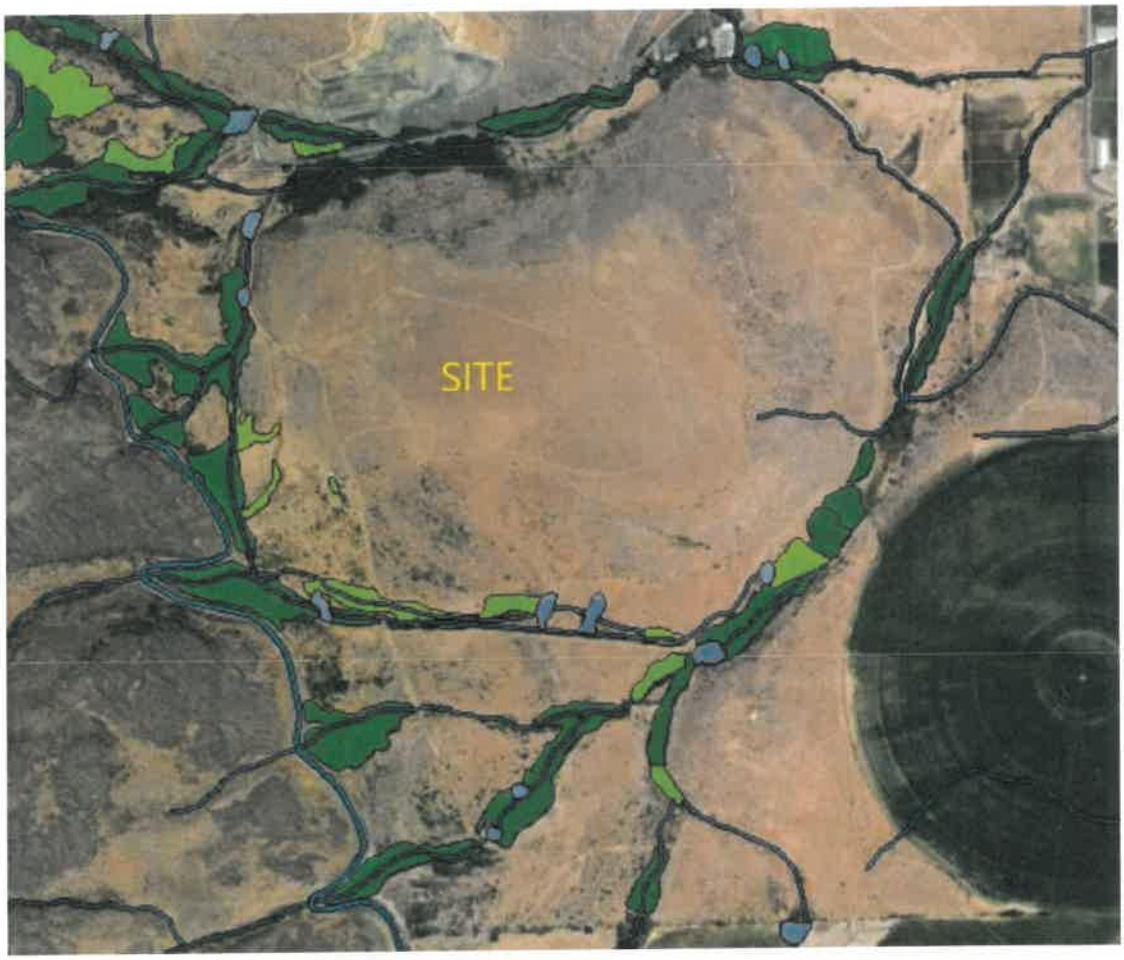
In addition, various wetland are mapped along these stream drainages all starting at the Taneum KRD canal which borders the west side of the site.

Above: Kittitas County Taxsifter with the stream layer activated.

Above: Kittitas County Taxsifter with the wetland layer activated.

National Wetlands Inventory (NWI)

The NWI map depicts a large amount of wetland along the drainages all east of the KRD Canal. This mapping done off 2017 aerial photographs was interpreted when the site still had canal seepage influencing the sites drainages. This was eliminated in 2021 and drastically changed the site hydrology. Almost all of these wetland areas have since dried up and are reverting to a xeric upland plant community. .

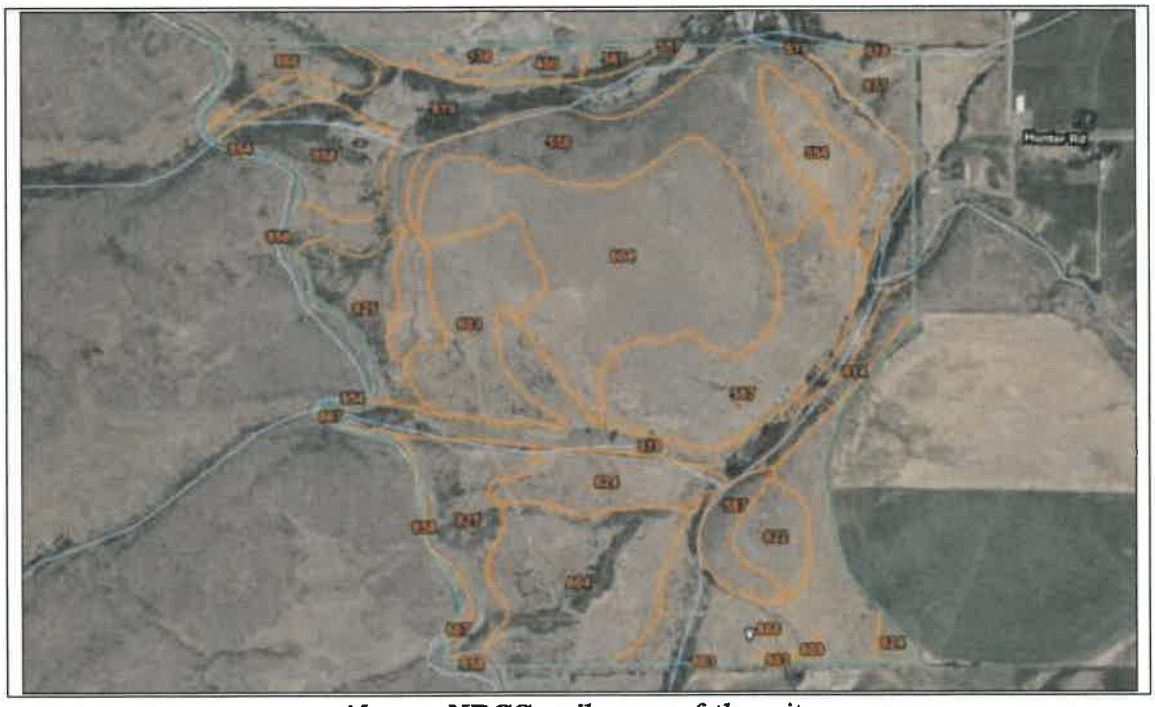


The wetlands and deepwater habitats in this area were photo interpreted using **1 meter (or less) digital, color infrared** imagery from **2017**. Click here for project specific mapping conventions and information.

Above: NWI map of the area of the site

Soil Survey

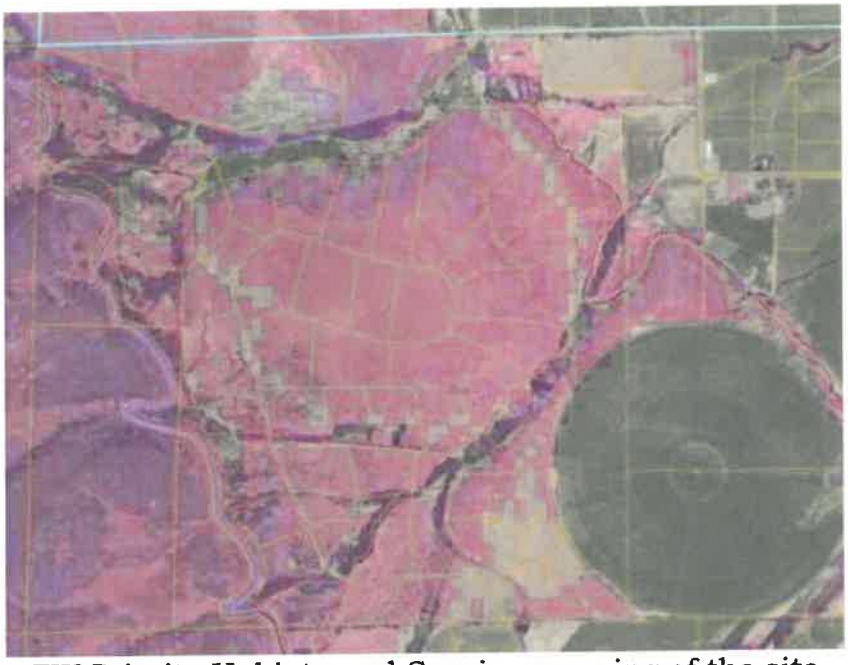
According to the NRCS Soil Mapper website, the site is mapped as containing nineteen (19) different soil types. Almost every soil type with the exception of one has a "well drained" drainage class. One of the soil types is moderately well drained. The soils originate in various parent materials including loess, alluvium, colluvium and glacial drift. None of the soils on the site are considered "hydric" or wetland soils according to the publication Hydric Soils of the United States (USDA NTCHS Pub No.1491, 1991).



Above: NRCS soil map of the site.

WDFW Priority Habitats and Species Maps

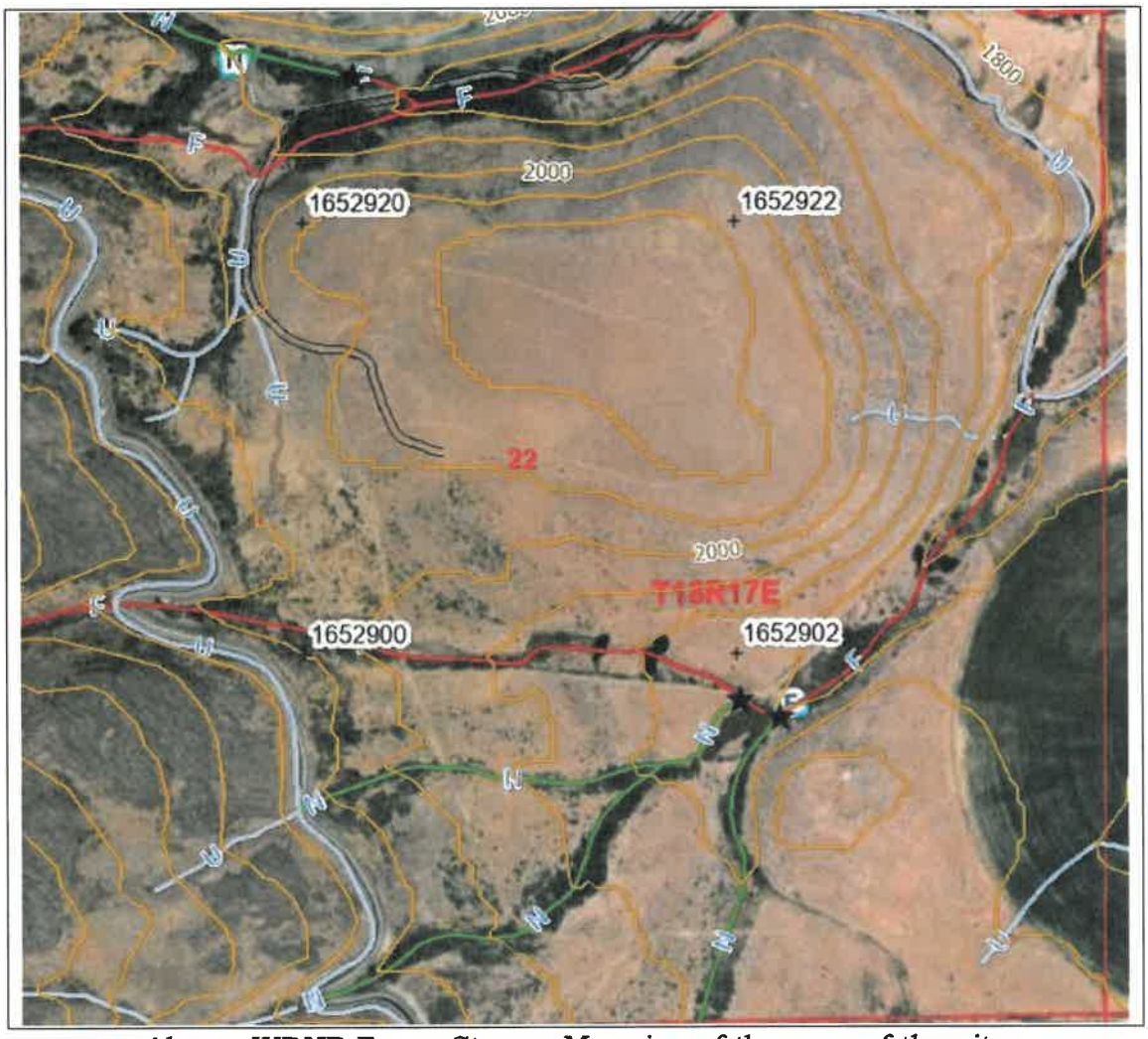
The WDFW Priority Habitats mapping of the site depicts nearly the entire site as "shrub steppe", as well as within the Township which the golden eagle and gray wolf are present. The wetlands depicted on the National Wetland Inventory are also carried over into this mapping.



Above: WDFW Priority Habiats and Species mapping of the site.

WADNR FPARS website

According to the WADNR FPARS website with stream types layers activated, as shown on the County map, there are two (2) Type F streams and 3 Type N streams and several unclassified drainages shown coming from the canal.

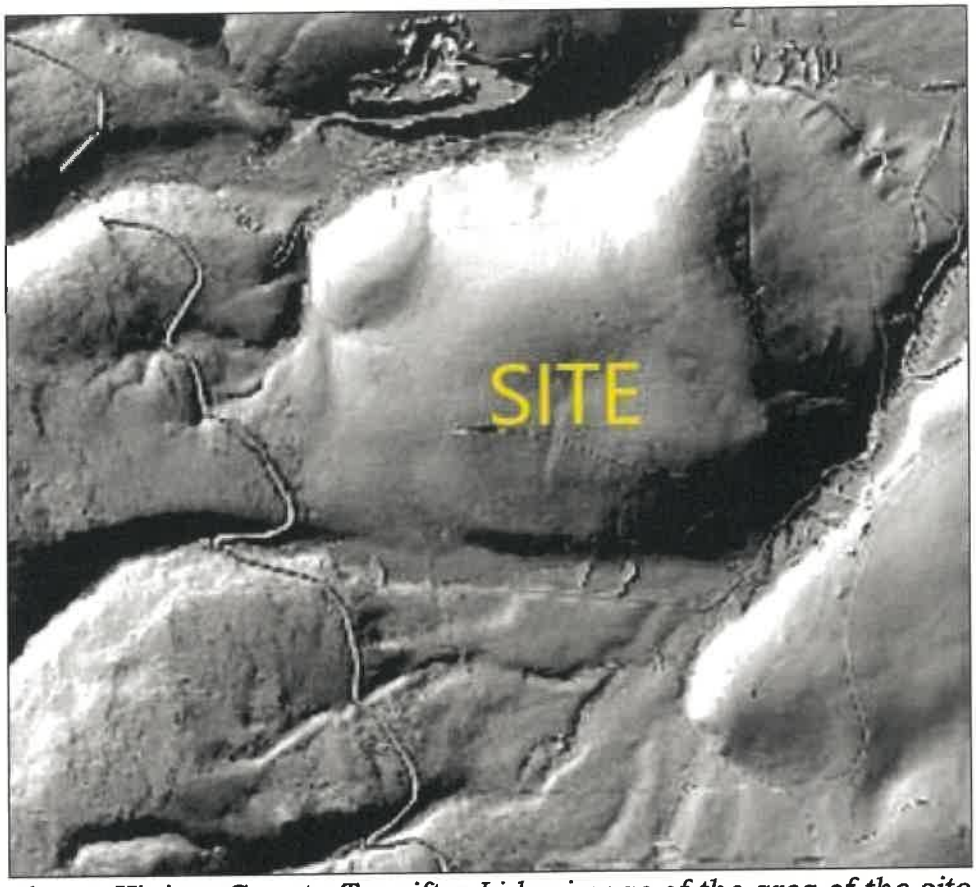


Above: WDNR Fpars Stream Mapping of the area of the site.

Field observations

The site consists of an undeveloped group of 65 abutting parcels all in area that has been historically used for grazing cattle as well as some hay production. Several farm roads pass through the site and numerous stock watering/irrigation ponds are located within the streams passing through the site. Old irrigation ditches are present throughout the site and the top of the hill on the site has an old wheel irrigation system.

The site is bordered by Hunter Road on the north, the south branch of the Taneum KRD canal on the west, and large lot agricultural and single family home parcels to the east and south.



Above: Kittitas County Taxsifter Lidar image of the area of the site.

The site is characterized by sloping topography on the west which slopes down to a central plateau. There is a large hill type feature in the center of the site.

All of the site has been in agricultural use at some time, for both pasture and hay production as well as cattle grazing. Some cattle were observed grazing on the site during our site inspections.

The areas along the west edge of the site and drainages have been primarily artificially supported by canal leakage water for decades, and this has allowed an immature forest community to develop in these areas with cottonwood as the primary overstory tree. Most of these trees are dead or dying now the irrigation canal leakage has been stopped by reconstruction of the canal with a concrete bottom and sides.

The site has a mix of shrubs and thickets of hawthorne, snowberry, small douglas firs, aspen, and substantial amounts of rose. Many weedy species are present including knapweed, mullein, teasel, thistle, as well as cheatgrass and pasture grasses such as quackgrass and fescue.

A small intact area of big sagebrush shrub steppe is present just south of Stream B and west of the existing gravel road that passes north south through the site.

South Branch KRD Canal Refurbishment

As previously noted, the South Branch of the Taneum KRD canal borders the west side of the site. This canal is a major irrigation canal which feeds irrigation throughout the area. The canal has been in existence for over 100 years and has been an earthen structure up until 2021. Since its inception the canal has lost large amounts of water to seepage and leaks which drained easterly onto the site. Some of these were significant enough to form stream-like features from the canal draining to the east. In addition, slope type wetlands were formed and on the slopes of the west side of the site from seepage that was historically present from April when water was directed into the canal, until October when it was shut off.

In 2020-2021the entire canal was rebuilt and refurbished with a complete impervious concrete bottom and sides. The purpose of the work was to stop the loss of water from the canal which was substantial. Water in the canal now only leaves the canal in designated irrigation turnouts, gates or valves. The result has been a dramatic shift in hydrology to the drainages and former wetlands east of the canal and on the site in the two years since the canal lining occurred. The unclassified drainages mapped on the northwest no longer have any flow. The northern Type F water along the north boundary has substantially reduced flow, although flow does still occur into the late spring. The remainder of the streams on the site (south Type F and three Type Ns streams) now only have flow in the spring when snow melt occurs in March. Our review of the site in early April found only the northern Type F stream had any flow. The remainder of the channels on the site were observed to be dry.

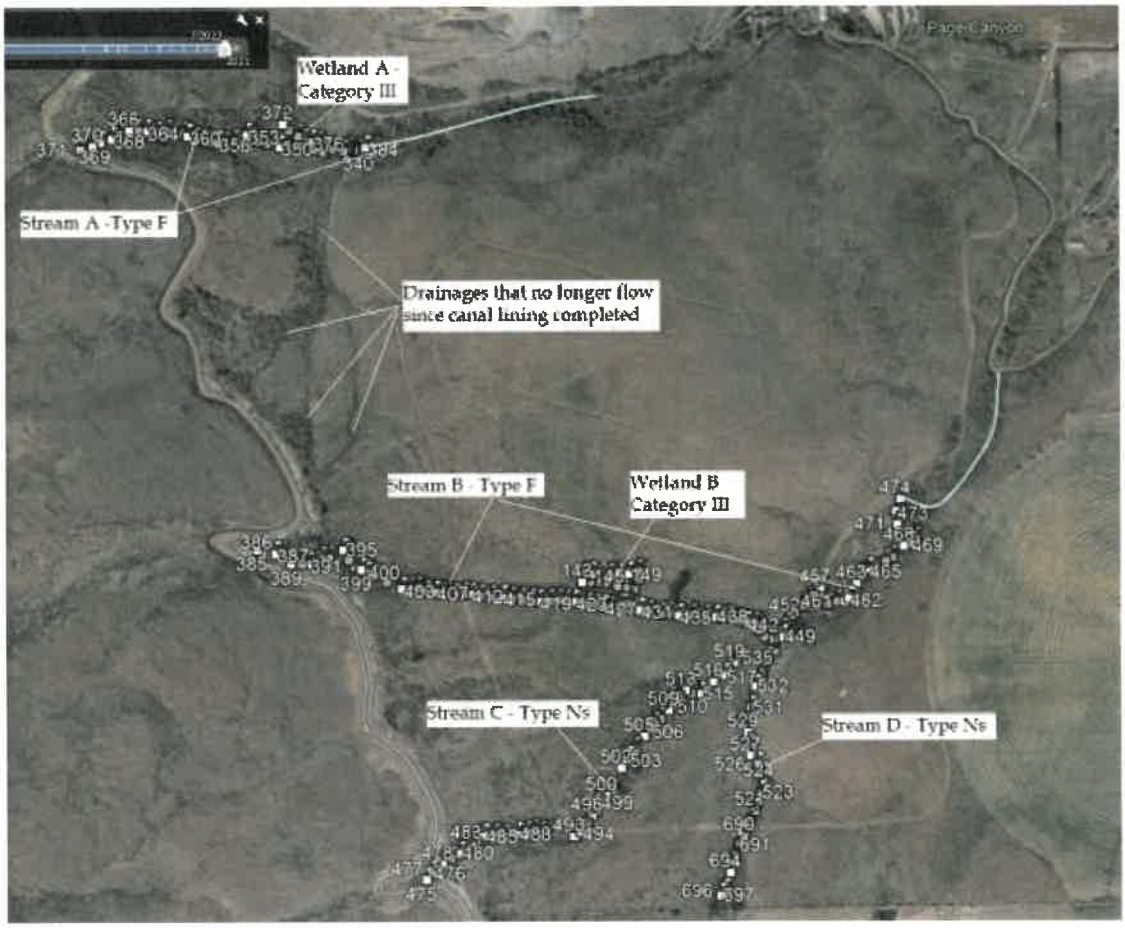
The mapped wetlands on the site have had a dramatic shift in hydrologic conditions with all but a few areas which were fed by spring type features

completely drying out. Many of these areas are vegetated with a mix of cottonwood, sitka alder, and aspen, red-osier dogwood and various emergent vegetation and grasses. Most of the trees in the areas the areas that had wetland conditions are now dead, as are many of the shrubs. Dry weedy species such as knapweed, teasel, cheatgrass, mullein, and tumble mustard are now invading these formerly wet areas.

Soil pits excavated throughout the previously mapped wetlands on the site are now completely dry, although relic hydric soil indicators (depletions and redox features) remain from the previous artificially wet conditions that were present when the canal leaked into these areas for 7 months a year in the growing season.

Wetlands and Streams

A total of four (4) streams and two wetlands were found to remain viable on the site now the canal lining is complete. The following is a description of the critical areas (wetlands and streams) that still remain on the site now that irrigation canal leakage has ceased across the site.

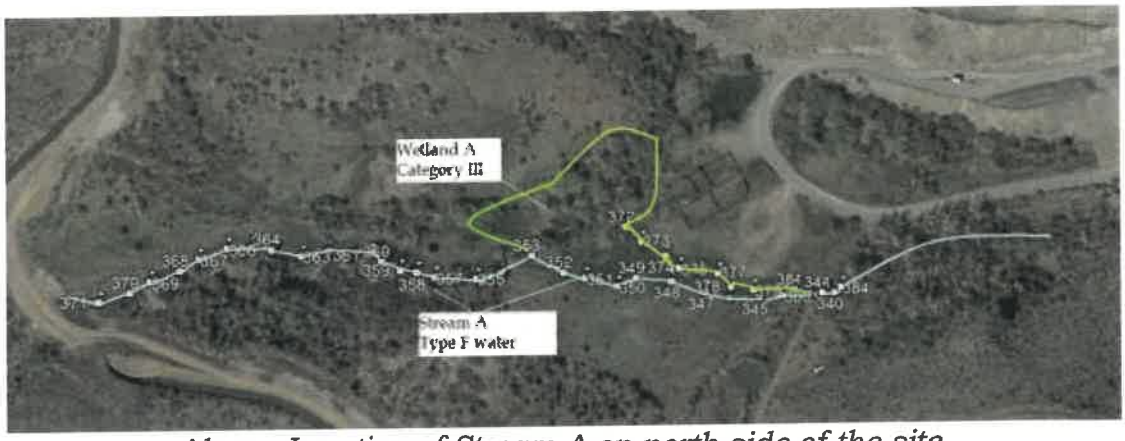


Above: Wetland and stream locations on the site.

Streams

Stream A

Stream A is a small 2'-3' wide channel on the site that drains easterly under the canal on the west side of the site in a culvert. It then passes along the northwest corner of the site before draining under an old farm road to the east off-site. The stream was gps located with points 371-384. The channel is heavily impacted by cattle trampling and in areas is a ditch like feature with cobbles in the bottom. During out site visits only a small amount of flow several inches deep was noted in the channel, primarily in the spring. No fish were observed within the channel, and its use seems unlikely but it does meet the parameters of a fish stream with a slope <16% and channel width of 3'.



Above: Location of Stream A on north side of the site.

This stream is mapped by Kittitas County and WADNR as a Type F stream. According to Kittitas County Municipal Code 17.A.04.030-4, Type F streams in the Columbia Plateau Ecoregion have a 100' buffer measured from the OHWM of the stream. In addition, a 15' Building Setback line is required from the edge of the buffer.

Table 17A.04.030-4 Standard RMZ Widths
Kittitas County Nonshoreline Rivers, Streams, Lakes and Ponds
(does not include building setback [KCC 17A.01.090.5])

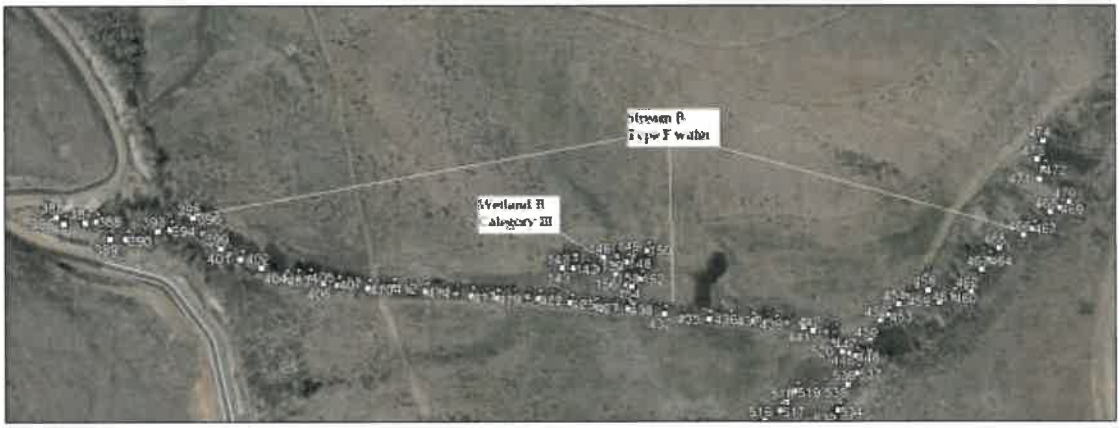
Stream Type	Riparian Management Zone Widths[1,2]	
	Cascade Ecoregion (feet)	Columbia Plateau Ecoregion (feet)
Type S (Shoreline)	See the SMP	See the SMP
Type F	150	100
Type Np	100	65
Type Ns	50	40

Stream B

Stream B is another small channel which is 4'-5' wide and contains 6 ponds constructed along its channel through the site. An existing gravel road crosses this stream and then parallels the south side as it proceeds easterly through the site. Although the channel is up to 5' in width currently it appears when there is flow, it only flows in a 1'-2' channel due to reduced flow from the canal work. The stream was gps located with points 385-474. All of the ponds and two road crossings create man-made barriers to any fish use through the channel. The channel has evidence of much higher flow when the canal leakage provided hydrology to the stream. Now the flow is only seasonal spring flow which is not enough to fill the ponds. As a result there is no continuous flow through the channel. The channel has some seepage on the eastern side of the site which maintains a small amount of flow an inch or two deep.

At the eastern side of the site the stream flows into several large man-made stock watering ponds. The stream is ditched and passes along these ponds to the east side of the site where it appears to flow into a irrigation canal.

This stream is mapped by Kittitas County and WADNR as a Type F stream. According to Kittitas County Municipal Code 17.A.04.030-4, Type F streams in the Columbia Plateau Ecoregion have a 100' buffer measured from the OHWM of the stream. In addition, a 15' Building Setback line is required from the edge of the buffer.



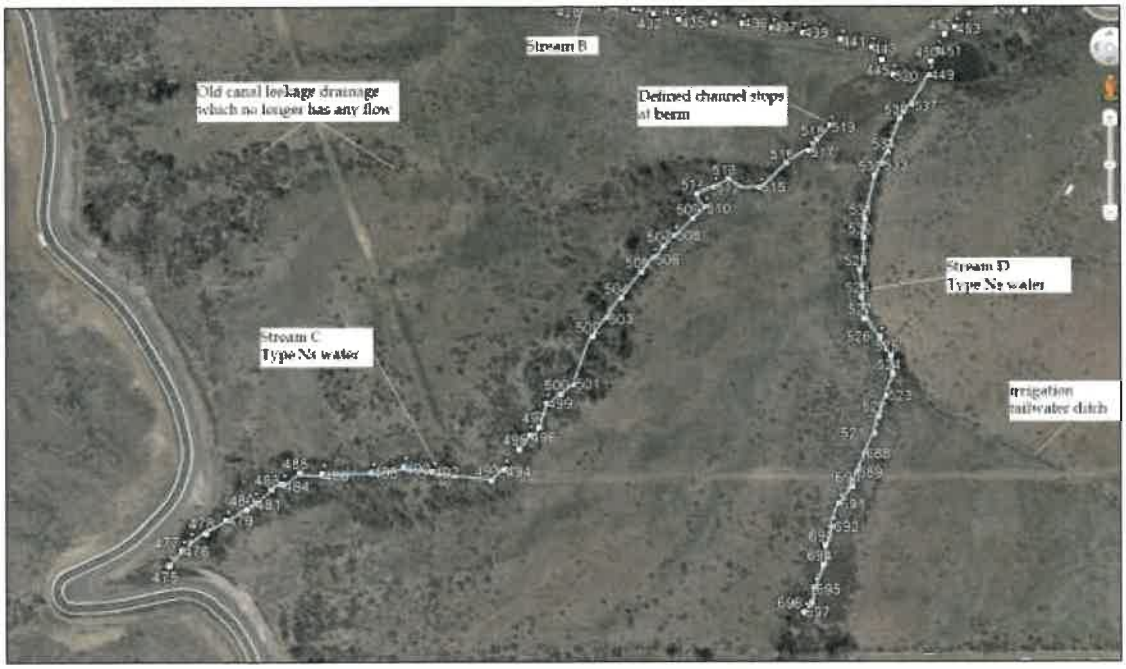
Above: Location of Stream B in the center of the site.

Stream C

Stream C is located on the south side of the site and enters the site through a culvert under the canal on the west. The channel passes through several small stock ponds that were constructed within the channel and the defined channel ends in a bermed stock pond with just an overflow outlet. No water was observed within this channel. At the overflow water historically sheet flowed through a wetland area. However, this area no longer is wet and it is doubtful any water passes through this feature before reaching a pond on the east side of the site. This stream was gps located with points 475-519.

No water has been seen flowing out of the stock pond at any time during our study by point 516, although a small ditch passes to point 519. However, clearly some water may pass through the channel in runoff events.

This stream is mapped by WADNR as a Type N stream which appears accurate, and would be a Type Ns due to seasonal flow. According to Kittitas County Municipal Code 17.A.04.030-4, Type Ns streams in the Columbia Plateau Ecoregion have a 40' buffer measured from the OHWM of the stream. In addition, a 15' Building Setback line is required from the edge of the buffer.



Above: Locations of Streams C & D.

Stream D

Stream D is located on the south side of the site and starts on the site in a bermed stock watering pond. A small culvert drains any overflow through the site in an 18" wide ditch with several small farm road crossings with 12" culverts. This stream was gps located with points 475-537. The stream is joined by a tail-water ditch at point 524 and eventually drains into a large stock pond to the north.

No water has been seen flowing in this feature from October of 2022-July 2023. However, clearly some water may pass through the channel in runoff events, and it appears to have a natural drainage channel out of the site.

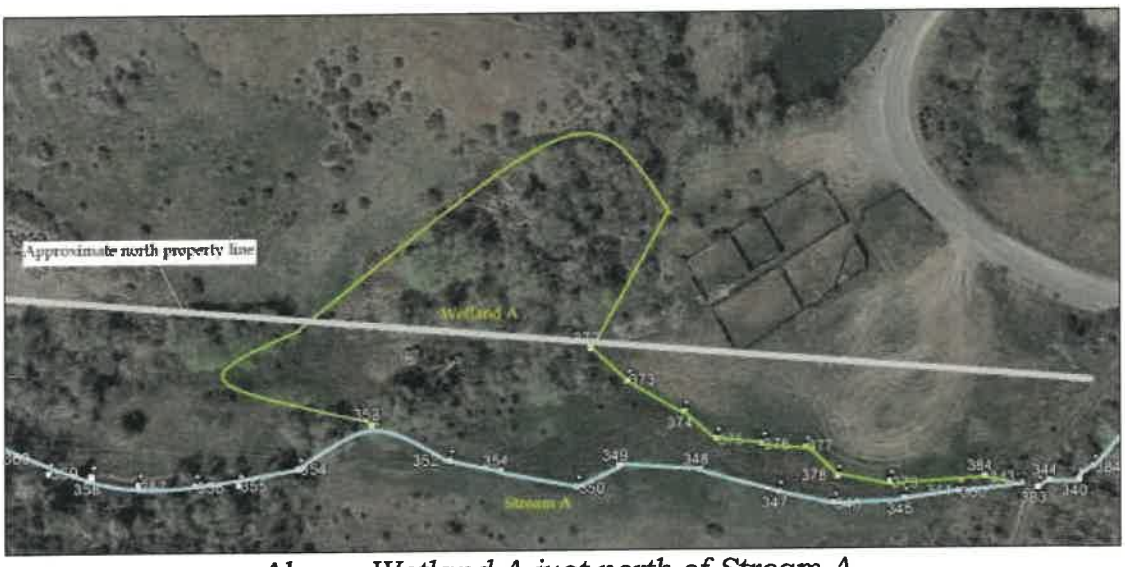
This stream is mapped by WADNR as a Type Ns stream which appears accurate due to the small channel width (18") and very intermittent flow. According to Kittitas County Municipal Code 17.A.04.030-4, Type Ns streams in the Columbia Plateau Ecoregion have a 40' buffer measured from the OHWM of the stream. In addition, a 15' Building Setback line is required from the edge of the buffer.

Wetland A

Wetland A is a mix of slope and depressional wetland along the north side of Stream A and extending off-site to the north and west. The stream does not provide any hydrology to the wetland but the wetland drains into the stream. Groundwater seeps appear to be the source of hydrology to this wetland.

The wetland includes a small forested portion on the west which is vegetated with crack willow and coyote willow, and an emergent portion on the east of soft rush, Baltic rush and sedges.

Soils excavated within this wetland revealed a clay loam with a soil color of 10YR 3/2 with few, fine, faint redoximorphic concentrations. The wetland was saturated at the surface during our spring review of this area.



Above: Wetland A just north of Stream A.

Using the 2014 Washington State Department of Ecology Washington State *Wetland Rating System for Eastern Washington, 2014 Update* dated June 2014 Publication No. 14-06-018, and rating this wetland as a "depressional" wetland, this wetland scored a total of 18 points with 7 for habitat. This indicates a Category III wetland. According to Kittitas County Municipal Code Table 17A.070.030, Category III wetlands with a moderate land use have a 110' buffer measured from the wetland edge.

Table 17A.07.030: Standard Buffer Widths

Category of Wetland	Land Use with Low Impact[1]	Land Use with Moderate Impact[2]	Land Use with High Impact[3]
I	125 ft	190 ft	250 ft
II	100 ft	150 ft	200 ft
III	75 ft	110 ft	150 ft
IV	25 ft	40 ft	50 ft

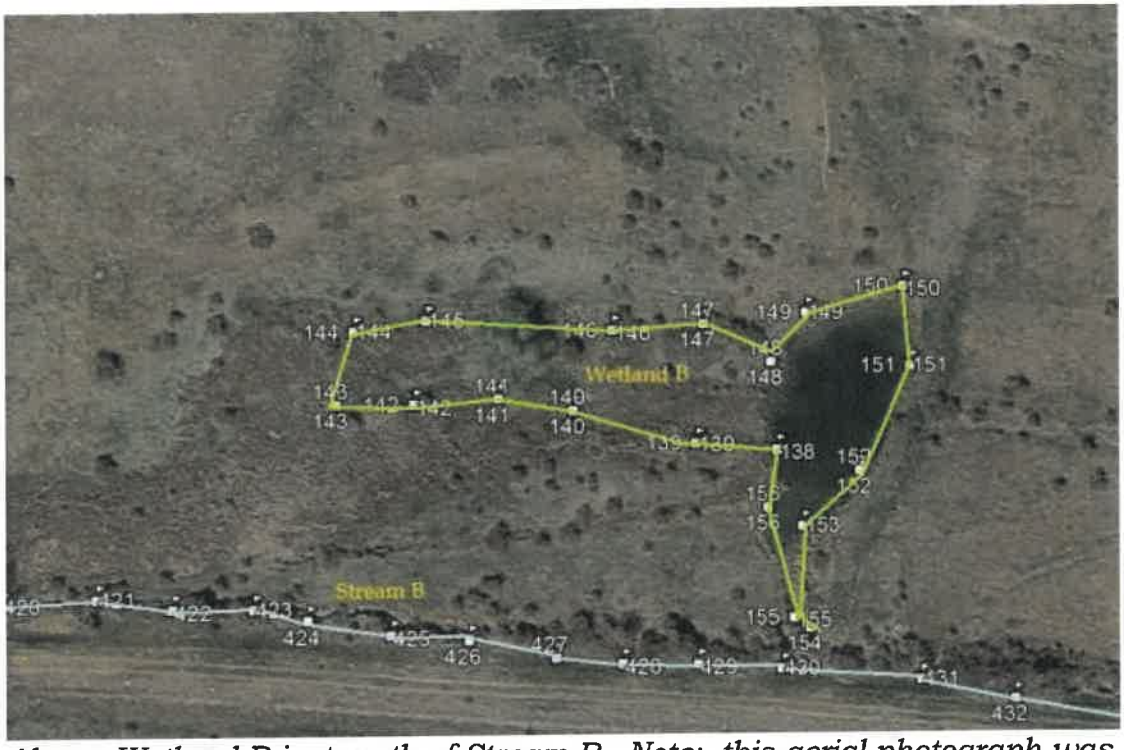
Wetland B

Wetland B is a small slope type wetland with some impoundment in a stock watering pond. The wetland is fed by a natural groundwater seep and drains to Stream B in a man-made ditch from the impoundment. This wetland was delineated with gps points 138-156.

The wetland is vegetated with a mix of soft rush, sedge, water cress, Baltic rush, timothy, and some cattail.

Soil pits revealed a black, clay loam with a soil color of 10YR 2/1 with hydrogen sulfide present and soils were saturated at the surface.

Using the 2014 Washington State Department of Ecology Washington State *Wetland Rating System for Eastern Washington, 2014 Update* dated June 2014 Publication No. 14-06-018, and rating this wetland as a "depressional" wetland, this wetland scored a total of 18 points with 7 for habitat. This indicates a Category III wetland. According to Kittitas County Municipal Code Table 17A.070.030, Category III wetlands with a moderate land use have a 110' buffer measured from the wetland edge.



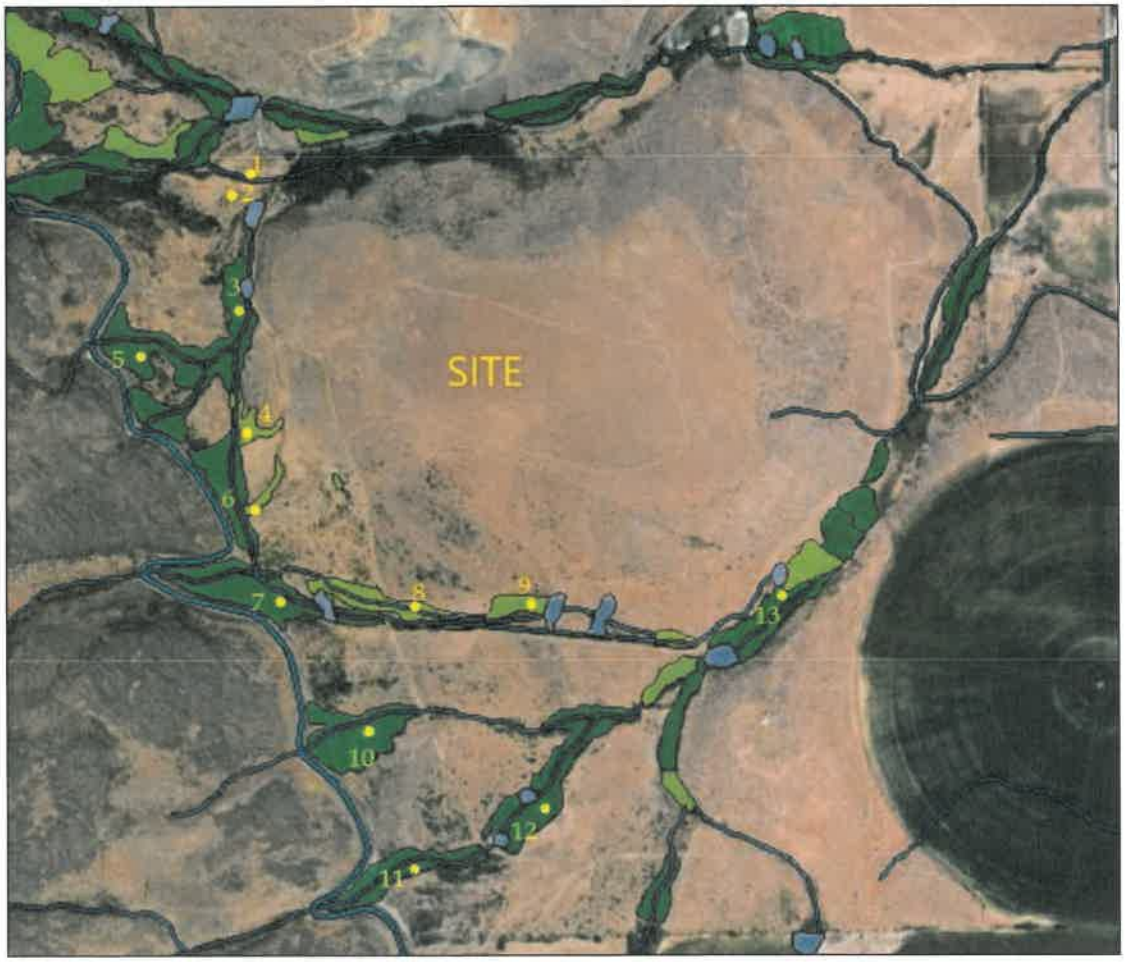
Above: Wetland B just north of Stream B. Note; this aerial photograph was taken in 2021 and water no longer is present within this pond as it receives no overflow from Stream B as it did prior to the canal lining.

If you have any questions in regards to this report or need additional information, please feel free to contact me at (253) 859-0515 or at esewall@sewallwc.com .

Sincerely,
Sewall Wetland Consulting, Inc.

Ed Sewall
Senior Wetlands Ecologist PWS #212

Attached: Rating forms and associated exhibits
Data sheets



Above: Representative data points. These were located in areas previously mapped as wetland and in all but two cases, these areas no longer have wetland hydrology based upon monitoring between October 2022 and July 2023. This is a result of lake of canal leakage water which provided hydrology to most of these areas.

REFERENCES

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Reed, P.B. Jr. 1993. 1993 Supplement to the list of plant species that occur in wetlands: Northwest (Region 9). USFWS supplement to Biol. Rpt. 88(26.9) May 1988.

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Wetland A

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hulin Rd City/County: Kittitas Sampling Date: 5-15-23

Applicant/Owner: State: WA Sampling Point: DP#1

Investigator(s): EL Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus effusus	60		FACW
2. Agrostis	20		FAC
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 2 (B)

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: DP#1

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 2/1		Few Fn		Rml		clay	

[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)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No _____ Depth (inches): 0"

Wetland Hydrology Present? Yes ✓ No _____

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

Remarks:

upland south of A

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hwy 12 City/County: K. Franks Sampling Date: 5-15-23

Applicant/Owner: State: WA Sampling Point: DP#2

Investigator(s): SL Smith Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes	No ✓	**Is the Sampled Area within a Wetland?** Yes	No ✓
Hydric Soil Present?	Yes	No ✓	
Wetland Hydrology Present?	Yes	No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Rosa sp	30		FAC
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Bromus tectorum	30		NL
2. Centaurea diffusa	20		NL
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

DP#2

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)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 3/3						SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (Inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

Mapped wetland south of wet A

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hutton Rd City/County: Whatcom Sampling Date: 5-15-17

Applicant/Owner: State: WA Sampling Point: DP#3

Investigator(s): Ed Sarsby Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ____ No ✓	

Remarks: No longer gets leakage from canal drained

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Salix exigua	30		FACW
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Dipsacus Fullonum	20		NI
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species 30	x 2 =	60
FAC species	x 3 =	
FACU species 20	x 4 =	80
UPL species	x 5 =	
Column Totals: 50 (A)		140 (B)

Prevalence Index = B/A = 2.8

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: DP#3

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

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 2/2						SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (Inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

No hydrology noted between October 2022 and July 2023

large expanse of Juncus on hill

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hutton Rd City/County: Kittitas Sampling Date: 7-20-23

Applicant/Owner: State: WA Sampling Point: DP#4

Investigator(s): Ed Sarell Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks: No longer gets leakage from canal drained

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus effusus	80		FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	____ = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks: mostly dried

DP #4

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)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 2/2							

[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)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

No evidence of hydrology either Oct 22 and July 23 Transect

mapped wetland area
now drained

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter Rd City/County: Kittitas Sampling Date: 7.20.23

Applicant/Owner: State: WA Sampling Point: DP#3

Investigator(s): EA Smith Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No	**Is the Sampled Area within a Wetland?** Yes	No ✓
Hydric Soil Present?	Yes	No ✓	
Wetland Hydrology Present?	Yes	No	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera	40		FAC
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Rosa spp	30		FAC
2. Crataegus sp	30		FACU
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

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	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No

Remarks:

SOIL

Sampling Point: DP#5

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 3/3						SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

no hydrology present below Oct 22" + July 23". No leaves gts canal seeping

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter Rd City/County: Kittitas Sampling Date: 7-20-23

Applicant/Owner: State: WA Sampling Point: DP #6

Investigator(s): JA Smith Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ____ No ✓
Hydric Soil Present?	Yes ____ No ✓	
Wetland Hydrology Present?	Yes ____ No ✓	

Remarks: Drained area that no longer has any hydrology from canal

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus effusus	80		FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

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

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? ✓ Yes ____ No ____

Remarks: mostly dead

SOIL

Sampling Point: DP#6

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 3/2						sa	

[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)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

Area no longer receives hydrology From canal leakage. No evidence of hydrology From Oct 22' - July 23'

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter Rd City/County: Kittitas Sampling Date: 7-20-23

Applicant/Owner: State: WA Sampling Point: DP7

Investigator(s): [illegible] Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation, Soil, or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation, Soil, or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No	Is the Sampled Area within a Wetland? Yes No ✓
Hydric Soil Present?	Yes	No ✓	
Wetland Hydrology Present?	Yes	No ✓	

Remarks: Former PFO no longer has any hydrology From canal leakage

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1. Populus balsamifera	60		FAC
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Cornus stolonifera	30		FACW
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 2 (B)

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No

Remarks:

Sampling Point: Dpt F

SOIL

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 3/2						SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks: Area has no evidence of hydrology previously provided by canal

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hwy 12 City/County: K. Falls Sampling Date: 7.20.23

Applicant/Owner: State: WA Sampling Point: DP#8

Investigator(s): JJ Sandy Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks: Drained area no longer hydrated by canal leakage

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1. Juncus effusus	60		FACW
2. Cirsum vulgare	40		FAC
3. Dispsus	30		NI
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 33 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks: Area heavily colonized by exotic weeds
Trees dead or dying

Sampling Point: DP#8

SOIL

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 2/1		FD+				gs	

[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)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (Inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (Inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (Inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

No hydrology present Oct 22 - July 23

no longer gets canal leakage

Wetland B

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hutton Rd City/County: Whitman Co Sampling Date: 7-20-23

Applicant/Owner: _____ State: WA Sampling Point: DP#9

Investigator(s): Ed Small Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: _____)			
1. Juncus bulticus	30		FACW
2. Juncus effusus	30		FACW
3. Carex spp	30		FAC
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

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

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

DP#5

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)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
16	10YR 2/1		Mod				SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ___ No ___ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0-1

Wetland Hydrology Present? Yes ✓ No _____

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

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter Rd City/County: Klamath Sampling Date: 7-20-23

Applicant/Owner: State: WA Sampling Point: DP#10

Investigator(s): SA Smith Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No	Is the Sampled Area within a Wetland? Yes	No ✓
Hydric Soil Present?	Yes	No ✓	
Wetland Hydrology Present?	Yes	No ✓	

Remarks: Most trees dead From cessation of canal irrigation

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus balsamifera	30		FAC
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Crataegus	20		FACU
2. Salix exigua	20		FACW
3. Rosa spp	2		FAC
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1. Bromus	10		UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

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	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No

Remarks: most vegetation dead or dying

SOIL

Sampling Point: DP#3

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
14	10YR3/1						SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter Rd City/County: Kittitas Sampling Date: 7.20-23

Applicant/Owner: State: WA Sampling Point: DP #1

Investigator(s): Ed Sewell Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1. Salix exigua	20		FACW
2. Crataegus	40		FACW
3. Rosa	30		FAC
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

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 ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: Dpit 11

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
14	10YR3/4						sl	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter TD City/County: K. Hollows Sampling Date: 7-20-23

Applicant/Owner: State: WA Sampling Point: WP#2

Investigator(s): Ed Smith Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No	**Is the Sampled Area within a Wetland?** Yes No ✓
Hydric Soil Present?	Yes ✓ No	
Wetland Hydrology Present?	Yes No ✓	

Remarks: previously flood by canal leakage

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1. Populus balsamifera	50		FAC
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size:)			
1. Rosa	30		FAC
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	= Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 2 (B)

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

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? ✓ Yes No

Remarks: Most vegetation dying from lack of water

SOIL

Sampling Point: DP#12

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
14	10YR3/2			Few	Few	Fmt	gr	

[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)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

No hydrology Oct 22 – July 23

no longer fed by canal leakages

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Hunter TR City/County: Kittitas Sampling Date: 7-20-23

Applicant/Owner: State: WA Sampling Point: DP#3

Investigator(s): JL Swan Section, Township, Range:

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

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: ____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix Fragilis	80		FACW
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: ____)			
1.			
2.			
3.			
4.			
5.			
	____ = Total Cover		
Herb Stratum (Plot size: ____)			
1. Phalaris arundinacea	30		FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	____ = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum ____ % Cover of Biotic Crust ____

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 1 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:

SOIL

Sampling Point: DP #13

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

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
14	10yr 3/3						SL	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ 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)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

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

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ 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)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

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

Remarks:

No evidence of wetland hydrology

Wetland name or number A

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Hunter Road - Wet A Date of site visit: 10/22 - 7/23

Rated by Ed Sewell Trained by Ecology? ✓ Yes ___ No Date of training ___

HGM Class used for rating Depressional Wetland has multiple HGM classes? ✓ Y ___ N

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

Source of base aerial photo/map ___

OVERALL WETLAND CATEGORY II (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___ **Category I** – Total score = 22-27

___ **Category II** – Total score = 19-21

✓ **Category III** – Total score = 16-18

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

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H (M) L	H M (L)	H (M) L	
Landscape Potential	H (M) L	H (M) L	(H) M L	
Value	H (M) L	H (M) L	H (M) L	TOTAL
Score Based on Ratings	6	5	7	18

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number A

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number A

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES** – The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded**.

   NO - go to 3 YES – The wetland class is **Slope**

   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**

   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number A

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
→ Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

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

Wetland name or number A

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality		Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?		
D 1.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 5	
Wetland has an intermittently flowing outlet	points = 3 (circled)	
Wetland has a highly constricted permanently flowing outlet	points = 3	
Wetland has a permanently flowing, unconstricted, surface outlet	points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)*	YES = 3 NO = 0 (circled)	0
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes)		
Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area	points = 5	
Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area	points = 3 (circled)	
Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area	points = 1	3
Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area	points = 0	
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.*		
Area seasonally ponded is > ½ total area of wetland	points = 3	
Area seasonally ponded is ¼ - ½ total area of wetland	points = 1	
Area seasonally ponded is < ¼ total area of wetland	points = 0 (circled)	0
Total for D 1	Add the points in the boxes above	6

Rating of Site Potential If score is: ___12- 16 = H ✓ 6- 11 = M ___ 0- 5 = L *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?		
D 2.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0 (circled)	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	Yes = 1 (circled) No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 No = 0 (circled)	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____	Yes = 1 No = 0 (circled)	0
Total for D 2	Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___3 or 4 = H ✓ 1 or 2 = M ___0 = L *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?		
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list?	Yes = 1 No = 0 (circled)	0
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]?	Yes = 1 (circled) No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)?	Yes = 2 No = 0 (circled)	0
Total for D 3	Add the points in the boxes above	1

Rating of Value If score is: ___2-4 = H ✓ 1 = M ___0 = L *Record the rating on the first page*

Wetland name or number A

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and erosion.		Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?		
D 4.1. Characteristics of surface water outflows from the wetland:		
Wetland has no surface water outlet	points = 8	
Wetland has an intermittently flowing outlet	points = 4	
Wetland has a highly constricted permanently flowing outlet	points = 4	
Wetland has a permanently flowing unconstricted surface outlet	points = 0	4
(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")		
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).*		
Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 8	
Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding	points = 6	
The wetland is a headwater wetland	points = 4	
Seasonal ponding: 1 ft - < 2 ft	points = 4	
Seasonal ponding: 6 in - < 1 ft	points = 2	
Seasonal ponding: < 6 in or wetland has only saturated soils	points = 0	0
Total for D 4	Add the points in the boxes above	4

Rating of Site Potential If score is: ___12-16 = H ___6-11 = M ✓0-5 = L *Record the rating on the first page*

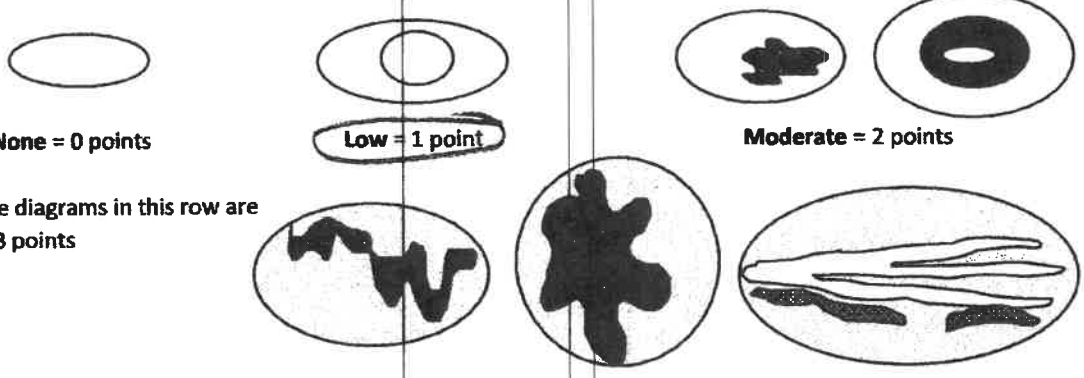
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?		
D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 No = 0	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff?	Yes = 1 No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses?	Yes = 1 No = 0	0
Total for D 5	Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___3 = H ✓1 or 2 = M ___0 = L *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?		
D 6.1. The wetland is in a landscape that has flooding problems.		
Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.*		
The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND		
Flooding occurs in sub-basin that is immediately down-gradient of wetland	points = 2	
Surface flooding problems are in a sub-basin farther down-gradient	points = 1	
The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood.		
Explain why _____	points = 0	1
There are no problems with flooding downstream of the wetland	points = 0	
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan?	Yes = 2 No = 0	0
Total for D 6	Add the points in the boxes above	1

Rating of Value If score is: ___2-4 = H ✓1 = M ___0 = L *Record the rating on the first page*

Wetland name or number A

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ____Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ____Scrub-shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac OR 10% of its area during the March to early June OR in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	2
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points All three diagrams in this row are **High** = 3 points Riparian braided channels with 2 classes	Figure__ 1

Wetland name or number A

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ___ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ___ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ___ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ___ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	2
Total for H 1 — Add the points in the boxes above	9

Rating of Site Potential If score is: ___ 15-18 = H ✓ 7-14 = M ___ 0-6 = L *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 40 % undisturbed habitat 0 + [(% moderate and low intensity land uses)/2] ___ = 40 % (points = 3) > 1/3 (33.3%) of 1 km Polygon — points = 2 20-33% of 1km Polygon — points = 1 10-19% of 1km Polygon <10% of 1km Polygon — points = 0	3
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 70 % undisturbed habitat ___ + [(% moderate and low intensity land uses)/2] ___ = 70 % (points = 3) Undisturbed habitat > 50% of Polygon Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0	3
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use — points = (- 2) Does not meet criterion above — (points = 0)	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	6

Rating of Landscape Potential If score is: ✓ 4-9 = H ___ 1-3 = M ___ < 1 = L *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — (points = 1) Site does not meet any of the criteria above — points = 0	

Rating of Value If score is: ___ 2 = H ✓ 1 = M ___ 0 = L *Record the rating on the first page*

Wetland name or number A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Vernal pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? — Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. — Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* — The soil in the wetland is shallow [< 1 ft (30 cm)deep] and is underlain by an impermeable layer such as basalt or clay. — Surface water is present for less than 120 days during the wet season. Yes – Go to **SC 1.1** No = **Not a vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? Yes – Go to **SC 1.2** No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? Yes = **Category II** No = **Category III**	**Cat. II** **Cat. III**
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? — The wetland has a conductivity > 3.0 mS/cm. — The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). — If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? — Salt encrustations around more than 75% of the edge of the wetland — More than ⅓ of the plant cover consists of species listed on Table 4 — A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. Yes = **Category I** No= **Not an alkali wetland**	**Cat. I**
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? Yes – Go to **SC 3.2** No – Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes = **Category I** No = **Not a WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes – **Contact WNHP/WDNR and go to SC 3.4** No = **Not a WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and it is listed on their website? Yes = **Category I** No =**Not a WHCV**	**Cat. I**

Wetland name or number A

SC 4.0 Bogs and Calcareous Fens Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? *Use the key below to identify if the wetland is a bog or calcareous fen.* ***If you answer yes you will still need to rate the wetland based on its functions.*** SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.* Yes – Go to **SC 4.3** No – Go to **SC 4.2** SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating ~~on top of a lake or pond~~? Yes – Go to **SC 4.3** No = **Is not a bog for rating** SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5? Yes = **Category I bog** No – Go to **SC 4.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog. SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy? Yes = **Category I bog** No – Go to **SC 4.5** SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks? Yes = **Is a Calcareous Fen for purpose of rating** No – Go to **SC 4.6** SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met: — Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems — The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland Yes = **Is a Category I calcareous fen** No = **Is not a calcareous fen**	**Cat. I** **Cat. I**

SC 5.0. Forested Wetlands Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H 1.1*) — The wetland is within the 100 year floodplain of a river or stream — Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species — There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW *(see definitions in question H3.1)* Yes – Go to **SC 5.1** No = **Not a forested wetland with special characteristics**	
SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)? Yes = **Category I** No – Go to **SC 5.2**	**Cat. I**
SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species? Yes = **Category I** No – Go to **SC 5.3**	**Cat. I**
SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)? Yes = **Category II** No – Go to **SC 5.4**	**Cat. II**
SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream? Yes = **Category II** No = **Not a forested wetland with special characteristics**	**Cat. II**
Category of wetland based on Special Characteristics *Choose the highest rating if wetland falls into several categories* If you answered No for all types, enter "Not Applicable" on Summary Form	N/A

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number B

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Hurka Rd Wetland B Date of site visit: 10/22-7/23

Rated by Ed Sewell Trained by Ecology? ✓ Yes ___ No Date of training ____

HGM Class used for rating Depressional Wetland has multiple HGM classes? ✓ Y ___ N

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

Source of base aerial photo/map ____

OVERALL WETLAND CATEGORY III (based on functions ✓ or special characteristics ___)

1. Category of wetland based on FUNCTIONS

___ **Category I** – Total score = 22-27

___ **Category II** – Total score = 19-21

___ **Category III** – Total score = 16-18

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

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the appropriate ratings			
Site Potential	H M (L)	H (M) L	H (M) L	
Landscape Potential	H (M) L	H (M) L	(H) M L	
Value	H (M) L	H (M) L	H (M) L	TOTAL
Score Based on Ratings	5	6	7	18

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

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

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alkali	I
Wetland of High Conservation Value	I
Bog and Calcareous Fens	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	✓

Wetland name or number B

Maps and figures required to answer questions correctly for Eastern Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.5	
Hydroperiods (including area of open water for H 1.3)	D 1.4, H 1.2, H 1.3	
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of wetland vs. width of stream *(can be added to another figure)*	R 4.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.5	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.5	
Hydroperiods	H 1.2, H 1.3	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which wetland is found (website)	S 3.3	

Wetland name or number B

HGM Classification of Wetland in Eastern Washington

For questions 1-4, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-4 apply, and go to Question 5.

1. Does the entire unit **meet both** of the following criteria?
   ___The vegetated part of the wetland is on the water side of the Ordinary High Water Mark of a body of permanent open water (without any plants on the surface) that is at least 20 ac (8 ha) in size
   ___At least 30% of the open water area is deeper than 10 ft (3 m)

   NO – go to 2 **YES** – The wetland class is **Lake Fringe** (Lacustrine Fringe)

2. Does the entire wetland unit **meet all** of the following criteria?
   ___The wetland is on a slope (*slope can be very gradual*),
   ___The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks;
   ___The water leaves the wetland **without being impounded.**

   NO - go to 3 YES – The wetland class is **Slope**
   NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 foot deep).

3. Does the entire wetland unit **meet all** of the following criteria?
   ___ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river;
   ___ The overbank flooding occurs at least once every 10 years.

   NO - go to 4 YES – The wetland class is **Riverine**
   NOTE: The Riverine wetland can contain depressions that are filled with water when the river is not flooding.

4. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year. *This means that any outlet, if present, is higher than the interior of the wetland.*

   NO – go to 5 YES – The wetland class is **Depressional**

5. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-4 APPLY TO DIFFERENT AREAS IN THE WETLAND UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

Wetland name or number B

NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the wetland unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM Class to use in rating
Slope + Riverine	Riverine
→ Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine (the riverine portion is within the boundary of depression)	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine

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

Wetland name or number B

DEPRESSIONAL WETLANDS Water Quality Functions - Indicators that the site functions to improve water quality	Points (only 1 score per box)
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 5 Wetland has an intermittently flowing outlet — points = 3 Wetland has a highly constricted permanently flowing outlet — points = 3 Wetland has a permanently flowing, unconstricted, surface outlet — points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions of soils)* YES = 3 NO = 0	
D 1.3. Characteristics of persistent vegetation (Emergent, Scrub-shrub, and/or Forested Cowardin classes) Wetland has persistent, ungrazed, vegetation for > $^2/_3$ of area — points = 5 Wetland has persistent, ungrazed, vegetation from $^1/_3$ to $^2/_3$ of area — points = 3 Wetland has persistent, ungrazed vegetation from $^1/_{10}$ to < $^1/_3$ of area — points = 1 Wetland has persistent, ungrazed vegetation < $^1/_{10}$ of area — points = 0	1
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland — points = 3 Area seasonally ponded is ¼ - ½ total area of wetland — points = 1 Area seasonally ponded is < ¼ total area of wetland — points = 0	1
Total for D 1 — Add the points in the boxes above	5

Rating of Site Potential If score is: ___12- 16 = H ___6- 11 = M ✓ 0- 5 = L *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	0
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1- D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___3 or 4 = H ✓ 1 or 2 = M ___0 = L *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, or lake that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where water quality is an issue in some aquatic resource [303(d) list, eutrophic lakes, problems with nuisance and toxic algae]? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the drainage or basin in which the wetland is found*)? Yes = 2 No = 0	0
Total for D 3 — Add the points in the boxes above	1

Rating of Value If score is: ___2-4 = H ✓ 1 = M ___0 = L *Record the rating on the first page*

Wetland name or number B

DEPRESSIONAL WETLANDS Hydrologic Functions - Indicators that the site functions to reduce flooding and erosion	Points (only 1 score per box)
D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 (circled) Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing unconstricted surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat wetland as "intermittently flowing")*	4
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: > 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in wetland or the surface of permanent ponding — points = 6 The wetland is a headwater wetland — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 (circled) Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: < 6 in or wetland has only saturated soils — points = 0	4
Total for D 4 — Add the points in the boxes above	8

Rating of Site Potential If score is: ___12-16 = H ✓ 6-11 = M ___0-5 = L *Record the rating on the first page*

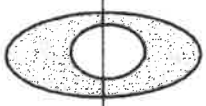
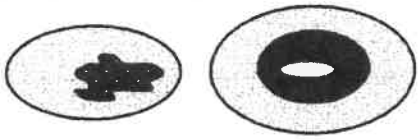
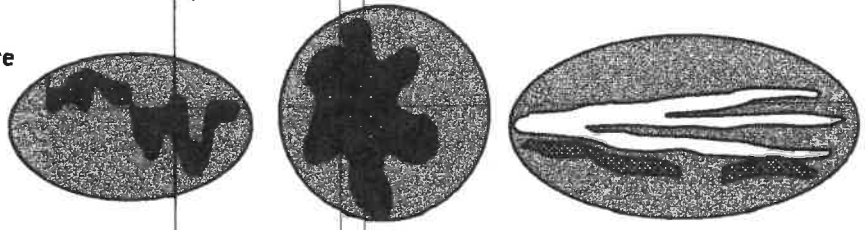
D 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0 (circled)	0
D 5.2. Is > 10% of the area within 150 ft of the wetland in a land use that generates runoff? Yes = 1 (circled) No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses? Yes = 1 No = 0 (circled)	0
Total for D 5 — Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___3 = H ✓ 1 or 2 = M ___0 = L *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The wetland is in a landscape that has flooding problems. Choose the description that best matches conditions around the wetland being rated. *Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds), AND Flooding occurs in sub-basin that is immediately down-gradient of wetland — points = 2 Surface flooding problems are in a sub-basin farther down-gradient — points = 1 (circled) The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ — points = 0 There are no problems with flooding downstream of the wetland — points = 0	1
D 6.2. Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0 (circled)	0
Total for D 6 — Add the points in the boxes above	1

Rating of Value If score is: ___2-4 = H ✓ 1 = M ___0 = L *Record the rating on the first page*

Wetland name or number A

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1.0. Does the wetland have the potential to provide habitat for many species?	
H 1.1. Structure of the plant community: *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ ac or >= 10% of the wetland if wetland is < 2.5 ac.* ____Aquatic bed ____Emergent plants 0-12 in (0-30 cm) high are the highest layer and have > 30% cover ____Emergent plants >12-40 in (>30-100 cm) high are the highest layer with >30% cover ____Emergent plants > 40 in (> 100 cm) high are the highest layer with >30% cover ____Scrub-shrub (areas where shrubs have >30% cover) ____Forested (areas where trees have >30% cover) 4 or more checks: points = 3 3 checks: points = 2 2 checks: points = 1 1 check: points = 0	1
H 1.2. Is one of the vegetation types Aquatic Bed? Yes = 1 No = 0	0
H 1.3. Surface water H 1.3.1. Does the wetland have areas of open water (without emergent or shrub plants) over at least ¼ ac **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Answer YES for Lake Fringe wetlands.* Yes = 3 points & go to H 1.4 No = go to H 1.3.2 H 1.3.2. Does the wetland have an intermittent or permanent, and unvegetated stream within its boundaries, or along one side, over at least ¼ ac or 10% of its area? *Answer yes only if H 1.3.1 is No.* Yes = 3 No = 0	3
H 1.4. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold. You do not have to name the species.* *Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Russian olive, Phragmites, Canadian thistle, yellow-flag iris, and saltcedar (Tamarisk)* # of species ____ Scoring: > 9 species: points = 2 4-9 species: points = 1 < 4 species: points = 0	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion among types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, moderate, low, or none. *Use map of Cowardin and emergent plant classes prepared for questions H 1.1 and map of open water from H 1.3. If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **High** = 3 points  Riparian braided channels with 2 classes	Figure__ 0

Wetland name or number 13

5

H 1.6. Special habitat features *Check the habitat features that are present in the wetland. The number of checks is the number of points.* ✓ Loose rocks larger than 4 in OR large, downed, woody debris (> 4 in diameter) within the area of surface ponding or in stream. ✓ Cattails or bulrushes are present within the wetland. ____ Standing snags (diameter at the bottom > 4 in) in the wetland or within 30 m (100 ft) of the edge. ____ Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____ Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 45 degree slope) OR signs of recent beaver activity ____ Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)*	2
Total for H 1 — Add the points in the boxes above	7

Rating of Site Potential If score is: ___ 15-18 = H ✓ 7-14 = M ___ 0-6 = L *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support habitat functions of the site?	
H 2.1. Accessible habitat (only area of habitat abutting wetland). If total accessible habitat is: *Calculate:* 40 % undisturbed habitat 60 + [(% moderate and low intensity land uses)/2] ____ = 40 % > 1/3 (33.3%) of 1 km Polygon — (points = 3) 20-33% of 1km Polygon — points = 2 10-19% of 1km Polygon — points = 1 <10% of 1km Polygon — points = 0	3
H 2.2. Undisturbed habitat in 1 km Polygon around wetland. *Calculate:* 70 % undisturbed habitat ✓ + [(% moderate and low intensity land uses)/2] ____ = 70 % Undisturbed habitat > 50% of Polygon — (points = 3) Undisturbed habitat 10 - 50% and in 1-3 patches — points = 2 Undisturbed habitat 10 - 50% and > 3 patches — points = 1 Undisturbed habitat < 10% of Polygon — points = 0	3
H 2.3. Land use intensity in 1 km Polygon: > 50% of Polygon is high intensity land use — points = (- 2) Does not meet criterion above — (points = 0)	0
H 2.4. The wetland is in an area where annual rainfall is less than 12 in, and its water regime is not influenced by irrigation practices, dams, or water control structures. *Generally, this means outside boundaries of reclamation areas, irrigation districts, or reservoirs* — Yes = 3 (No = 0)	0
Total for H 2 — Add the points in the boxes above	6

Rating of Landscape Potential If score is: ✓ 4-9 = H ___ 1-3 = M ___ < 1 = L *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose the highest score that applies to the wetland being rated* Site meets ANY of the following criteria: — points = 2 — It has 3 or more priority habitats within 100 m (see Appendix B) — It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) — It is mapped as a location for an individual WDFW species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100 m (see Appendix B) — (points = 1) Site does not meet any of the criteria above — points = 0	

Rating of Value If score is: ___ 2 = H ✓ 1 = M ___ 0 = L *Record the rating on the first page*

Wetland name or number B

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All wetlands should also be characterized based on their functions.

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Vernal pools Is the wetland **less than 4000 ft²**, and does it meet at least **two** of the following criteria? — Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input. — Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *If you find perennial, obligate, wetland plants, the wetland is probably NOT a vernal pool.* — The soil in the wetland is shallow [< 1 ft (30 cm)deep] and is underlain by an impermeable layer such as basalt or clay. — Surface water is present for less than 120 days during the wet season. Yes – Go to **SC 1.1** No = **Not a vernal pool** SC 1.1. Is the vernal pool relatively undisturbed in February and March? Yes – Go to **SC 1.2** No = **Not a vernal pool with special characteristics**	
SC 1.2. Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 mi (other wetlands, rivers, lakes etc.)? Yes = **Category II** No = **Category III**	**Cat. II** **Cat. III**
SC 2.0. Alkali wetlands Does the wetland meet **one** of the following criteria? — The wetland has a conductivity > 3.0 mS/cm. — The wetland has a conductivity between 2.0 and 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). — If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meet two of the following three sub-criteria? — Salt encrustations around more than 75% of the edge of the wetland — More than ⅔ of the plant cover consists of species listed on Table 4 — A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. Yes = **Category I** No= **Not an alkali wetland**	**Cat. I**
SC 3.0. Wetlands of High Conservation Value (WHCV) SC 3.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? Yes – Go to **SC 3.2** No – Go to **SC 3.3** SC 3.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? Yes = **Category I** No = **Not a WHCV** SC 3.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf Yes – **Contact WNHP/WDNR and go to SC 3.4** No = **Not a WHCV** SC 3.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and it is listed on their website? Yes = **Category I** No =**Not a WHCV**	**Cat. I**

Wetland name or number 5

SC 4.0 Bogs and Calcareous Fens Does the wetland (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens? *Use the key below to identify if the wetland is a bog or calcareous fen.* ***If you answer yes you will still need to rate the wetland based on its functions.***	
SC 4.1. Does an area within the wetland have organic soil horizons (i.e., layers of organic soil), either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? *See Appendix C for a field key to identify organic soils.* Yes – Go to **SC 4.3** No – Go to **SC 4.2**	
SC 4.2. Does an area within the wetland have organic soils, either peats or mucks, that are less than 16 in deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? Yes – Go to **SC 4.3** No = **Is not a bog for rating**	
SC 4.3. Does an area within the wetland have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5? Yes = **Category I bog** No – Go to **SC 4.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.	
SC 4.4. Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy? Yes = **Category I bog** No – Go to **SC 4.5**	**Cat. I**
SC 4.5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks? Yes = **Is a Calcareous Fen for purpose of rating** No – Go to **SC 4.6**	
SC 4.6. Do the species listed in Table 6 comprise at least 10% of the total plant cover in an area of peats and mucks, AND one of the two following conditions is met: — Marl deposits [calcium carbonate ($CaCO_3$) precipitate] occur on the soil surface or plant stems — The pH of free water is ≥ 6.8 AND electrical conductivity is ≥ 200 uS/cm at multiple locations within the wetland Yes = **Is a Category I calcareous fen** No = **Is not a calcareous fen**	**Cat. I**

SC 5.0. Forested Wetlands Does the wetland have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified that a forested class is present in question H 1.1*) — The wetland is within the 100 year floodplain of a river or stream — Aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species — There is at least ¼ ac of trees (even in wetlands smaller than 2.5 ac) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW *(see definitions in question H3.1)* Yes – Go to **SC 5.1** No = **Not a forested wetland with special characteristics**	
SC 5.1. Does the wetland have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*)? Yes = **Category I** No – Go to **SC 5.2**	**Cat. I**
SC 5.2. Does the wetland have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species? Yes = **Category I** No – Go to **SC 5.3**	**Cat. I**
SC 5.3. Does the wetland have at least ¼ acre with a forest canopy where more than 50% of the tree species (by cover) are fast growing species (*see Table 7*)? Yes = **Category II** No – Go to **SC 5.4**	**Cat. II**
SC 5.4. Is the forested component of the wetland within the 100 year floodplain of a river or stream? Yes = **Category II** No = **Not a forested wetland with special characteristics**	**Cat. II**
Category of wetland based on Special Characteristics *Choose the highest rating if wetland falls into several categories* If you answered No for all types, enter "Not Applicable" on Summary Form	NA

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland: ***NOTE:*** *This question is independent of the land use between the wetland and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Old-growth/Mature forests:** Old-growth east of Cascade crest – Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 10 trees/ac (25 trees/ha) that are > 21 in (53 cm) dbh, and 1-3 snags/ac (2.5-7.5 snags/ha) that are > 12-14 in (30-35 cm) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west and 80-160 years old east of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

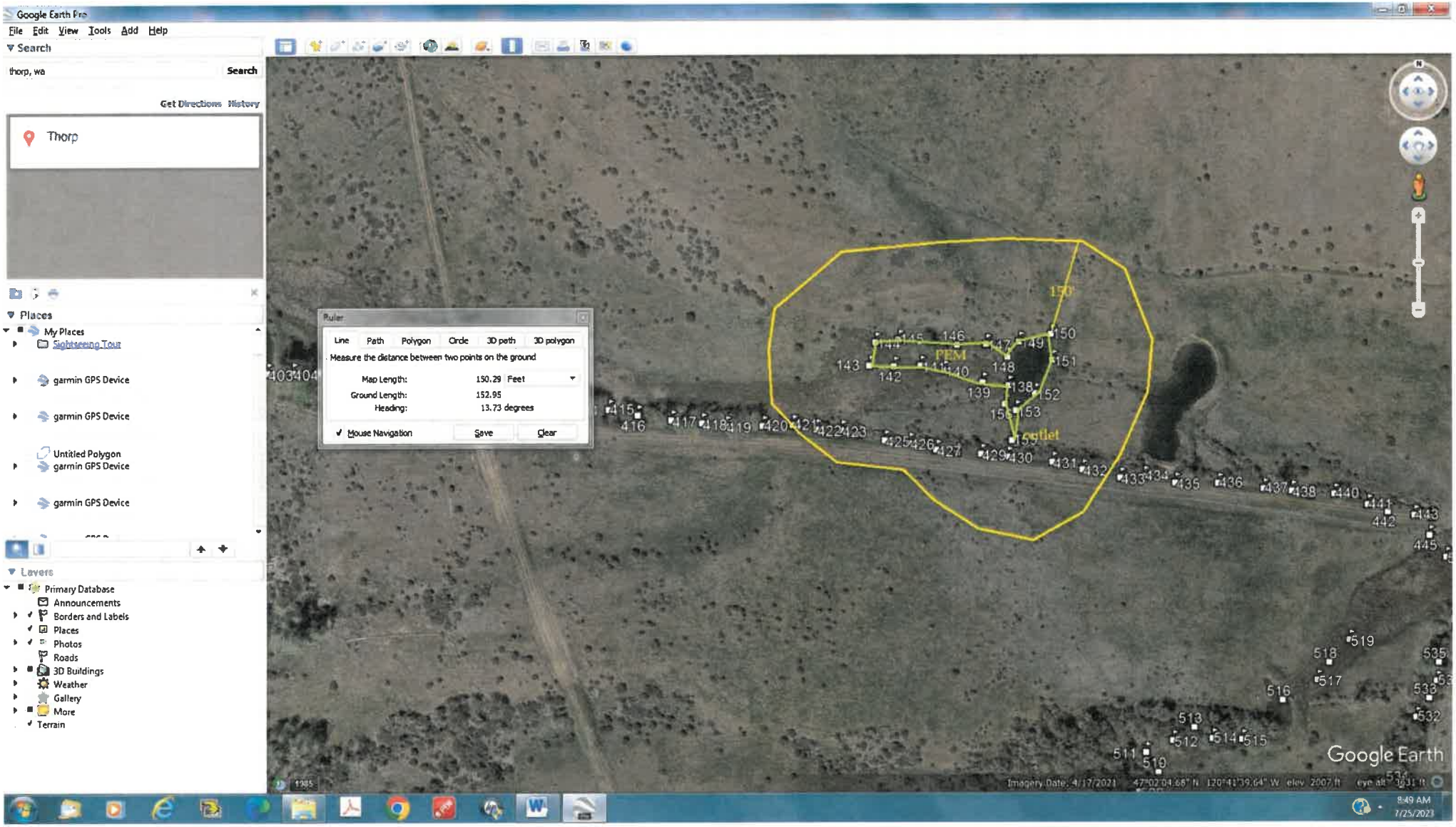
— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 12 in (30 cm)in eastern Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

— **Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

— **Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch wheatgrass (*Pseudoroegneria spicata*) is often the prevailing cover component along with Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa secunda*), rough fescue (*F. campestris*), or needlegrasses (*Achnatherum* spp.).

— **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.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Places
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Sightseeing Tour
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Layers
Primary Database
Announcements
Borders and Labels
Places
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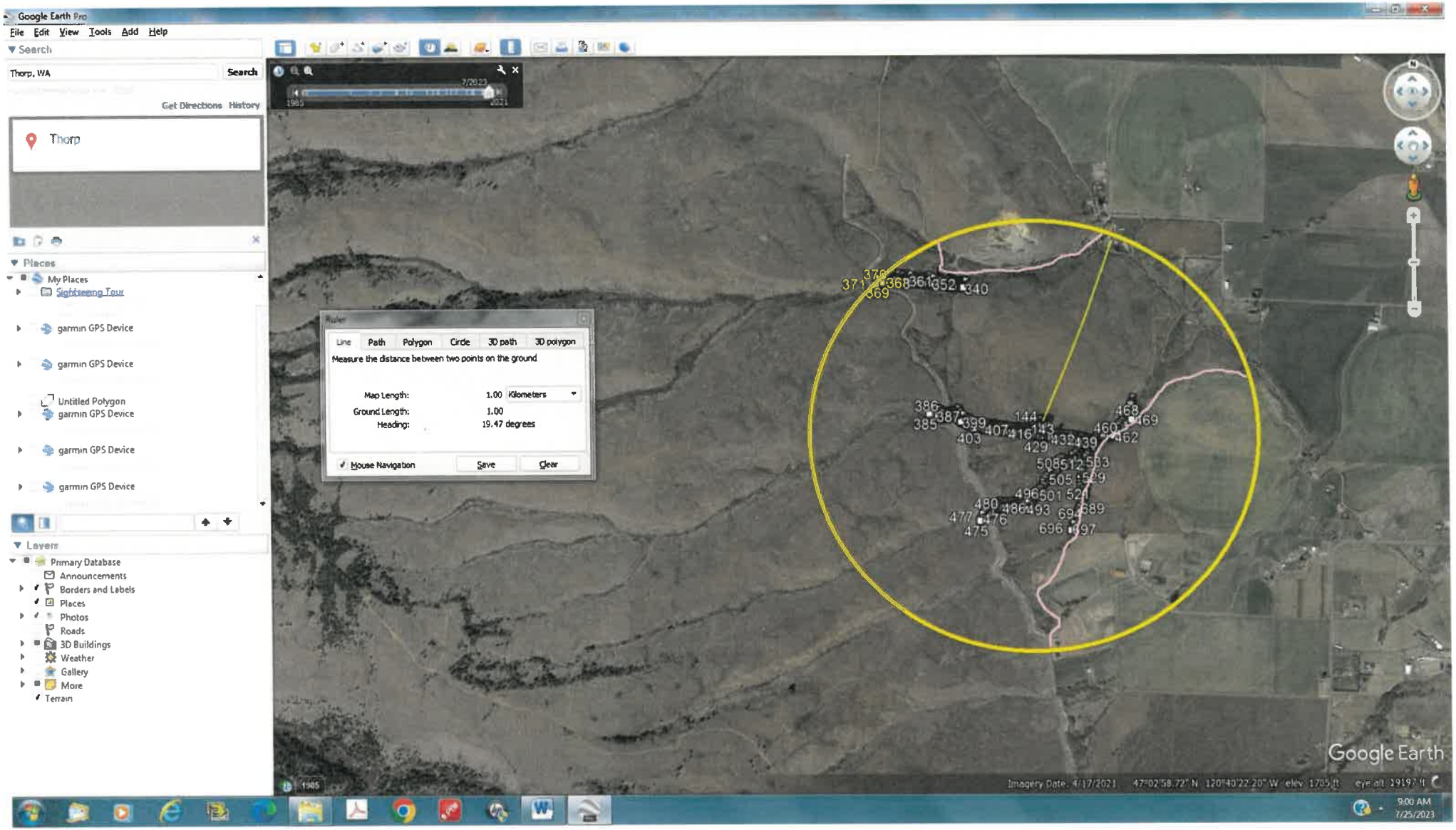
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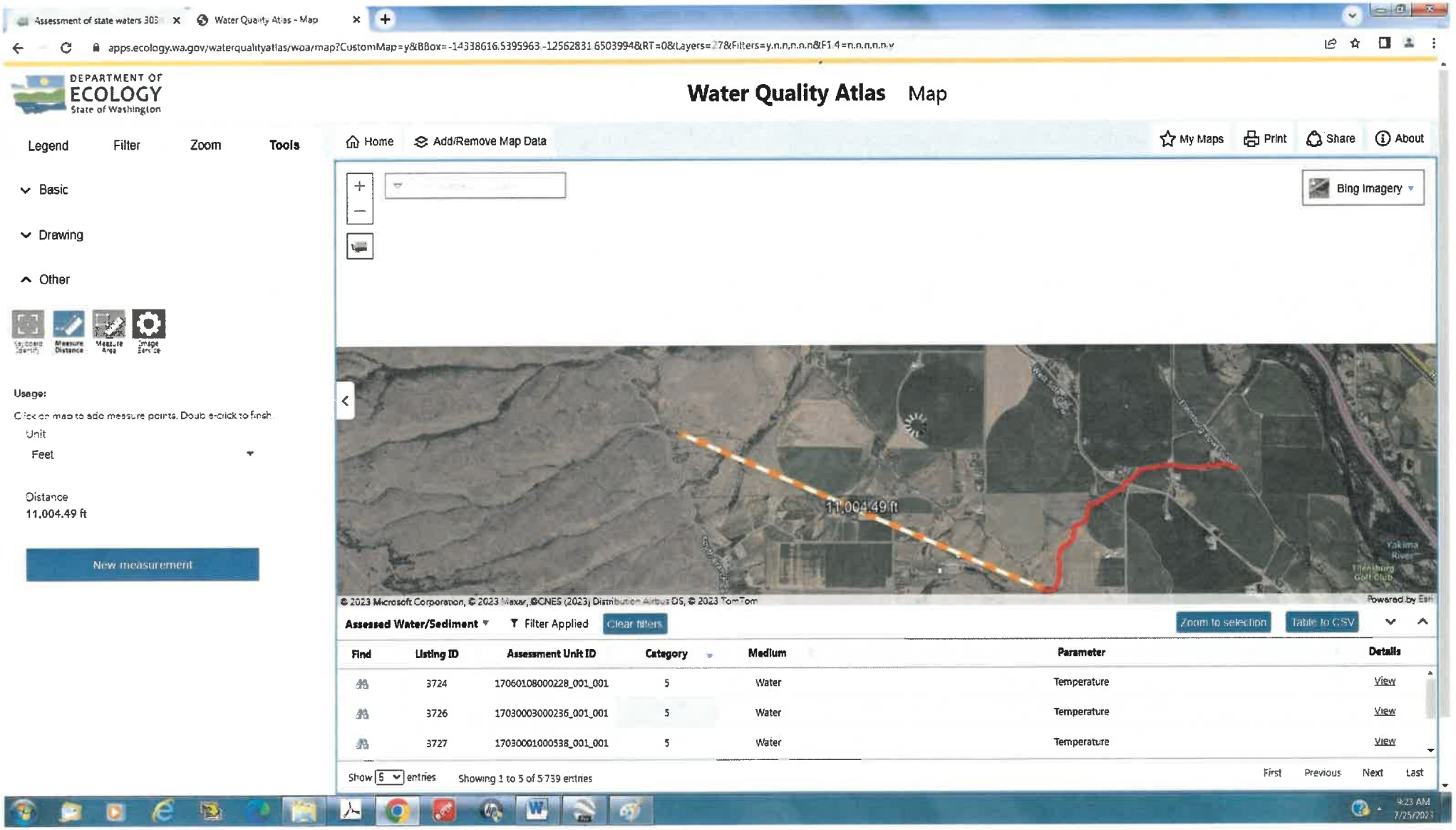
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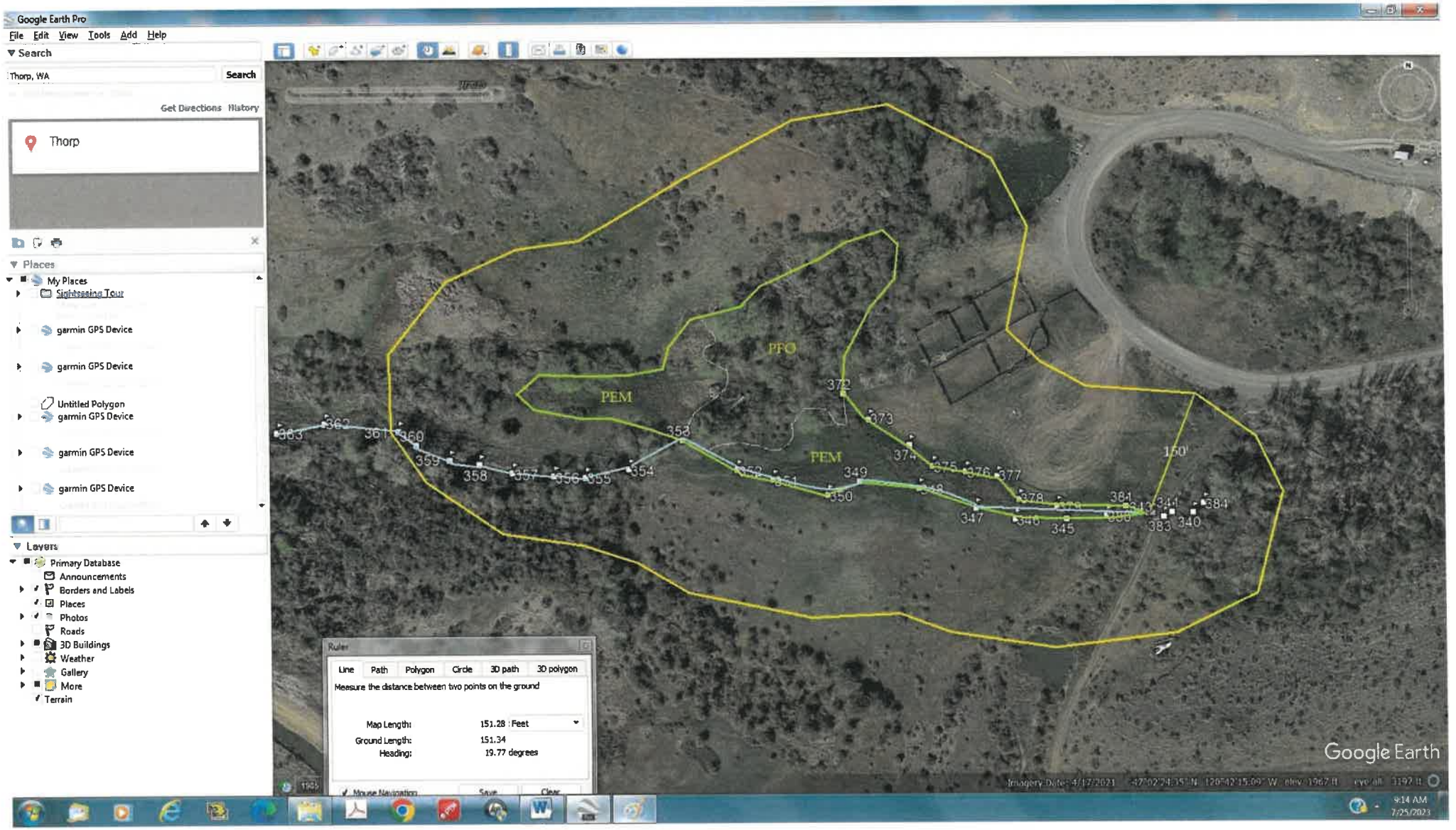
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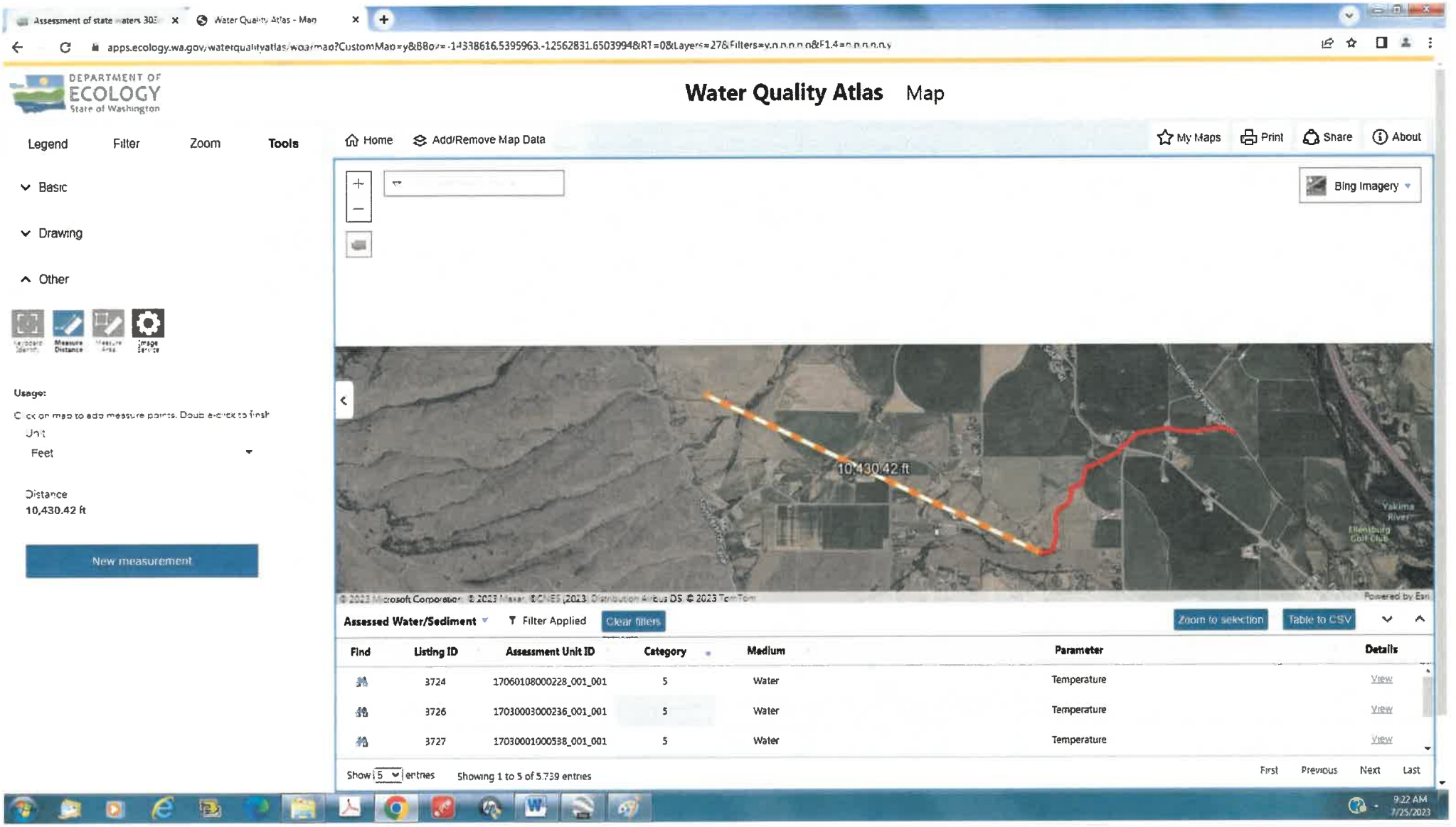
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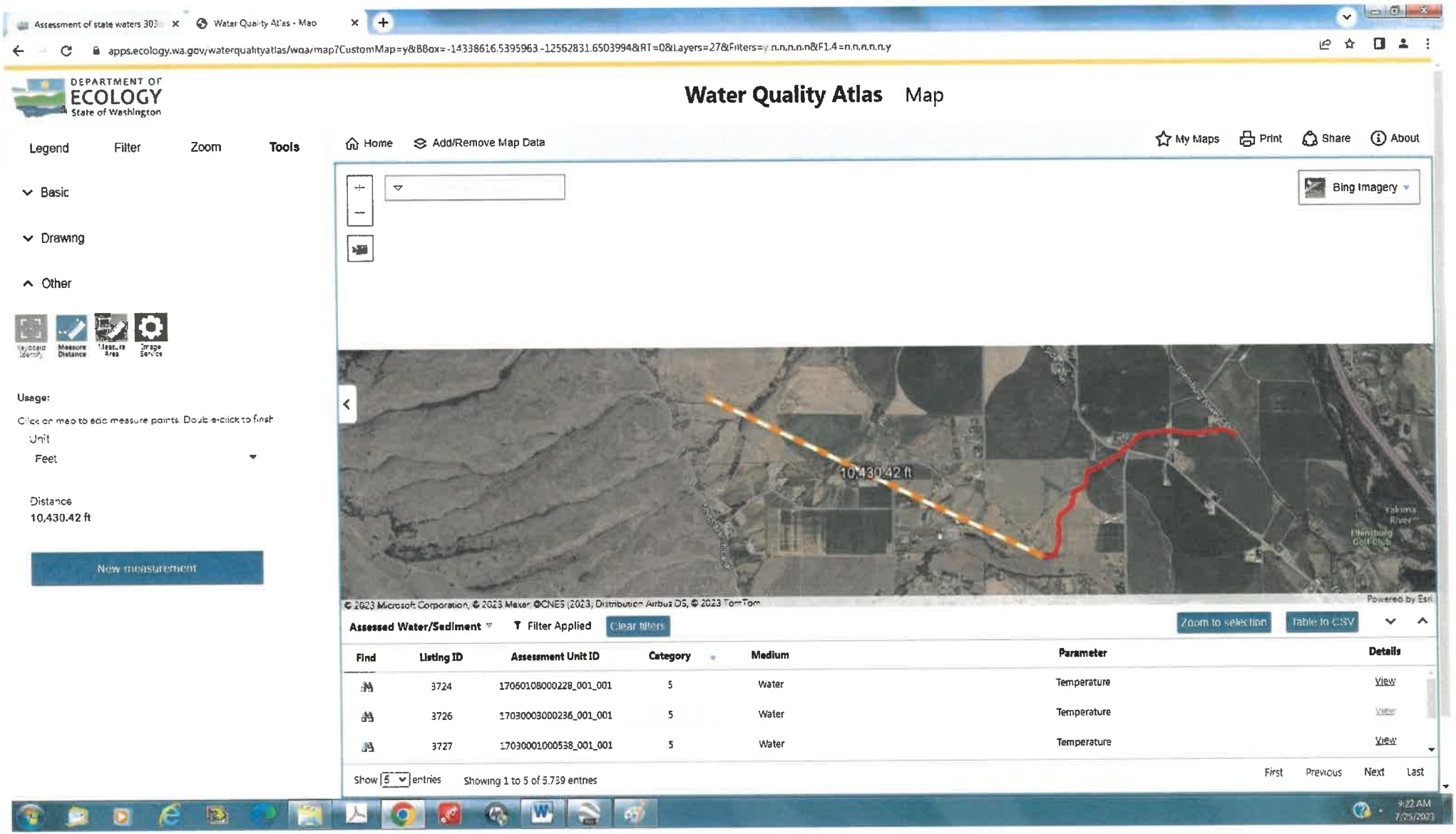
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Ellensburg Golf Club
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7/25/2023

APPENDIX C

CONSTRUCTION SWPPP
OPERATIONS AND MAINTENANCE MANUAL

Construction Stormwater Pollution Prevention Plan

Hunter Road Development

Submitted to

Vic Jansen
P.O. Box 57
Moses Lake, Washington 98837

February 2, 2024

Submitted by

Simpli Civil, LLC
1800 Rd K NE
Moses Lake, WA 98837
253.579.2212

TABLE OF CONTENTS

PROJECT ENGINEER'S CERTIFICATE

I hereby certify that this Construction Stormwater Pollution Prevention Plan has been prepared by me or under my direct supervision and meets minimum standards of care and expertise which is usual and customary in this community for professional engineers. I understand that Kittitas County does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

Trav Story, PE

Construction Stormwater Pollution Prevention Plan

Project Location
Site Address
Hunter Rd
Ellensburg, WA 98926

Parcel(s)
21465 - 21506 | Kittitas County
21508 - 21528 | Kittitas County
086433 | Kittitas County
076433 | Kittitas County
066433 | Kittitas County
056433 | Kittitas County
046433 | Kittitas County

1. Construction Stormwater Pollution Prevention Elements

Element #1: Preserve Vegetation/Mark Clearing Limits
Prior to beginning land-disturbing activities, all clearing limits, sensitive areas and their buffers within the construction area will be marked. BMPs to be utilized include:

BMP C103E: High-Visibility Fence
BMP C233E: Silt Fence

Element #2: Establish Construction Access
Construction vehicle access will be limited to one location west of the turn off to the north borrow pit (see construction plans). BMP to be utilized:

BMP C105E: Stabilized Construction Access

Element #3: Control Flow Rates
To protect downstream properties, waterways, and infiltration systems from erosion and the associated discharge of turbid waters, the following BMPs may utilized:

BMP C207E: Check Dams
BMP C209E: Outlet Protection
BMP C235E: Wattles

Element #4: Install Sediment Controls
Sediment control BMPs shall be functional before land-disturbing activities begin. BMPs to be utilized:

BMP C233E: Silt Fence
BMP C235E: Wattles

Element #5: Stabilize Soils
Exposed and unworked soils shall be stabilized using such BMPs as temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, the early application of gravel in areas to be paved, and dust control.

To prevent erosion, soils must not remain exposed and unworked for more than the following time periods:
- During the regional dry season (July 1 through September 30): 30 days
- During the regional wet season (October 1 through June 30): 15 days

BMPs to be utilized may include:
BMP C120E: Temporary and Permanent Seeding
BMP C121E: Mulching
BMP C122E: Nets and Blankets

BMP C123E: Plastic Covering
BMP C124E: Sodding
BMP C125E: Topsoiling/Composting
BMP C130E: Surface Roughening
BMP C140E: Dust Control

Element #6: Protect Slopes
Slopes shall be protected utilizing one or more of the following BMPs:

BMP C120E: Temporary and Permanent Seeding
BMP C121E: Mulching
BMP C122E: Nets and Blankets
BMP C123E: Plastic Covering
BMP C124E: Sodding
BMP C130E: Surface Roughening
BMP C200E: Interceptor Dike and Swale
BMP C207E: Check Dams

Element #7: Protect Drain Inlets
All storm drain inlets made operable during construction shall be protected to prevent sediment laden stormwater from entering the conveyance system. BMP to be utilized:

BMP C220E: Inlet Protection

Element #8: Stabilize Channels and Outlets
Existing onsite channels and proposed ditches shall be stabilized to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches at the outlets of all conveyance systems. BMPs to be utilized include:

BMP C207E: Check Dams
BMP C209E: Outlet Protection

Element #9: Control Pollutants
Pollution control will be implemented during construction to ensure that stormwater is not contaminated. Methods for controlling pollutants include the following:

- Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants.
- Handle and dispose of all pollutants that occur on-site, including waste materials and demolition debris, in a manner that does not cause contamination of stormwater.
- Provide cover, containment, and protection from vandalism for all chemicals, liquid products, petroleum products, and materials that have the potential to pose a threat to human health or the environment. On-site fueling tanks must include secondary containment.
- Conduct maintenance, fueling, and repair of heavy equipment and vehicles using spill prevention measures and control measures. Clean contaminated surfaces immediately following any spill incident.
- Apply fertilizers and pesticides in a manner and at application rates that will not result in loss of chemical to stormwater runoff. Follow manufacturers' label recommendations for application rates and procedures.
- Use BMPs to prevent contamination of stormwater runoff by pH-modifying sources. The sources for this contamination include, but are not limited to: bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, dewatering concrete vaults, recycled concrete stockpiles, and concrete pumping and mixer washout waters.
- Adjust the pH of stormwater if necessary to prevent violations of the water quality standards.

- Ensure that washout of concrete trucks is performed off-site or in designated concrete washout areas only. Do not wash out concrete trucks or concrete handling equipment onto the ground, or into storm drains, open ditches, streets, or streams. Do not dump excess concrete on-site, except in designated concrete washout areas. Concrete spillage or concrete discharge to surface waters of the state is prohibited.

BMPs to be utilized include:

BMP C151E: Concrete Handling
BMP C153E: Material Delivery, Storage, and Containment
BMP C154E: Concrete Washout Area
BMP C252E: Treating and Disposing of High pH Water

Element #10: Control Dewatering
Construction excavations are not anticipated to require dewatering; no BMPs are recommended at this time.

Element #11: Maintain BMPs
All temporary and permanent ESC BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function in accordance with BMP specifications.

- Remove all temporary ESC BMPs within 30 days after achieving final site stabilization or after the temporary BMPs are no longer needed.
- Provide protection to all BMPs installed for the permanent control of stormwater from sediment and compaction. All BMPs that are to remain in place following completion of construction shall be examined and placed in full operating conditions. If sediment enters the BMPs during construction, it shall be removed and the facility shall be returned to the conditions specified in the construction documents.
- Remove or stabilize trapped sediment on-site. Permanently stabilize disturbed soil resulting from removal of BMPs or vegetation.

BMPs to be utilized include:

BMP C150E: Materials on Hand
BMP C160E: Certified Erosion and Sediment Control Lead

Element #12: Manage the Project
The project will be managed based on the following principles:

- Phase project development to the maximum degree practicable and take into account seasonal work limits.
- Inspect, maintain, and repair all BMPs as needed to ensure continued performance of their intended function. Conduct site inspections and monitoring in accordance with the CSWGP or local plan approval authority.
- Maintaining an updated Construction SWPPP – Maintain, update, and implement the SWPPP in accordance with the CSWGP.

BMPs to be utilized include:

BMP C150E: Materials on Hand
BMP C160E: Certified Erosion and Sediment Control Lead
BMP C162E: Scheduling

Element #13: Protect Low Impact Development BMPs (Infiltration BMPs)
No LID BMPs are proposed as part of the site development.

2. Project Description

The project entails the construction of 22 ft wide gravel roadways (BST surfacing) and an irrigation system to serve 60 single family lots. The total project area is 480 acres, with a total developed area of 14.89 acres. The proposed impervious area is 12.00 acres.

3. Existing Site Conditions

Topography

The existing project area is undeveloped and vacant, with a few unpaved roads traversing portions of the property. The site is characterized by sloping topography on the west which slopes down to a central plateau. There is an elevated area in the center of the site, which is bounded to the north and south by two relatively well-incised canyons. The overall topography ascends from east to west for a maximum topographic relief of about 370 feet within the project area.

Vegetation

The site has a mix of shrubs and thickets of hawthorne, snowberry, small douglas firs, aspen, and substantial amounts of rose. Weedy species present including knapweed, mullein, teasel, thistle, as well as cheatgrass and pasture grasses such as quack grass and fescue.

Drainage

See the Critical Area Report by Sewall Wetland Consulting, Inc. included in Appendix B of the Drainage Report.

4. Adjacent Areas

Streams

There are four viable streams onsite:
Stream A – Type F stream
Stream B – Type F stream
Stream C – Type Ns stream
Stream D – Type Ns stream

Lakes

There are no lakes adjacent to the site.

Wetlands

There are two viable wetlands onsite.
Wetland A – Category III wetland
Wetland B – Category III wetland

Residential Areas

Single family home parcels are located to the east and south of the site.

Roads

The site is bordered on the north by Hunter Road.

Other

The site is bordered on the west by the South Branch of the Taneum KRD canal.

5. Critical Areas

A geotechnical evaluation of the project site performed by Earth Solutions NW LLC (ESNW) identified isolated landslide hazard areas (areas exceeding 40 percent slope and 10 feet in height). These are generally outside the proposed road alignment and should not affect project development. ESNW did not recommend special requirements for working in or near critical areas, however their report noted that based on subsurface observations of predominantly dense to very dense native soil and bedrock, the steep onsite slopes are generally considered to be in a stable condition.

6. Soils

According to ESNW's geotechnical evaluation of the project site, the native soils underlying the topsoil and fill was variable across the site. Most commonly, the native soils were comprised of silty sand with and without gravel (USCS: SM) and silty gravel with sand (USCS: GM). Isolated pockets of fine-grained sandy silt and silt with sand deposits (USCS: ML) were encountered, along with limited areas of relatively free-draining sand and gravel deposits (USCS: SW-SM, GW-GM, and GP-GM).

Soil density was generally dense to very dense, beginning near the surface and extending to the termination depth of all exploration sites. Moisture content was characterized as damp to moist at the time of exploration. Fines content within the various deposits ranged between about 5 and 78 percent, with higher fines content soils being more representative of general site soil conditions.

7. Erosion Problem Areas

Slopes exceeding 40 percent (classified as erosion hazard areas in Kittitas County) occur onsite. However according to ESNW, the proposed road alignment is unlikely to create erosion hazards during construction. Soil exposure will be temporary and permanently stabilized by means of bituminous surface treatment (BST) of the proposed roadways and native vegetation adjacent to the roadways.

8. Construction Phasing

The project will be constructed in one phase.

9. Construction Schedule

Project construction will start in June of 2024. Projected end date is December of 2025 / June 2026. There are no wet season construction restraints proposed at this time, other than not allowing soils to remain exposed and unworked for more than 15 days.

10. Financial/Ownership Responsibilities

Vic Jansen
P.O. Box 57
Moses Lake, Washington 98837

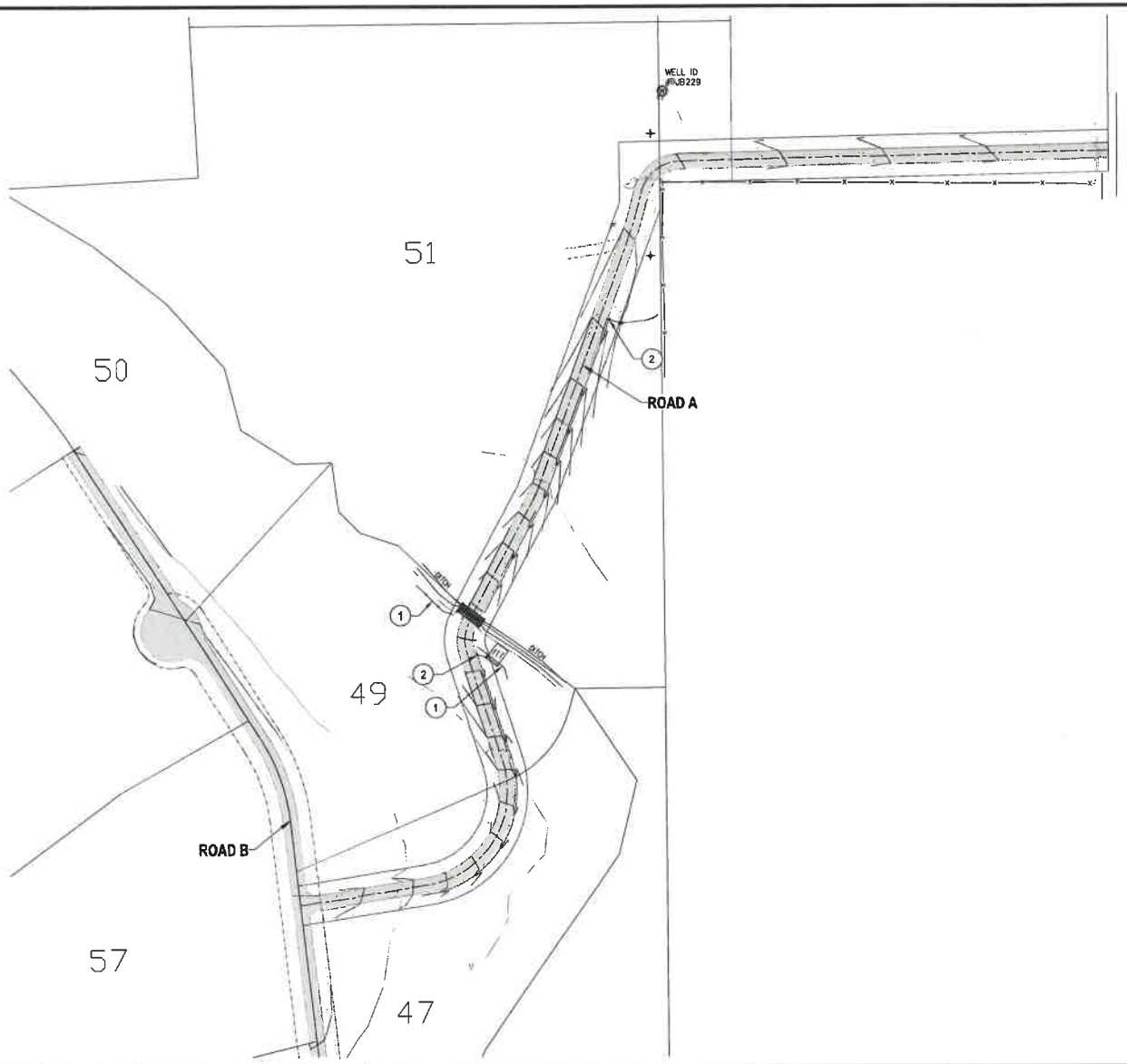
Bonds and/or other evidence of financial responsibility: TBD

11. Engineering Calculations

None at this time.

Attachment A

Construction Drawings



CONSTRUCTION NOTES

1. PROVIDE SILT FENCE (4/C6.0)
2. PROVIDE INLET PROTECTION (2/C6.0)

TESC NOTES

1. THE IMPLEMENTATION OF THESE EROSION/SEDIMENTATION CONTROL PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE BMP FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.
2. THE BMP FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.
3. THE BMP FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE BMP FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
4. ALL BMPS SHALL BE ADJUSTED TO FIT SITE CONDITIONS.
5. DO NOT COMMENCE EARTH MOVING OPERATIONS UNTIL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES ARE IN PLACE.
6. PROTECT AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS DURING EARTH MOVING OPERATIONS.
7. THE BMP FACILITIES SHALL BE INSPECTED DAILY AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING. WRITTEN RECORDS SHALL BE KEPT OF MONTHLY REVIEWS.
8. IF THE SITE BECOMES INACTIVE, THE BMP FACILITIES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 24 HOURS FOLLOWING A MAJOR STORM EVENT.
9. BMP MEASURES REQUIRING MAINTENANCE BUT NOT REQUIRING IMMEDIATE ATTENTION SHALL HAVE ALL MAINTENANCE BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
10. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR SEVEN DAYS, SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED BMP METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
11. REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES ONCE THE SITE IS STABILIZED.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING DIRT, MUD, AND OTHER CONSTRUCTION DEBRIS, WHICH MAY ACCUMULATE ON PAVED STREETS ADJACENT TO THE SITE AS A RESULT OF THE CONSTRUCTION ACTIVITY. AS A MINIMUM, DIRT, MUD AND OTHER DEBRIS SHALL BE REMOVED FROM PAVED STREETS AT THE CLOSE OF EACH CONSTRUCTION DAY.
13. WRITTEN RECORDS SHALL BE KEPT OF WEEKLY REVIEWS OF THE BMP FACILITIES DURING CONSTRUCTION.
14. IN ANY SEASON, STOCKPILES AND STEEP CUT AND FILL SLOPES ARE TO BE PROTECTED IF UNWORKED FOR MORE THAN 12 HOURS. MATERIALS SUFFICIENT TO COVER ALL DISTURBED AREAS SHALL BE STOCKPILED ON SITE. STOCKPILES SHALL BE STABILIZED WITH PLASTIC COVERING (OR OTHER APPROVED DEVICE) DAILY.
15. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY FENCING AND/OR BARRICADES AS NECESSARY TO LIMIT ACCESS TO AREAS UNDER CONSTRUCTION.

NPDES NOTE

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR APPLYING FOR AN NPDES GENERAL CONSTRUCTION PERMIT.

811
Know what's below. Call before you dig.

N

80 40 0 80
SCALE: 1" = 80'

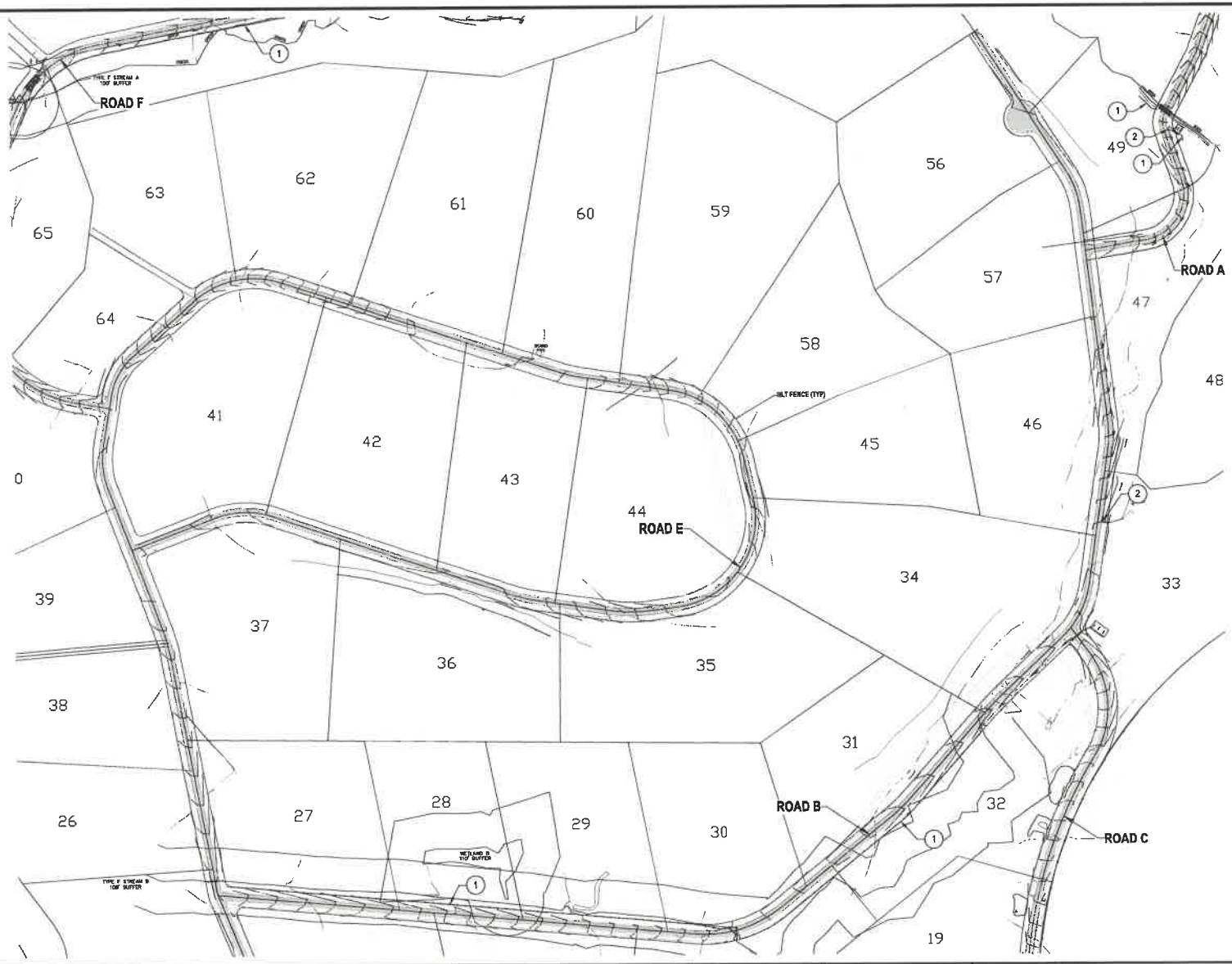
MARK	REVISION DESCRIPTION	BY	APP.	DATE

simpliCIVIL
253.678.2212 | PO Box 745, Moses Lake, WA 98837

DRAWN BY	JB / KB
DESIGN BY	TS
CHECK BY	TS
PROJECT MGR	TS

HUNTER ROAD DEVELOPMENT
ROAD A
TESC PLAN

DRAWING NO.	C1.6
PROJECT NO.	20.022
DATE:	02/02/24
SHEET NO.	7 OF 48



CONSTRUCTION NOTES

1. PROVIDE SILT FENCE (1/C07)
2. PROVIDE INLET PROTECTION (2/C07)

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14. IN ANY SEASON, STOCKPILES AND STEEP CUT AND FILL SLOPES ARE TO BE PROTECTED IF UNWORKED FOR MORE THAN 12 HOURS. MATERIALS SUFFICIENT TO COVER ALL DISTURBED AREAS SHALL BE STOCKPILED ON SITE. STOCKPILES SHALL BE STABILIZED WITH PLASTIC COVERING (OR OTHER APPROVED DEVICE) DAILY.
15. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN TEMPORARY FENCING AND/OR BARRICADES AS NECESSARY TO LIMIT ACCESS TO AREAS UNDER CONSTRUCTION.

NPDES NOTE

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR APPLYING FOR AN NPDES GENERAL CONSTRUCTION PERMIT.

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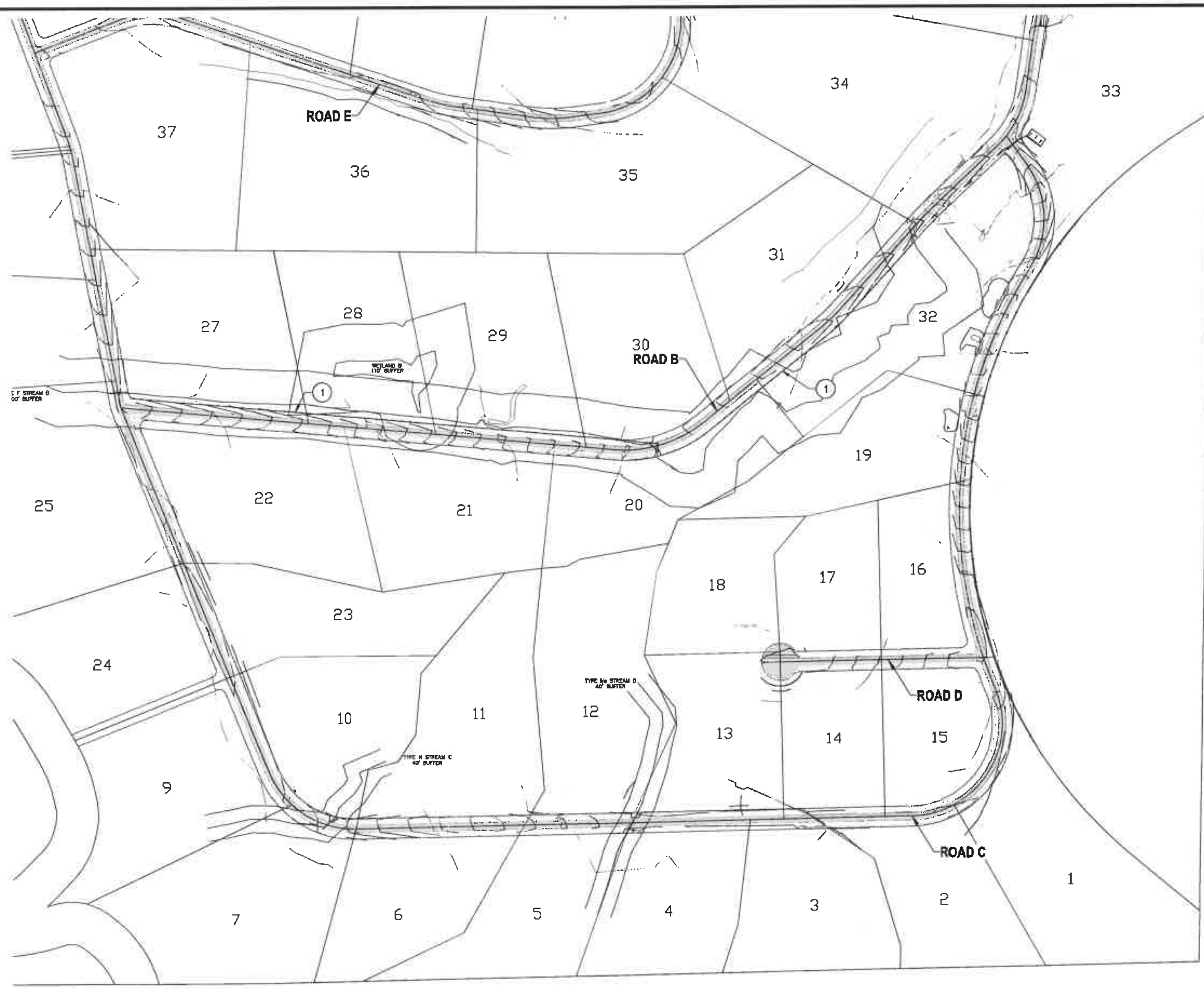
HUNTER ROAD DEVELOPMENT
ROAD B AND E
TESC PLAN

DRAWING NO.	C1.7
PROJECT NO.	20.022
DATE:	02/02/24
SHEET NO.	8 OF 48



CONSTRUCTION NOTES

(1) PROVIDE SILT FENCE

TESC NOTES

1. THE IMPLEMENTATION OF THESE EROSION/SEDIMENTATION CONTROL PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE BMP FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.
2. THE BMP FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT LADEN WATER DO NOT ENTER THE DRAINAGE SYSTEM, ROADWAYS, OR VIOLATE APPLICABLE WATER STANDARDS.
3. THE BMP FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE BMP FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
4. ALL BMP'S SHALL BE ADJUSTED TO FIT SITE CONDITIONS.
5. DO NOT COMMENCE EARTH MOVING OPERATIONS UNTIL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES ARE IN PLACE.
6. PROTECT AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS DURING EARTH MOVING OPERATIONS.
7. THE BMP FACILITIES SHALL BE INSPECTED DAILY AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING. WRITTEN RECORDS SHALL BE KEPT OF MONTHLY REVIEWS.
8. IF THE SITE BECOMES INACTIVE, THE BMP FACILITIES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 24 HOURS FOLLOWING A MAJOR STORM EVENT.
9. BMP MEASURES REQUIRING MAINTENANCE BUT NOT REQUIRING IMMEDIATE ATTENTION SHALL HAVE ALL MAINTENANCE BE ADDRESSED WITHIN FIFTEEN (15) DAYS.
10. ANY AREAS OF EXPOSED SOILS, INCLUDING ROADWAY EMBANKMENTS, THAT WILL NOT BE DISTURBED FOR SEVEN DAYS, SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED BMP METHODS (E.G., SEEDING, MULCHING, PLASTIC COVERING, ETC.).
11. REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES ONCE THE SITE IS STABILIZED.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING DIRT, MUD, AND OTHER CONSTRUCTION DEBRIS, WHICH MAY ACCUMULATE ON PAVED STREETS ADJACENT TO THE SITE AS A RESULT OF THE CONSTRUCTION ACTIVITY. AS A MINIMUM, DIRT, MUD AND OTHER DEBRIS SHALL BE REMOVED FROM PAVED STREETS AT THE CLOSE OF EACH CONSTRUCTION DAY.
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HUNTER ROAD DEVELOPMENT
ROAD C AND D
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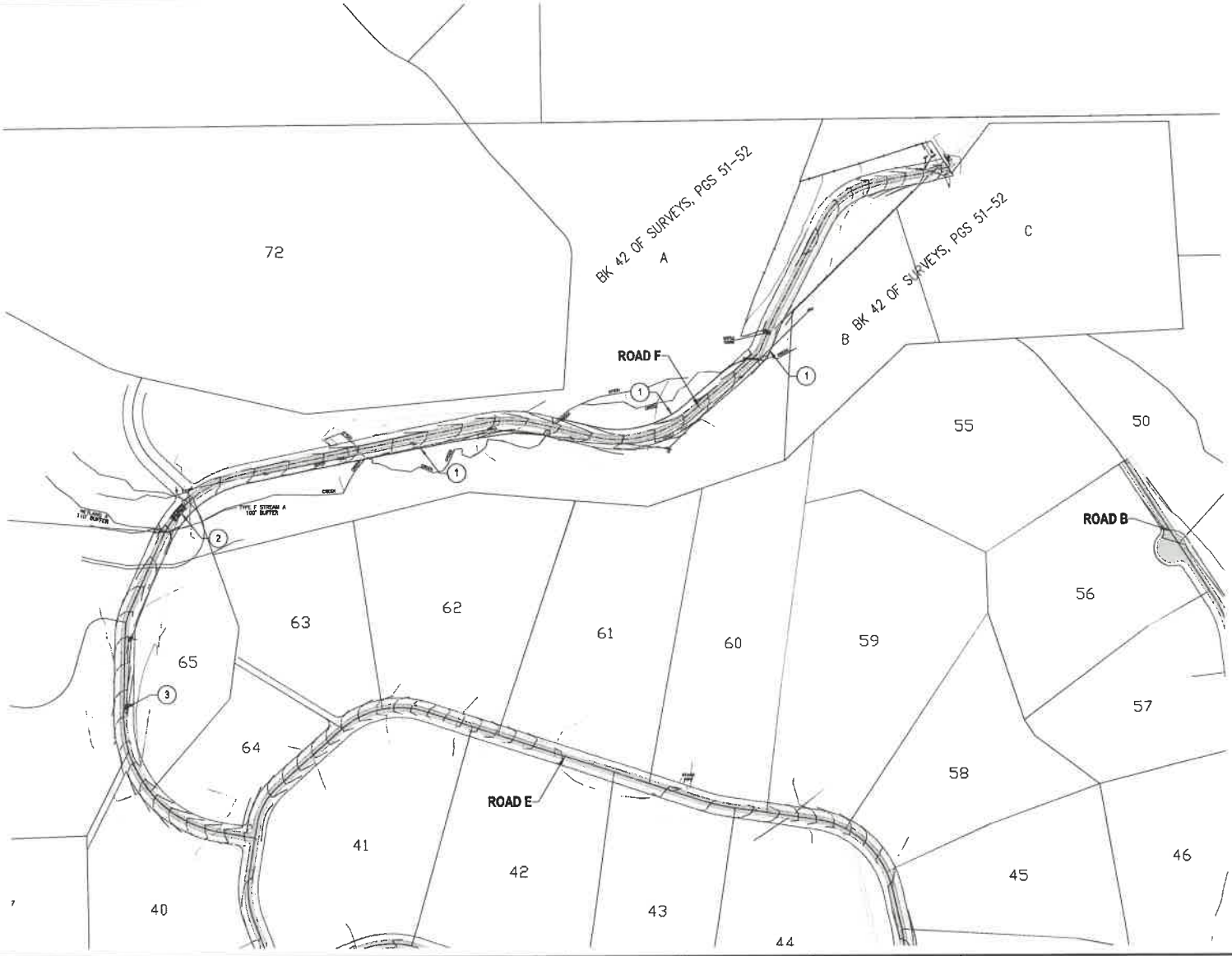
DRAWING NO.	C1.8
PROJECT NO.	20.022
DATE:	02/02/24
SHEET NO.	9 OF 48



CONSTRUCTION NOTES

1. PROVIDE SILT FENCE
2. PROVIDE CONSTRUCTION ENTRANCE
3. RELOCATE EXISTING UTILITY POLE OUTSIDE OF NEW ROADWAY. COORDINATE WITH UTILITY PROVIDER.

TESC NOTES

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Attachment B

Construction BMPs

BMP C103E:	High-Visibility Fence
BMP C105E:	Stabilized Construction Access
BMP C120E:	Temporary and Permanent Seeding
BMP C121E:	Mulching
BMP C122E:	Nets and Blankets
BMP C123E:	Plastic Covering
BMP C124E:	Sodding
BMP C125E:	Topsoiling/Composting
BMP C130E:	Surface Roughening
BMP C140E:	Dust Control
BMP C150E:	Materials on Hand
BMP C151E:	Concrete Handling
BMP C153E:	Material Delivery, Storage, and Containment
BMP C154E:	Concrete Washout Area
BMP C160E:	Certified Erosion and Sediment Control Lead
BMP C162E:	Scheduling
BMP C200E:	Interceptor Dike and Swale
BMP C207E:	Check Dams
BMP C209E:	Outlet Protection
BMP C220E:	Inlet Protection
BMP C233E:	Silt Fence
BMP C235E:	Wattles
BMP C252E:	Treating and Disposing of High pH Water

Conditions of Use

- Natural buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Contractors can use vegetative buffer zones to protect natural swales, and they can incorporate them into the natural landscaping of an area.
- Do not use critical-areas buffer zones as sediment treatment areas. These areas shall remain completely undisturbed. The jurisdiction may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas and buffer zones. Steel construction fencing is the most effective method to protect sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.
- Do not push debris or extra soil into the buffer zone area because it will cause damage by burying and smothering vegetation.
- Vegetative buffer zones for streams, lakes or other receiving waters shall be established by the jurisdiction or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately.

BMP C103E: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits;
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed;
- Limit construction traffic to designated construction entrances, exits, or internal roads; and
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits, plastic, fabric, or metal fence may be used under certain conditions:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared
- As necessary to control vehicle access to and on the site

Design and Installation Specifications

- High-visibility plastic fence shall be composed of a high-density polyethylene (HDPE) material and shall be ≥ 4 feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every 6 inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 pounds per foot (lb/ft) using the ASTM D4595 testing method.
- If appropriate, install fabric silt fence in accordance with BMP C233E (Silt Fence) to act as high-visibility fence. Silt fence shall be ≥ 3 feet high and must be highly visible to meet the requirements of this BMP.
- Metal fences shall be designed and installed according to the manufacturer's specifications.
- Metal fences shall be ≥ 3 feet high and must be highly visible.
- Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105E: Stabilized Construction Access

Stabilized construction entrances are established to reduce the amount of sediment transported onto paved roads by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for construction sites.

- Construction entrances shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.
- For residential subdivision construction sites, provide stabilized construction entrances for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.
- On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized entrances not shown in the initial Construction Stormwater Pollution Prevention Plan (SWPPP). It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation

- See Figure 7.3: Stabilized Construction Entrance for details.

  Note: The 100-foot minimum length of the entrance shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100 feet).

- Construct stabilized construction entrances with a 12-inch thick pad of 4- to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction entrance stabilization because these products increase pH levels in stormwater, and concrete discharge to surface waters of the state is prohibited.

- A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards listed in Table 7.1: Stabilized Construction Entrance Geotextile Standards.

Figure 7.3: Stabilized Construction Entrance

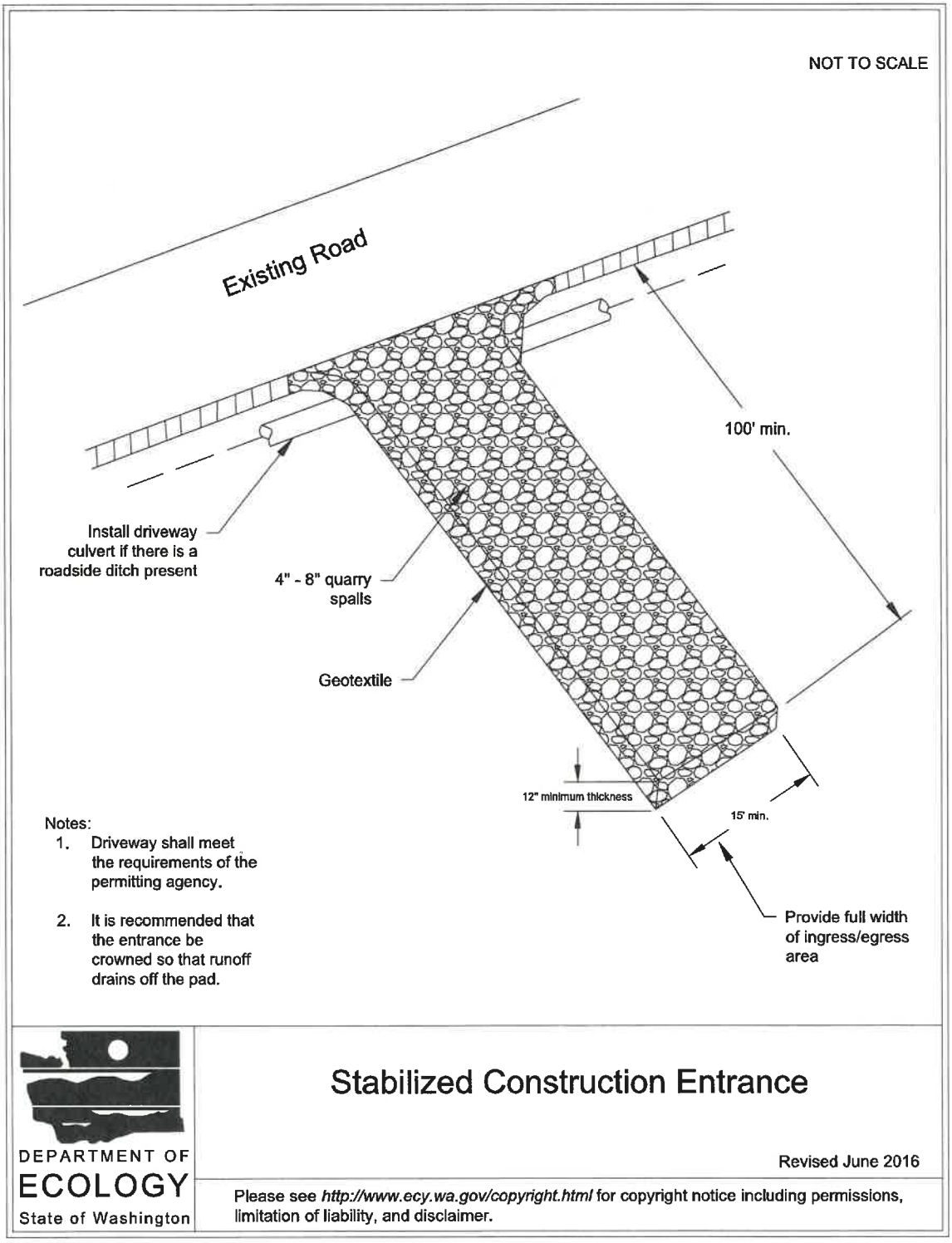


Table 7.1: Stabilized Construction Entrance Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 pounds per square inch (psi) minimum
Grab Tensile Elongation (ASTM D4632)	30% maximum
Mullen Burst Strength (ASTM D3786-80a)	400 psi minimum
Apparent Opening Size (ASTM D4751)	No. 20 to No. 45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized entrance. Also consider the installation of excess concrete as a stabilized entrance. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103E: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction entrance.
- Whenever possible, the entrance shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction entrances should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction entrance must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.
- Alternative material specification:
    - The Washington State Department of Transportation (WSDOT) has raised safety concerns about the quarry spall rock specified in the second bullet in the Design and Installation subsection. WSDOT has noticed that rocks measuring 4 to 8 inches can become trapped between dually truck tires and subsequently released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the stabilized construction entrance remains effective. To remain effective, the BMP must prevent sediment from migrating off-site. To date, there has been no performance testing to verify operation of this new specification. Local jurisdictions may use the alternative specification, but must perform increased off-site inspections
    - Stabilized construction entrances may use material that meets the requirements of the latest version of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* for ballast unless the alternative grading and quality requirements listed in Table 7.2: Stabilized Construction Entrance Alternative Material Requirements are used.

Table 7.2: Stabilized Construction Entrance Alternative Material Requirements

Sieve Size	Percentage Passing
2.5 inches	99 to 100
2 inch	65 to 100
3/4 inch	40 to 80
No. 4	5 maximum
No. 100	0 to 2
% Fracture	75 minimum
Notes: All percentages are by weight. The sand equivalent value and dust ratio requirements do not apply. The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.	

Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the entrance, or the installation of BMP C106E: Wheel Wash.
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on-site. The pavement shall not be cleaned by washing down the street, except when sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the washwater shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high-efficiency sweeper. Do not use a non-high-efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction entrance(s) BMP C103E: High-Visibility Fence shall be installed to control traffic.
- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

- Following construction, these areas shall be restored to preconstruction condition or better to prevent future erosion.
- Perform street cleaning at the end of each day or more often if necessary.

BMP C120E: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

- Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for > 30 days. See Element #5: Stabilize Soils for specific timelines for stabilizing exposed soils.
- The optimum permanent seeding window for eastern Washington is October 1 through November 15.
- The acceptable permanent seeding window for eastern Washington is September 1 through April 30.
- Seeding permanent species is not recommended for eastern Washington from May 1 through August 31, unless irrigation is conducted.
- Review all disturbed areas in late August to early September and complete all seeing by the end of April. Otherwise, vegetation will not establish itself well enough to provide more than average protection.
- Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See BMP C121E: Mulching for specifications.
- Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions or geotextiles) which will prevent erosion. See BMP F6.61: Amending Construction Site Soils.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a bonded fiber matrix (BFM). For vegetated channels that will have high flows, install erosion control blankets over hydroseed. Before allowing water to flow in vegetated channels, establish a 50% vegetation cover of all seeded areas after 3 months of active growth following germination during the growing season. If vegetated channels cannot be established by seed before water flow, install sod or prevegetated mats in the channel bottom over hydromulch

and blankets.

- Confirm the installation of all required stormwater control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre (lb/acre) of mulch with 3% tackifier.
- Mulch is always required for seeding. Apply mulch on top of the seed or simultaneously by hydroseeding. See BMP C121E: Mulching for specifications.
- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Reinstall native topsoil on the disturbed soil surface before application. See BMP F6.61: Amending Construction Site Soils in Chapter 6 - Flow Control BMP Design.
- When installing seed via hydroseeding operations, only about one-third of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. One way to overcome this is to increase seed quantities by up to 50%.
- Vegetation establishment can be enhanced by one of the following two approaches:
    - Approach 1: Enhance vegetation establishment by dividing the hydromulch operation into two phases:
        - Phase 1 – Install all seed and fertilizer with 25% to 30% mulch and tackifier onto the soil in the first lift.
        - Phase 2 – Install the remaining mulch and tackifier over the first lift.
    - Approach 2: Vegetation can also be enhanced by:
        - Installing the mulch, seed, fertilizer, and tackifier in one lift;
        - Spreading or blowing straw over the top of the hydromulch at a rate of about 800 to 1,000 lb/acre; or
        - Holding straw in place with a standard tackifier.
    - Both of these approaches (Approach 1 and Approach 2) will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:
        - Irrigation,
        - Reapplication of mulch, and
        - Repair of failed slope surfaces.

      Either of these approaches can use standard hydromulch (1,500 lb/acre minimum) and BFM/mechanically bonded fiber matrix (MBFM) (3,000 lb/acre minimum).
- Seed may be installed by hand if it is:

- Temporary and covered by straw, mulch, or topsoil; or
- Permanent in small areas (usually < 1 acre) and covered with mulch, topsoil, or erosion blankets.

- The seed mixes listed in Table 7.3: Temporary Seeding through Table 7.12: Permanent Seed Mixes: Stabilization of Ski Slopes and Subalpine Areas include recommended mixes for both temporary and permanent seeding. Alternative seed mixes approved by the local jurisdiction may be used.
- Because it is difficult to generalize soil and climate conditions in eastern Washington, the project proponent is directed to check with the local suppliers or the local conservation district for appropriate seed mixes and application rates for their site based on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic.
- In addition to meeting erosion control functions and not hindering maintenance operations, selection of long-lived, successional growth native vegetation that can compete against or exclude weeds and grow with minimal maintenance after plant establishment is preferred. Provide diversity to the greatest extent possible and plan for a succession of flowering times to improve pollinator habitat.

Table 7.3: Temporary Seeding shows seeding rates for four different seed mixes (A, B, C, and D) for the temporary stabilization of disturbed areas until permanent vegetation or other long-term erosion control measures can be established. These annual plants will generally not survive more than one growing season.

Table 7.3: Temporary Seeding

Common Name	Seeding Rate for Four Seed Mixes (lb/acre)			
	A	B	C	D
Winter or spring wheat (I)	80			
Spring barley (I)		80		
Regreen (I)[a] or triticale (I)			50	
Annual ryegrass (I)				15
[a]Sterile wheat x wheatgrass hybrid I = introduced, nonnative plant species				

Table 7.4: Permanent Seed Mixes: Upland Areas with Less than 12 Inches Precipitation shows three different erosion control seed mixes (A, B, and C) for upland areas that receive less than 12 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.4: Permanent Seed Mixes: Upland Areas with Less than 12 Inches Precipitation

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Crested or Siberian wheatgrass* (droughty, coarse soils) (I)	7		
Bluebunch wheatgrass (N)		7	
Indian ricegrass (sandy soil)(N)	2		
Thickspike wheatgrass (N)			8
Sheep fescue (I)		1	1
Big bluegrass (N) or needle and thread grass (N)	1	1	
TOTAL	10	9	9
Seeds/sq ft/mixture	63	56	64

[a]Expressed as pure live seed

I = introduced, nonnative plant species

N = native plant species

sf = square feet

Table 7.5: Permanent Seed Mixes: Upland Areas That Receive 12 to 15 Inches Precipitation shows three different erosion control seed mixes (A, B, and C) for upland areas that receive 12 to 15 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.5: Permanent Seed Mixes: Upland Areas That Receive 12 to 15 Inches Precipitation

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Bluebunch or beardless wheatgrass (N)		8	
Pubescent wheatgrass (I)			7
Indian ricegrass (sandy or sandy loam soils) (N)	2		
Thickspike wheatgrass (N)	7		2
Sheep fescue (I)		1	2
Basin wildrye (N)		1	
TOTAL	9	10	11
Seeds/sf/mixture	53	63	49

[a]Expressed as pure live seed

I = introduced, nonnative plant species

N = native plant species

sf = square feet

Table 7.6: Permanent Seed Mixes: Upland Areas With 15 to 18 Inches Precipitation shows two different erosion control seed mixes (A and B) for upland areas that receive 15 to 18 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.6: Permanent Seed Mixes: Upland Areas With 15 to 18 Inches Precipitation

Common Name	Seeding Rate for Two Seed Mixes (lb/acre)[a]	
	A	B
Bluebunch wheatgrass (N) or beardless wheatgrass (N)	8	
Pubescent wheatgrass (I) or intermediate wheatgrass (I) or thickspike wheatgrass (N)		8
Hard fescue (I) or sheep fescue (I)	2	2
Big bluegrass (N)	1	1
Native legume (N)	2	2
TOTAL	9	10
Seeds/sf/mixture	70	72
[a]Expressed as pure live seed I = introduced, nonnative plant species N = native plant species sf = square feet		

Table 7.7: Permanent Seed Mixes: Upland Areas With 18 to 24 Inches Precipitation shows three different erosion control seed mixes (A, B, and C) for upland areas that receive 18 to 24 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.7: Permanent Seed Mixes: Upland Areas With 18 to 24 Inches Precipitation

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Slender wheatgrass (N) or sodar streambank wheatgrass	7		
Blue wildrye (N)		8	
Mountain brome (N)	1		8
Hard fescue (I)	2	2	2
White clover (I) or red clover (I)			2

Table 7.7: Permanent Seed Mixes: Upland Areas With 18 to 24 Inches Precipitation (continued)

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Native lupine (N) or northern sweetvetch (N)		2	
Native clover spp. (N) or milkvetch spp. (N)	2		
TOTAL	12	12	12
Seeds/sf/mixture	64	62	76

[a]Expressed as pure live seed

I = introduced, nonnative plant species

N = native plant species

sf = square feet

Table 7.8: Permanent Seed Mixes: Upland Areas With More Than 24 Inches Precipitation shows two different erosion control seed mixes (A and B) for upland areas that receive > 24 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.8: Permanent Seed Mixes: Upland Areas With More Than 24 Inches Precipitation

Common Name	Seeding Rate for Two Seed Mixes (lb/acre)[a]	
	A	B
Hard fescue (I)		2
Blue wildrye (N)	6	
Red fescue (I)	1	
Mountain brome (N)	2	4
Slender wheatgrass (N)		4
White clover (I)	2	
Native legume (N)		2
TOTAL	11	12

Table 7.8: Permanent Seed Mixes: Upland Areas With More Than 24 Inches Precipitation (continued)

Common Name	Seeding Rate for Two Seed Mixes (lb/acre)[a]	
	A	B
Seeds/sf/mixture	72	61

[a]Expressed as pure live seed

I = introduced, nonnative plant species

N = native plant species

sf = square feet

Table 7.9: Permanent Seed Mixes: Grassed Waterways With Fewer Than 15 Inches Precipitation shows three different erosion control seed mixes (A, B, and C) for stabilizing grassed waterways in areas that receive fewer than 15 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.9: Permanent Seed Mixes: Grassed Waterways With Fewer Than 15 Inches Precipitation

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Pubescent wheatgrass (I)		10	
Streambank wheatgrass (N)			7
Thickspike wheatgrass (N)	7		
Sheep fescue (I)		2	2
Big bluegrass (N)	2		
TOTAL	9	12	9
Seeds/sf/mixture	66	48	56

[a]Expressed as pure live seed

I = introduced, nonnative plant species

N = native plant species

sf = square feet

Table 7.10: Permanent Seed Mixes: Grassed Waterways With 15 to 18 Inches Precipitation shows three different erosion control seed mixes (A, B, and C) for stabilizing grassed waterways in areas that receive 15 to 18 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.10: Permanent Seed Mixes: Grassed Waterways With 15 to 18 Inches Precipitation

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Tall wheatgrass (I)	10		
Pubescent wheatgrass (I), streambank wheatgrass (N), or intermediate wheatgrass (I)		10	
Hard fescue (I) or sheep fescue (I)	2	2	2
Thickspike wheatgrass (N)			8
TOTAL	12	12	10
Seeds/sf/mixture	46	48	57
[a]Expressed as pure live seed I = introduced, nonnative plant species N = native plant species sf = square feet			

Table 7.11: Permanent Seed Mixes: Grassed Waterways With More Than 18 Inches Precipitation shows three different erosion control seed mixes (A, B, and C) for stabilizing grassed waterways in areas that receive more than 18 inches effective precipitation. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.11: Permanent Seed Mixes: Grassed Waterways With More Than 18 Inches Precipitation

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]		
	A	B	C
Intermediate wheatgrass (I)	10		
Mountain brome (N) or meadow brome		10	
Annual ryegrass (I) or perennial ryegrass (I)	4		
Hard fescue (I)		2	
Tall wheatgrass (I)			10
TOTAL	14	12	10
Seeds/sf/mixture	40	46	38
[a]Expressed as pure live seed I = introduced, nonnative plant species N = native plant species sf = square feet			

Table 7.12: Permanent Seed Mixes: Stabilization of Ski Slopes and Subalpine Areas shows two different erosion control seed mixes (A and B) for stabilizing ski slopes and subalpine areas in eastern Washington. For each, drilled seeding rates are given (in lb/acre); double seed rates if broadcast or hydroseeded. Consideration should be given to the traffic hazard for wildlife when selecting food species for roadside stabilization.

Table 7.12: Permanent Seed Mixes: Stabilization of Ski Slopes and Subalpine Areas

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]	
	A	B
Blue wildrye (N) or Idaho fescue (N)	10	
Pubescent wheatgrass (I) or red fescue (I)		8
Hard fescue (I)		5
Sheep fescue (I)	2	2
White clover (I) or bentgrasses (I)		2
Lupine (N)	2	

Table 7.12: Permanent Seed Mixes: Stabilization of Ski Slopes and Subalpine Areas (continued)

Common Name	Seeding Rate for Three Seed Mixes (lb/acre)[a]	
	A	B
TOTAL	14	17
[a]Expressed as pure live seed I = introduced, nonnative plant species N = native plant species		

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Back-blading or smoothing of slopes > 4H:1V is not allowed if they are to be seeded.
- Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum, permanent areas shall receive soil amendments to achieve organic matter and permeability performance defined in amended soil/landscape systems. For systems that are deeper than 8 inches, complete the rototilling process in multiple lifts, or prepare the soil amendments to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer needed is recommended. This will prevent the overapplication of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form. A natural system typically releases 20% to 10% of its nutrients annually. Chemical fertilizers have been formulated to simulate what organic matter does naturally.
- Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow release coating.

There are numerous products available to take the place of chemical fertilizers, including several with seaweed extracts that are beneficial to soil microbes and organisms. If 100% cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes, use BFM or MBFM products. Apply BFM/MBFM products at a minimum rate of 3,000 lb per acre of mulch with approximately 10% tackifier. Achieve a minimum of 95% soil coverage during application. Numerous products are available commercially. Install products per manufacturer's instructions. Most products require 24 to 36 hours to cure before a rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40- to 50-pound bags and include all necessary ingredients except for seed and fertilizer.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include the following:
    - BFM and MBFMs do not require surface preparation.
    - Helicopters can assist in installing BFM and MBFMs in remote areas.
    - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
    - Installing BFM and MBFMs can save at least $1,000 per acre compared to blankets.
- In most cases, the shear strength of blankets is not a factor when used on slopes, only when used in channels.
    - Areas to be permanently landscaped shall provide a healthy topsoil or amend the existing soil to reduce the need for fertilizers, improve overall topsoil quality, provide for better plant health and vitality, improve hydrologic characteristics, and reduce the need for irrigation.
    - Areas that already have good topsoil, such as undisturbed areas, do not require soil amendments.

Maintenance Standards

- Reseed any seeded areas that fail to establish ≥ 50% cover (100% cover for areas that receive sheet or concentrated flows) of all seeded areas after 3 months of active growth following germination during the growing season. If reseeding is ineffective, use an alternative method, such as sodding, mulching, or nets/blankets. If winter weather prevents adequate grass growth, this time limit may be relaxed at the discretion of the local authority when sensitive areas would otherwise be protected.
- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. If the erosion problem is drainage related, the problem shall be fixed and the eroded area reseeded and protected by mulch.
- Seeded areas shall be supplied with adequate moisture, but not watered to the extent that causes runoff.

Approved as Equivalent

The Washington State Department of Ecology (Ecology) has approved products as able to meet the requirements of BMP C120E: Temporary and Permanent Seeding. The products did not pass through the Technology Assessment Protocol–Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent or may require additional testing prior to

consideration for local use. The products are available for review on Ecology's Emerging Stormwater Treatment Technologies (TAPE) web page at the following address:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C121E: Mulching

Purpose

The purpose of mulching soils is to provide immediate temporary protection from erosion. Mulch also enhances plant establishment by conserving moisture; holding fertilizer, seed, and topsoil in place; and moderating soil temperatures. There are a variety of mulches are available for use. Only the most common types are discussed in this section.

Conditions of Use

- As a temporary cover measure, mulch should be used:
    - For < 30 days on disturbed areas that require cover;
    - At all times for seeded areas, especially during the wet season and during the hot summer months; and
    - During the wet season on slopes steeper than 3H:1V with more than 10 feet of vertical relief.
- Mulch may be applied at any time of the year and must be refreshed periodically.
- For seeded areas, mulch may consist of 100% of the following:
    - Cottonseed meal
    - Fibers made of wood, recycled cellulose, hemp, or kenaf
    - Compost
    - A blend of these three materials
- Tackifier shall be plant-based, such as guar or *Alpha plantago*, or chemical-based such as polyacrylamide (PAM) or polymers. Any mulch or tackifier product used shall be installed per manufacturer's instructions. Generally, mulches come in 40- to 50-pound bags. Seed and fertilizer are added at time of application.

Design and Installation Specifications

For mulch materials, application rates, and specifications see Table 7.13: Mulch Standards and Guidelines. Always use a minimum mulch thickness of 2 inches; increase the thickness until the ground is 95% covered (i.e., not visible under the mulch layer).

Note: Thicknesses may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.

Table 7.13: Mulch Standards and Guidelines

Mulch Material: Straw	
Quality Standards	Air-dried; free from undesirable seed and coarse material.
Application Rates	2- to 3 inches thick; five bales per 1,000 sf or 2 to 3 tons per acre
Remarks	Cost-effective protection when applied with adequate thickness. Hand-application generally requires greater thickness than blown straw. The thickness of straw may be reduced by half when used in conjunction with seeding. In windy areas, straw must be held in place by crimping, using a tackifier, or covering with netting. Blown straw always has to be held in place with a tackifier because even light winds will blow it away. Straw, however, has several deficiencies that should be considered when selecting mulch materials. It often introduces and/or encourages the propagation of weed species, and it has no significant long-term benefits. Straw should be used only if mulches with long-term benefits are unavailable locally. It should also not be used within the ordinary high-water elevation of receiving waters (due to flotation).
Mulch Material: Hydromulch	
Quality Standards	No growth inhibiting factors.
Application Rates	Approximately 25 to 30 lb per 1,000 sf or 1,000 to 1,300 lb per acre.
Remarks	Shall be applied with hydromulcher. Shall not be used without seed and tackifier unless the application rate is at least doubled. Fibers > 0.75 to 1 inch can clog hydromulch equipment. Fibers should be kept to < 0.75 inch.
Mulch Material: Compost	
Quality Standards	No visible water or dust during handling. Must be produced per Chapter 173-350 WAC, Solid Waste Handling Standards, but may have up to 35% biosolids.
Application Rates	2 inches thick at a minimum; approximately 100 tons per acre (approx. 750 lb per cubic yard).
Remarks	More effective control can be obtained by increasing thickness to 3 inches. Excellent mulch for protecting final grades until landscaping because it can be directly seeded or tilled into soil as an amendment. Compost used for mulch has a coarser size gradation than compost used for BMP C125E: Topsoiling/Composting or BMP F6.61: Amending Construction Site Soils. It is more stable and practical to use in wet areas and during rainy weather conditions. Do not use near wetlands or near phosphorus-impaired water bodies.
Mulch Material: Chipped Site Vegetation	
Quality Standards	Average size shall be several inches. Gradations from fines to 6 inches in length for texture, variation, and interlocking properties.
Application Rates	2 inches thick at a minimum.
Remarks	This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates

Table 7.13: Mulch Standards and Guidelines (continued)

	the problems associated with burning. Generally, it should not be used on slopes above approximately 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of receiving waters. If seeding is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment.
Mulch Material: Wood-Based Mulch or Wood Straw	
Quality Standards	No visible water or dust during handling. Must be purchased from a supplier with a Solid Waste Handling Permit or one exempt from solid waste regulations.
Application Rates	2 inches thick; approximately 100 tons per acre (approximately 750 lb per cubic yard).
Remarks	This material is often called "hog or hogged fuel." It is usable as a material for BMP C105E: Stabilized Construction Access and as a mulch. The use of mulch ultimately improves the organic matter in the soil. Special caution is advised regarding the source and composition of wood-based mulch. Its preparation typically does not provide any weed seed control, so evidence of residual vegetation in its composition or known inclusion of weed plants or seeds should be monitored and prevented (or minimized).
Mulch Material: Wood Strand Mulch	
Quality Standards	A blend of loose, long, thin wood pieces derived from native conifers or deciduous trees with high length-to-width ratio.
Application Rates	2 inches thick at a minimum.
Remarks	Cost-effective protection when applied with adequate thickness. A minimum of 95% of the wood strand shall have lengths between 2 and 10 inches, with a width and thickness between 1/16 and 0.5 inches. The mulch shall not contain resin, tannin, or other compounds in quantities that would be detrimental to plant life. Sawdust or wood shavings shall not be used as mulch. See the latest version of the Washington State Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction*.

Where the option of "compost" is selected, it should be a coarse compost that meets the size gradations listed in Table 7.14: Size Gradations of Compost as Mulch Material when tested in accordance with Test Method 02.02-B in *Test Methods for the Examination of Composting and Compost* (Thompson, 2001).

Table 7.14: Size Gradations of Compost as Mulch Material

Sieve Size	Percentage Passing
3 inch	100
1 inch	90 to 100
3/4 inch	70 to 100
1/4 inch	40 to 100

Mulch used within the ordinary high-water mark of receiving waters should be selected to minimize potential flotation of organic matter. Composted organic materials have higher specific gravities (densities) than straw, wood, or chipped material. Consult the Hydraulic Project Approval (HPA) for mulch mixes if applicable.

Maintenance Standards

- The thickness of the mulch cover must be maintained.
- Any areas that experience erosion shall be remulched and/or protected with a net or blanket. If the erosion problem is drainage related, then the problem shall be fixed and the eroded area remulched.

BMP C122E: Nets and Blankets

Purpose

Erosion control nets and blankets are intended to prevent erosion and hold seed and mulch in place on steep slopes and in channels so that vegetation can become well established. In addition, some nets and blankets can be used to permanently reinforce turf to protect drainage systems during high flows.

Nets (commonly called matting) are strands of material woven into an open but high-tensile strength net (for example, coconut fiber matting and turf reinforcement mats [TRM]). Blankets are strands of material that are not tightly woven but instead form a layer of interlocking fibers, typically held together by a biodegradable or photodegradable netting (for example, excelsior or straw blankets). They generally have lower tensile strength than nets but cover the ground more completely. Coir (coconut fiber) fabric comes as both nets and blankets.

Conditions of Use

Erosion control nets and blankets should be used for the following purposes:

- To aid permanent vegetated stabilization of slopes 2H:1V or greater and with more than 10 feet of vertical relief.
- For drainage ditches and swales (highly recommended). The application of appropriate netting or blanket to drainage ditches and swales can protect bare soil from channelized runoff while vegetation is established. Nets and blankets also can capture a great deal of sediment due to their open, porous structure. Synthetic nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap. 100% synthetic blankets manufactured for use in ditches may be easily reused as temporary ditch liners.

Disadvantages of nets and blankets include the following:

- Surface preparation is required.
- On slopes steeper than 2.5H:1V, net and blanket installers may need to be roped and harnessed for safety.
- They cost at least $4,000 to $6,000 per acre installed.

Advantages of nets and blankets include the following:

- They can be installed without mobilizing special equipment.
- They can be installed by anyone with minimal training.
- They can be installed in stages or phases as the project progresses.
- Seed and fertilizer can be hand-placed by the installers as they progress down the slope.
- They can be installed in any weather.
- Numerous types of nets and blankets can be designed with various parameters in mind: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

An alternative to nets and blankets is BMP C202E (Riprap Channel Lining).

Design and Installation Specifications

- See Figure 7.5: Channel Installation and Figure 7.6: Slope Installation for typical orientation and installation of nets and blankets used in channels and as slope protection. Note: these are typical only; all nets and blankets must be installed per manufacturer's installation instructions.
- Installation is critical to the effectiveness of these products. If good ground contact is not achieved, runoff can concentrate under the product, resulting in significant erosion.
- Nets and blankets are installed on slopes according to the following procedure:
    1. Complete final grade and track walk up and down the slope. Soils should be raked and uniform prior to installing nets or blankets. To be effective, nets and blankets must have good adhesion to the soil.
    2. Install hydromulch with seed and fertilizer.
    3. Dig a small trench, approximately 12 inches wide by 6 inches deep along the top of the slope.
    4. Install the leading edge of the net/blanket into the small trench and staple approximately every 18 inches. Note: Staples are metal, U-shaped, and a minimum of 6 inches long. Longer staples are used in sandy soils. Biodegradable stakes are also available.
    5. Roll the net/blanket slowly down the slope as you walk backward. Note: The net/blanket rests against the installer's legs. Staples are installed as the net/blanket is unrolled. It is critical that the proper staple pattern is used for the net/blanket being installed. The net/blanket is not to be allowed to roll down the slope on its own as this stretches the net/blanket, making it impossible to maintain soil contact. In addition, no one is allowed to walk on the net/blanket after it is in place.
    6. If the net/blanket is not long enough to cover the entire slope length, allow the trailing edge of the upper net/blanket to overlap the leading edge of the lower net/blanket and staple it. On steeper slopes, this overlap should be installed in a small trench, stapled, and covered with soil.

With the variety of products available, it is impossible to cover all the details of appropriate use and installation. Therefore, it is critical that the designer review the manufacturer's information and that a site visit take place in order to ensure that the specified product is appropriate. Information is also available in the latest version of the Washington State Department of Transportation *Standard Specifications for Road, Bridge, and Municipal Construction*.

- Jute matting must be used in conjunction with mulch (BMP C121E: Mulching). Excelsior, woven straw blankets, and coir (coconut fiber) blankets may be installed without mulch. There are many other types of erosion control nets and blankets on the market that may be appropriate in certain circumstances.
- In general, most nets (e.g., jute matting) require mulch in order to prevent erosion because they have a fairly open structure. Blankets typically do not require mulch because they usually provide complete protection of the surface.
- Extremely steep, unstable, wet, or rocky slopes are often appropriate candidates for use of synthetic blankets, as are riverbanks, beaches, and other high-energy environments. If synthetic blankets are used, the soil should be hydromulched first.
- For use in sensitive areas, 100% biodegradable blankets are available. These organic blankets are usually held together with a paper or fiber mesh and stitching, which may last up to a year.
- Most netting used with blankets is photodegradable, meaning it breaks down under sunlight (not ultraviolet [UV] stabilized). However, this process can take months or years even under bright sun. Once vegetation is established, sunlight does not reach the mesh. It is not uncommon to find nondegraded netting still in place several years after installation. This can be a problem if maintenance requires the use of mowers or ditch cleaning equipment. In addition, birds and small animals can become trapped in the netting.

Maintenance Standards

- Maintain good contact with the ground. Erosion must not occur beneath the net or blanket.
- Repair and staple any areas of the net or blanket that are damaged or not in close contact with the ground.
- Fix and protect eroded areas if erosion occurs due to poorly controlled drainage.

Figure 7.5: Channel Installation

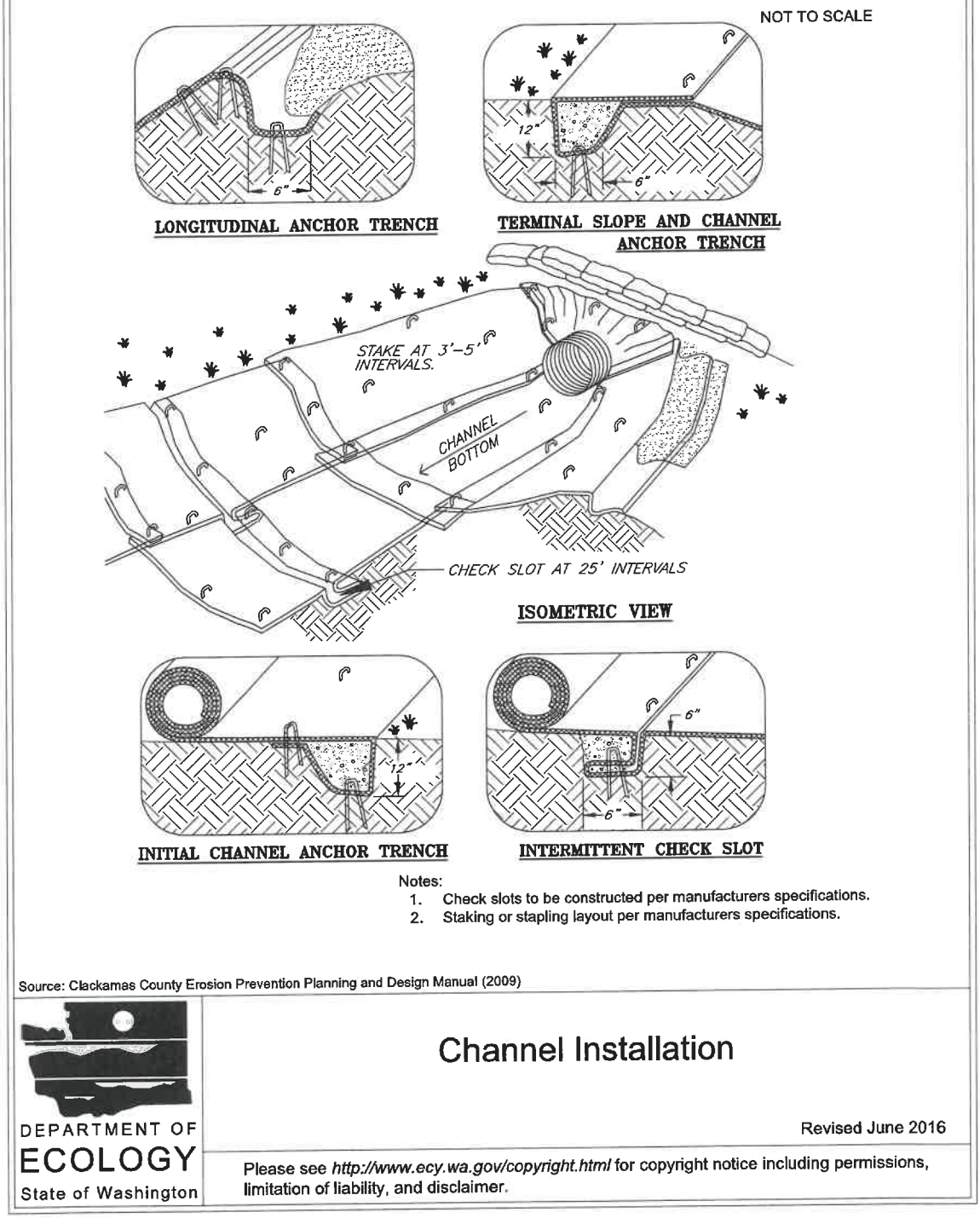
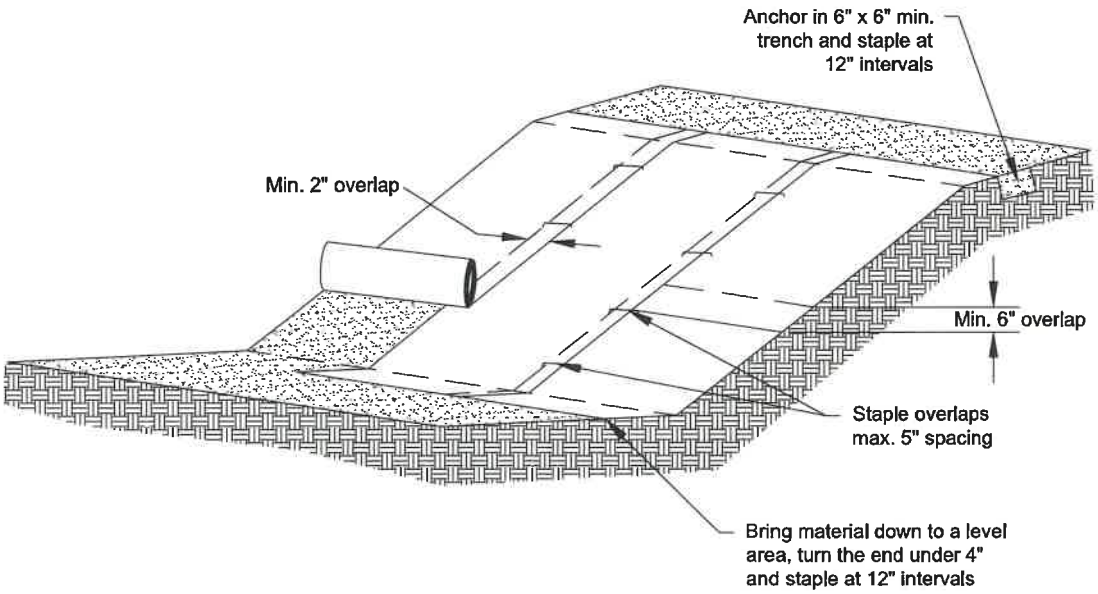


Figure 7.6: Slope Installation



Notes:

1. Slope surface shall be smooth before placement for proper soil contact.
2. Stapling pattern as per manufacturer's recommendations.
3. Do not stretch blankets/mattings tight - allow the rolls to mold to any irregularities.
4. For slopes less than 3H:1V, rolls may be placed in horizontal strips.
5. If there is a berm at the top of the slope, anchor upslope of the berm.
6. Lime, fertilize, and seed before installation. Planting of shrubs, trees, etc. should occur after installation.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Slope Installation

Revised June 2016

BMP C123E: Plastic Covering

Purpose

Plastic covering provides immediate, short-term erosion protection to slopes and disturbed areas.

Conditions of Use

Plastic covering may be used on disturbed areas that require cover measures for < 30 days, with the following exceptions:

- Plastic is particularly useful for protecting cut-and-fill slopes and stockpiles. However, the relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for applications > 6 months.
- Due to rapid runoff caused by plastic covering, do not use this method upslope of areas that might be adversely impacted by concentrated runoff. Such areas include steep and/or unstable slopes.
- Plastic sheeting may result in increased runoff volumes and velocities, requiring additional on-site measures to counteract the increases. Creating a trough with wattles or other material can convey clean water away from these areas.
- To prevent undercutting, trench and backfill plastic covering that comes in a rolled form.
- Although the plastic material is inexpensive to purchase, the cost of installation, maintenance, removal, and disposal add to the total costs of this BMP.
- Whenever plastic is used to protect slopes, install water collection measures at the base of the slope. These measures include plastic-covered berms, channels, and pipes used to convey clean rainwater away from bare soil and disturbed areas. Do not mix clean runoff from a plastic covered slope with dirty runoff from a project.
- Other uses for plastic include the following:
    - Temporary ditch liner
    - Pond liner in temporary sediment pond
    - Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored
    - Emergency slope protection during heavy rains
    - Temporary drainpipe ("elephant trunk") used to direct water

Design and Installation Specifications

- Plastic slope cover must be installed according to the following procedure:
    1. Run plastic up and down the slope, not across the slope.
    2. Plastic may be installed perpendicular to slope if the slope length < 10 feet.

3. Provide a minimum overlap of 8 inches at the seams.
4. On long or wide slopes, or slopes subject to wind, tape all seams.
5. Place plastic into a small (12-inch-wide by 6-inch-deep) slot trench at the top of the slope and backfill with soil to keep water from flowing underneath.
6. Place sand-filled burlap or geotextile bags every 3 to 6 feet along seams and tie them together with twine to hold them in place.
7. Inspect plastic for rips, tears, and open seams regularly and repair immediately. This prevents high-velocity runoff from contacting bare soil, which causes extreme erosion.
8. Sandbags may be lowered into place tied to ropes. However, all sandbags must be staked in place.

- Plastic sheeting shall have a minimum thickness of 0.06 millimeters.
- If erosion at the toe of a slope is likely, a gravel berm, riprap, or other suitable protection shall be installed at the toe of the slope in order to reduce the velocity of runoff.

Maintenance Standards

- Torn sheets must be replaced and open seams repaired.
- Completely remove and replace the plastic if it begins to deteriorate due to ultraviolet radiation.
- Completely remove plastic when no longer needed.
- Dispose of old tires used to weight down plastic sheeting appropriately.

Approved as Functionally Equivalent

The Washington State Department of Ecology (Ecology) has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol–Ecology (TAPE) process. Local jurisdictions may choose not to accept these products or may require additional testing prior to consideration for local use. The products that Ecology has approved as functionally equivalent are available for review on Ecology's Emerging Stormwater Treatment Technologies (TAPE) web page at the following address:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C124E: Sodding

Purpose

The purpose of sodding is to establish permanent turf for immediate erosion protection and to stabilize drainage paths where concentrated overland flow will occur.

Conditions of Use

Sodding may be used in the following areas:

- Disturbed areas that require short-term or long-term cover.
- Disturbed areas that require immediate vegetative cover.
- All waterways that require vegetative lining. Waterways may also be seeded rather than sodded and protected with a net or blanket.

Design and Installation Specifications

Sod shall be free of weeds, have a uniform thickness (approximately 1 inch), and have a dense root mat for mechanical strength.

The following steps are recommended for sod installation:

1. Shape and smooth the surface to final grade in accordance with the approved grading plan. Consider any areas (such as swales) that need to be overexcavated below design elevation to allow room for placing soil amendment and sod.
2. Amend 4 inches (minimum) of compost into the top 8 inches of the soil if the organic content of the soil is less than 10% or the permeability is less than 0.6 inches per hour. See the Washington State Department of Ecology's Compost web page for further information:

   https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Organic-materials/Managing-organics-compost
3. Fertilize according to the sod supplier's recommendations.
4. Work lime and fertilizer 1 to 2 inches into the soil, and smooth the surface.
5. Lay strips of sod beginning at the lowest area to be sodded and perpendicular to the direction of water flow. Wedge strips securely into place. Square the ends of each strip to provide for a close, tight fit. Stagger joints ≥ 12 inches. Staple on slopes steeper than 3H:1V. Staple the upstream edge of each sod strip.
6. Roll the sodded area and irrigate.
7. When sodding is carried out in alternating strips or other patterns, seed the areas between the sod immediately after sodding.

Maintenance Standards

If the grass is unhealthy, the cause shall be determined and appropriate action taken to reestablish a healthy ground cover. If it is impossible to establish a healthy ground cover due to frequent saturation, instability, or some other cause, the sod shall be removed, and the area shall be seeded with an appropriate mix and protected with a net or blanket (BMP C122E: Nets and Blankets).

BMP C125E: Topsoiling/Composting

Purpose

Topsoiling and composting provide a suitable growth medium for final site stabilization with vegetation. While not a permanent cover practice in itself, topsoiling is an integral component of providing permanent cover in areas with an unsuitable soil surface for plant growth. Use this BMP in

conjunction with other BMPs such as BMP C120E: Temporary and Permanent Seeding, BMP C121E: Mulching, or BMP C124E: Sodding.

Note: BMP C125E: Topsoiling/Composting is functionally the same as BMP F6.61: Amending Construction Site Soils.

Native soils and disturbed soils that have been organically amended not only retain much more stormwater but also serve as effective biofiltration for urban pollutants and, by supporting more vigorous plant growth, reduce the amount of water, fertilizer, and pesticides needed to support installed landscapes. Topsoil includes no subsoils, consisting of only material from the top several inches including organic debris.

Conditions of Use

- Permanent landscaped areas shall contain healthy topsoil that reduces the need for fertilizers, improves overall topsoil quality, provides for better vegetative health and vitality, improves hydrologic characteristics, and reduces the need for irrigation.
- Leave native soils and the duff layer undisturbed to the maximum extent practicable. Stripping of existing, properly functioning soil system and vegetation for the purpose of topsoiling during construction is not acceptable. Preserve existing soil systems in undisturbed and uncompacted conditions if functioning properly.
- Areas that already have good topsoil, such as undisturbed areas, do not require soil amendments.
- Restore, to the maximum extent practical, native soils disturbed during clearing and grading to a condition equal to or better than the original site condition's moisture-holding capacity. Use on-site native topsoil, incorporate amendments into on-site soil, or import blended topsoil to meet this requirement.
- Topsoiling is a required procedure when establishing vegetation on shallow soils and soils of critically low pH (high acid) levels.
- Beware of where the topsoil comes from and what vegetation was on-site before disturbance. Invasive plant seeds may be included and could cause problems for establishing native plants, landscaped areas, or grasses.
- Topsoil from the site will contain mycorrhizal bacteria that are necessary for healthy root growth and nutrient transfer. These native mycorrhizae are acclimated to the site and will provide optimum conditions for establishing grasses. Use commercially available mycorrhizae products when using off-site topsoil.

Design and Installation Specifications

If topsoiling is to be performed, the following guidelines should be considered:

- Maximize the depth of the topsoil wherever possible to provide the maximum possible infiltration capacity and beneficial growth medium. Topsoil shall have the following:
    - A minimum depth of 8 inches.
    - A target organic content of 6% to 8% dry weight for all nonturf planting areas and 3% to

5% organic matter content for turf areas. Imported topsoil mixes should contain 35% to 40% compost by volume for nonturf planting areas and 20% to 25% compost by volume for turf areas.

  - A pH between 6.0 and 8.0 or as specified for particular plant choices.
  - If blended topsoil is imported, fines should be limited to 25% passing through a No. 200 sieve.

- Mulch planting beds with 2 inches of organic material.
- Accomplish the required organic content, depth, and pH by returning native topsoil to the site, importing topsoil of sufficient organic content, and/or incorporating organic amendments. When incorporating amendments to meet the organic content requirement, use compost that meets the compost specification for bioretention (see Chapter 5 - Runoff Treatment BMP Design), with the exception that the compost may have up to 35% biosolids or manure. The compost material should be mature and derived from organic waste materials including plant debris, biosolids, or wood wastes that meet the functional requirements and intent of the organic soil amendment specification.
- Organic amendments should be incorporated to a minimum depth of 8 inches except where tree roots or other natural features limit the depth of incorporation. Subsoils at a depth > 12 inches should be scarified ≥ 2 inches to avoid stratified layers, where feasible. The decision to either layer topsoil over a subgrade or incorporate topsoil into the underlying layer may vary depending on the planting specified.
- The final composition and construction of the soil system will result in a natural selection or favoring of certain plant species over time. For example, incorporation of topsoil may favor grasses, while layering with mildly acidic, high-carbon amendments may favor more woody vegetation.
- Allow sufficient time in scheduling for topsoil spreading prior to seeding, sodding, or planting.
- Take care when applying topsoil to subsoils with contrasting textures. Sandy topsoil over clayey subsoil is a particularly poor combination, as water creeps along the junction between the soil layers and causes the topsoil to slough. If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method to prevent a lack of bonding is to actually work the topsoil into the layer below for a depth ≥ 6 inches.
- Field exploration of the site shall be made to determine if there is surface soil of sufficient quantity and quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, or clay loam). Avoid areas of natural ground water recharge.
- Stripping shall be confined to the immediate construction area. A 4- to 6-inch stripping depth is common, but depth may vary depending on the particular soil. All surface runoff control structures shall be in place prior to stripping.
- Ripping or restructuring the subgrade may also provide additional benefits in terms of the overall infiltration and interflow dynamics of the soil system.
- Do not place topsoil while in a frozen or muddy condition, when the subgrade is excessively

wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed sodding or seeding.

- In any areas requiring grading, remove and stockpile the duff layer and topsoil on-site in a designated, controlled area, not adjacent to public resources and critical areas. Reapply stockpiled topsoil to other portions of the site where feasible.
- Locate the topsoil stockpile so that it meets specifications and does not interfere with work on the site. It may be possible to locate more than one pile in proximity to areas where topsoil will be used.
- Stockpiling of topsoil shall occur in the following manner:
    - Side slopes of the stockpile shall not > 2H:1V.
    - Between October 1 and June 30:
        - Install an interceptor dike with gravel outlet and silt fence to surround all topsoil stockpiles.
        - Within 7 days, complete erosion control seeding or cover stockpiles with clear plastic or other mulching materials.
    - Between July 1 and September 30:
        - Install an interceptor dike with gravel outlet and silt fence to surround all topsoil stockpiles if the stockpile will remain in place for a longer period of time than active construction grading.
        - Within 30 days, complete erosion control seeding or cover stockpiles with clear plastic or other mulching materials.
- Previously established grades on the areas to be topsoiled shall be maintained according to the approved plan.
- When native topsoil is to be stockpiled and reused, the following should apply to ensure that the mycorrhizal bacteria, earthworms, and other beneficial organisms will not be destroyed:
    1. Reinstall topsoil within 4 to 6 weeks.
    2. Do not allow the topsoil to become saturated with water.
    3. Do not use plastic covering.

Maintenance Standards

- Inspect stockpiles regularly, especially after large storm events. Stabilize any areas that have eroded.
- Establish soil quality and depth toward the end of construction and once established, protect from compaction, such as from large machinery use, and from erosion.
- Plant and mulch soil after installation.
- Leave plant debris or its equivalent on the soil surface to replenish organic matter.
- Reduce and adjust, where possible, the use of irrigation, fertilizers, herbicides and pesticides, rather than continuing to implement formerly established practices.

- The PAM anionic charge density may vary from 2% to 30%; a value of 18% is typical. Studies conducted by the U.S. Department of Agriculture (USDA), Agricultural Research Service demonstrated that soil stabilization was optimized by using very high molecular weight (12 to 15 milligrams (mg)/mole), highly anionic (> 20% hydrolysis) PAM.
- PAM tackifiers are available and being used in place of guar and alpha plantago. Typically, PAM tackifiers should be used at a rate of no more than 0.5 to 1 pound per 1,000 gallons of water in a hydromulch machine. Some tackifier product instructions say to use at a rate of 3 to 5 pounds per acre, which can be too much. In addition, pump problems can occur at higher rates due to increased viscosity.

Maintenance Standards

- PAM may be reapplied on actively worked areas after a 48-hour period.
- Reapplication is not required unless PAM-treated soil is disturbed or unless turbidity levels show the need for an additional application. If PAM-treated soil is left undisturbed, a reapplication may be necessary after 2 months. More PAM applications may be required for steep slopes, silty and clayey soils (USDA Classification Type "C" and "D" soils), long grades, and high precipitation areas. When PAM is applied first to bare soil and then covered with straw, a reapplication may not be necessary for several months.
- Loss of sediment and PAM may be a basis for penalties per RCW 90.48.080.

BMP C130E: Surface Roughening

Purpose

Surface roughening aids in the establishment of vegetative cover, reduces runoff velocity, increases infiltration, and provides for sediment trapping through the provision of a rough soil surface. Horizontal depressions are created by operating a tiller or other suitable equipment on the contour or by leaving slopes in a roughened condition by not fine grading them.

For more information: Use this BMP in conjunction with other BMPs such as BMP C120E: Temporary and Permanent Seeding, BMP C121E: Mulching, or BMP C124E: Sodding.

Conditions for Use

- All slopes > 3H:1V and > 5 vertical feet require surface roughening to a depth of 2 to 4 inches prior to seeding.
- Areas that will not be stabilized immediately may be roughened to reduce runoff velocity until seeding takes place.
- Slopes with a stable rock face do not require roughening.
- Slopes where mowing is planned should not be excessively roughened.

Design and Installation Specifications

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends on the type of slope. Roughening methods include stair-step

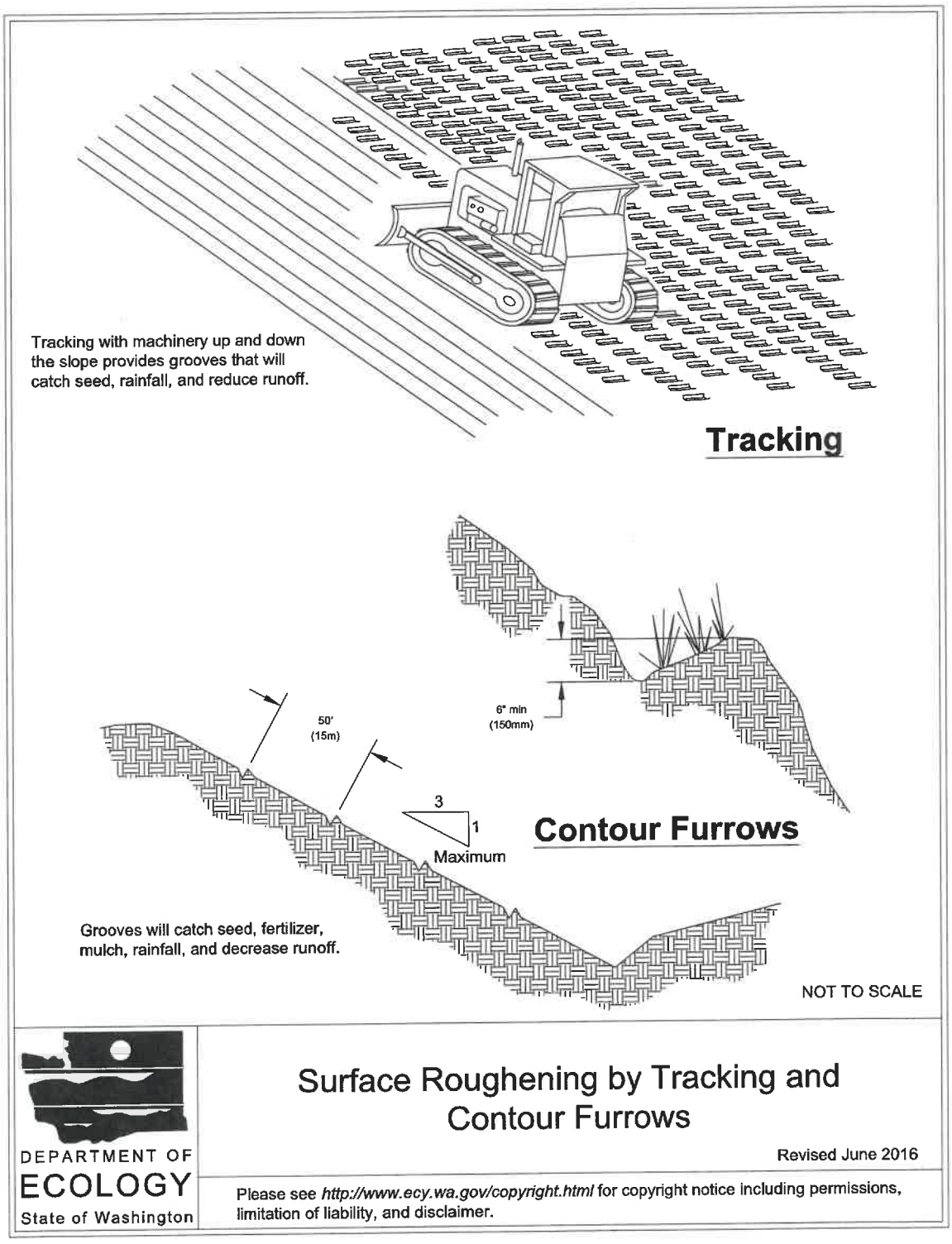
grading, grooving, contour furrows, and tracking. See Figure 7.7: Surface Roughening by Tracking and Contour Furrows for tracking and contour furrows. Factors to be considered in choosing a roughening method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

- Disturbed areas that will not require mowing may be stair-step graded, grooved, or left rough after filling.
- Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material that sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment. Stair steps must be on contour or gullies will form on the slope.
- Areas that will be mowed (these areas should have slopes less steep than 3:1) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes > 3H:1V but < 2H:1V should be roughened before seeding. This can be accomplished in a variety of ways, including "track walking," or driving a crawler tractor up and down the slope, leaving a pattern of cleat imprints parallel to slope contours.
- Tracking is done by operating equipment up and down the slope to leave horizontal depressions in the soil.

Maintenance Standards

- Areas that are surface roughened should be seeded as quickly as possible.
- Regular inspections should be made of the area. If rills appear, they should be re-roughened and reseeded immediately.

Figure 7.7: Surface Roughening by Tracking and Contour Furrows



BMP C140E: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, into drainage systems, and into receiving waters. Wind erosion is a significant cause of soil movement from construction sites in eastern Washington. Although wind erosion can contribute to water quality impacts, dust control is regulated in some areas of eastern Washington primarily through local air quality authorities. Where such an entity exists, contact the local air quality authority for appropriate and required BMPs for dust control to implement at your project site.

Conditions for Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts on roadways, drainage systems, or receiving waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition, if stable. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, see BMP C105E: Stabilized Construction Access and BMP C106E: Wheel Wash.
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local jurisdictions may approve other dust palliatives such as calcium chloride or polyacrylamide (PAM).
- PAM (BMP C126E: Polyacrylamide for Soil Erosion Protection) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to the increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control, especially in eastern Washington. PAM should not be directly applied to water or allowed to enter a water body.
- Contact your local air pollution control authority for guidance and training on other dust control measures. Compliance with the local air pollution control authority constitutes compliance with this BMP. See the following website for more information:

https://ecology.wa.gov/About-us/Our-role-in-the-community/Partnerships-committees/Clean-air-agencies

- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.

Techniques that can be used for unpaved roads and lots include the following:

- Reduce speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
- Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
- Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles < 0.075 millimeters to 10% to 20%.
- Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
- Encourage the use of alternate, paved routes, if available.
- Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
- Limit dust-generating work on windy days.
- Pave unpaved permanent roads and other trafficked areas.

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150E: Materials on Hand

Purpose

Quantities of erosion prevention and sediment control materials can be kept on the project site at all times to be used for emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction Stormwater Pollution Prevention Plan (SWPPP) requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions for Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible pipe, sandbags, geotextile fabric and steel "T" posts.

- Materials should be stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or developer could keep a stockpile of materials that are available to be used on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at their office or yard. The office or yard must be less than an hour from the project site.

Design and Installation Specifications

Depending on the project type, size, complexity, and length, the materials and quantities will vary. A good minimum list of items that will cover numerous situations includes the following:

- Clear plastic, 6 mil
- Drainpipe, 6- or 8-inch-diameter
- Sandbags, filled
- Straw bales for mulching
- Quarry spalls
- Washed gravel
- Geotextile fabric
- Catch basin inserts
- Steel "T" posts
- Silt fence material
- Straw wattles

Maintenance Standards

- All materials with the exception of the quarry spalls, steel "T" posts, and gravel should be kept covered and out of both sun and rain.
- Restock materials as needed.

BMP C151E: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see BMP C154E: Concrete Washout Area)
3. De minimus washout to formed areas awaiting concrete

Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to BMP C154E: Concrete Washout Area for information on concrete washout areas.
    - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in BMP C154E: Concrete Washout Area.
- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMP C252E: Treating and Disposing of High pH Water for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
    - Significant concrete work (as defined in the CSWGP).
    - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
    - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152E: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contain fine particles and have a high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to surface waters of the state is prohibited. Use this BMP to minimize and prevent process water and slurry created by sawcutting or surfacing from entering waters of the state.

Conditions for Use

Anytime sawcutting or surfacing operations take place, these management practices should be used. Sawcutting and surfacing operations include, but are not limited to, the following:

- Sawing
- Coring
- Grinding
- Roughening
- Hydrodemolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings should not remain on permanent concrete or asphalt pavement overnight.

- Slurry and cuttings should not drain to any natural or constructed drainage system. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydrodemolition, surface roughening or similar operations to drain to any natural or constructed drainage system. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pickup sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuum trucks.

BMP C153E: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the drainage system or receiving waters from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., polyacrylamide)
- Fertilizers, pesticides, and herbicides
- Detergents
- Asphalt and concrete compounds
- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

The following steps should be taken to minimize risk:

- Temporary storage area should be located away from vehicle traffic, near the construction entrance(s), and away from receiving waters or storm drains.
- Safety Data Sheets should be supplied for all stored materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (October 1 through June 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as earthen dike, horse trough, or even a children's wading pool for nonreactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.

Material Storage Areas and Secondary Containment Practices

- Liquids, petroleum products, and substances listed in 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be nonhazardous.
- Sufficient separation should be provided between stored containers to allow spill cleanup and emergency response access.
- During the wet weather season (October 1 through June 30), each secondary containment facility shall be covered during nonworking days.
- At all times, each secondary containment facility shall be covered prior to and during rain events.
- Keep material storage areas clean, organized, and equipped with an ample supply of

appropriate spill cleanup material (spill kit).

- The spill kit should include, at a minimum, the following items:
    - One water-resistant nylon bag
    - Three oil-absorbent socks (3 inches by 4 feet)
    - Two oil-absorbent socks (3 inches by 10 feet)
    - Twelve oil-absorbent pads (17 by 19 inches)
    - One pair of splash-resistant goggles
    - Three pairs of nitrile gloves
    - Ten disposable bags with ties
    - Instructions

BMP C154E: Concrete Washout Area

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

  Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

Design and Installation Specifications

Implementation

- Perform washout of concrete truck drums at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete onto non-formed areas, or into storm drains, open ditches, streets,

or streams.

- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas as allowed above.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks.
- Self-installed above-grade structures should only be used if excavation is not practical.
- Concrete washout areas shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for the contractor's superintendent or Certified Erosion and Sediment Control Lead (CESCL) to oversee and enforce concrete waste management procedures.
- A sign should be installed adjacent to each concrete washout area to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

Location and Placement

- Locate concrete washout areas at least 50 feet from sensitive areas such as storm drains, open ditches, water bodies, or wetlands.
- Allow convenient access to the concrete washout area for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access the concrete washout area, prevent track-out with a pad of rock or quarry spalls (see BMP C105E: Stabilized Construction Access). These

areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.

- The number of concrete washout areas you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, concrete washout areas should be placed in multiple locations for ease of use by concrete truck drivers.

Concrete Truck Washout Procedures

- Washout of concrete truck drums shall be performed in designated concrete washout areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated concrete washout areas or properly disposed of off-site.

Concrete Washout Area Installation

- Concrete washout areas should be constructed as shown in the figures below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Lath and flagging should be commercial type.
- Liner seams shall be installed in accordance with manufacturers' recommendations.
- Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.
- Once concrete wastes are washed into the designated washout area and allowed to harden, the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.
- During periods of concrete work, inspect the concrete washout areas daily to verify continued performance.
    - Check overall condition and performance.
    - Check remaining capacity (% full).
    - If using self-installed concrete washout areas, verify plastic liners are intact and

sidewalls are not damaged.

- If using prefabricated containers, check for leaks.

- Maintain the concrete washout areas to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Concrete washout areas must be cleaned, or new concrete washout areas must be constructed and ready for use once the concrete washout area is 75% full.
- If the concrete washout area is nearing capacity, vacuum and dispose of the waste material in an approved manner.
    - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
    - Do not discharge to the sanitary sewer without local approval.
    - Place a secure, non-collapsing, non-water collecting cover over the concrete washout area prior to predicted wet weather to prevent accumulation and overflow of precipitation.
    - Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from a self-installed concrete washout area, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

Removal of Concrete Washout Areas

- When concrete washout areas are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct concrete washout areas shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

Figure 7.9: Concrete Washout Area with Wood Planks

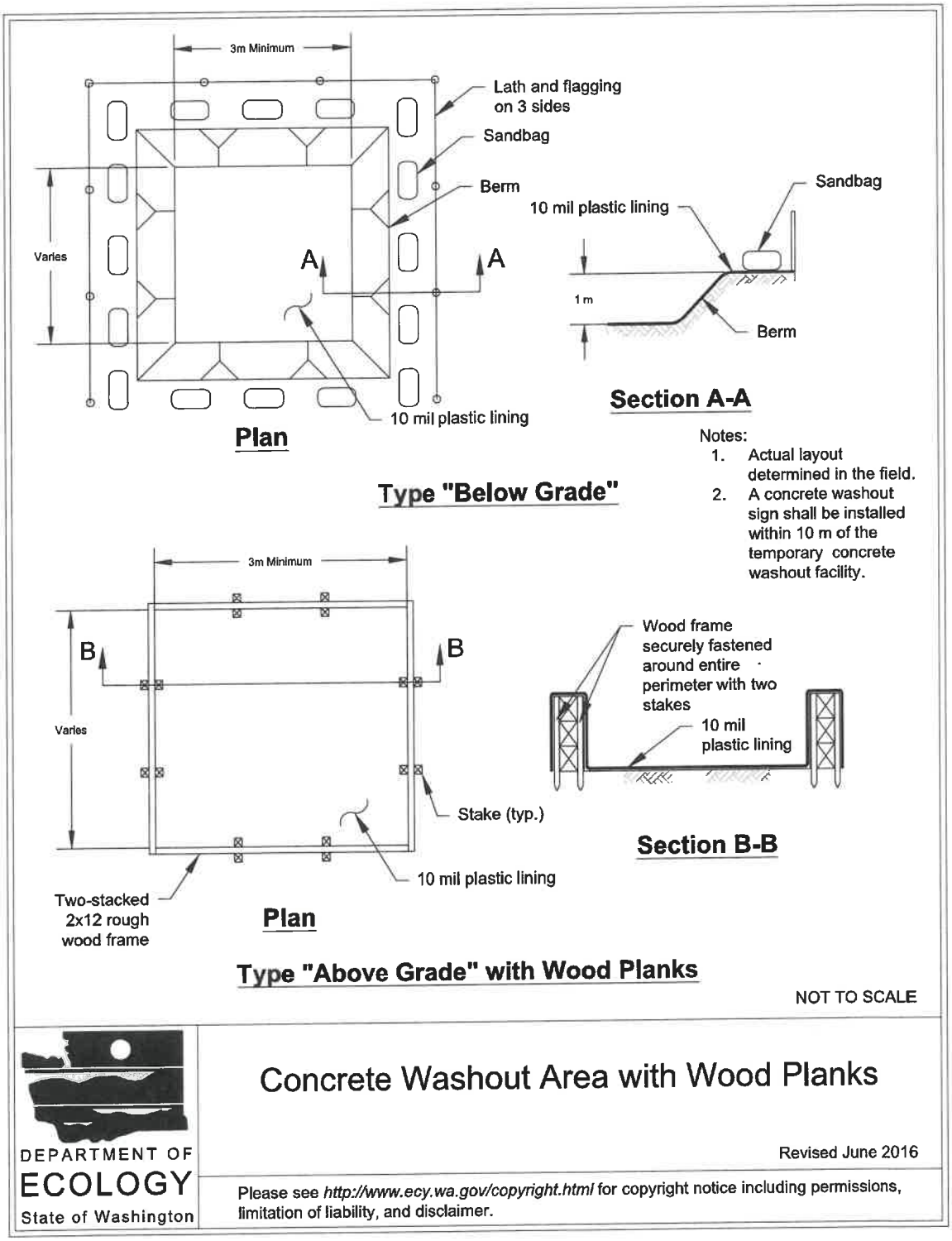


Figure 7.10: Concrete Washout Area with Straw Bales

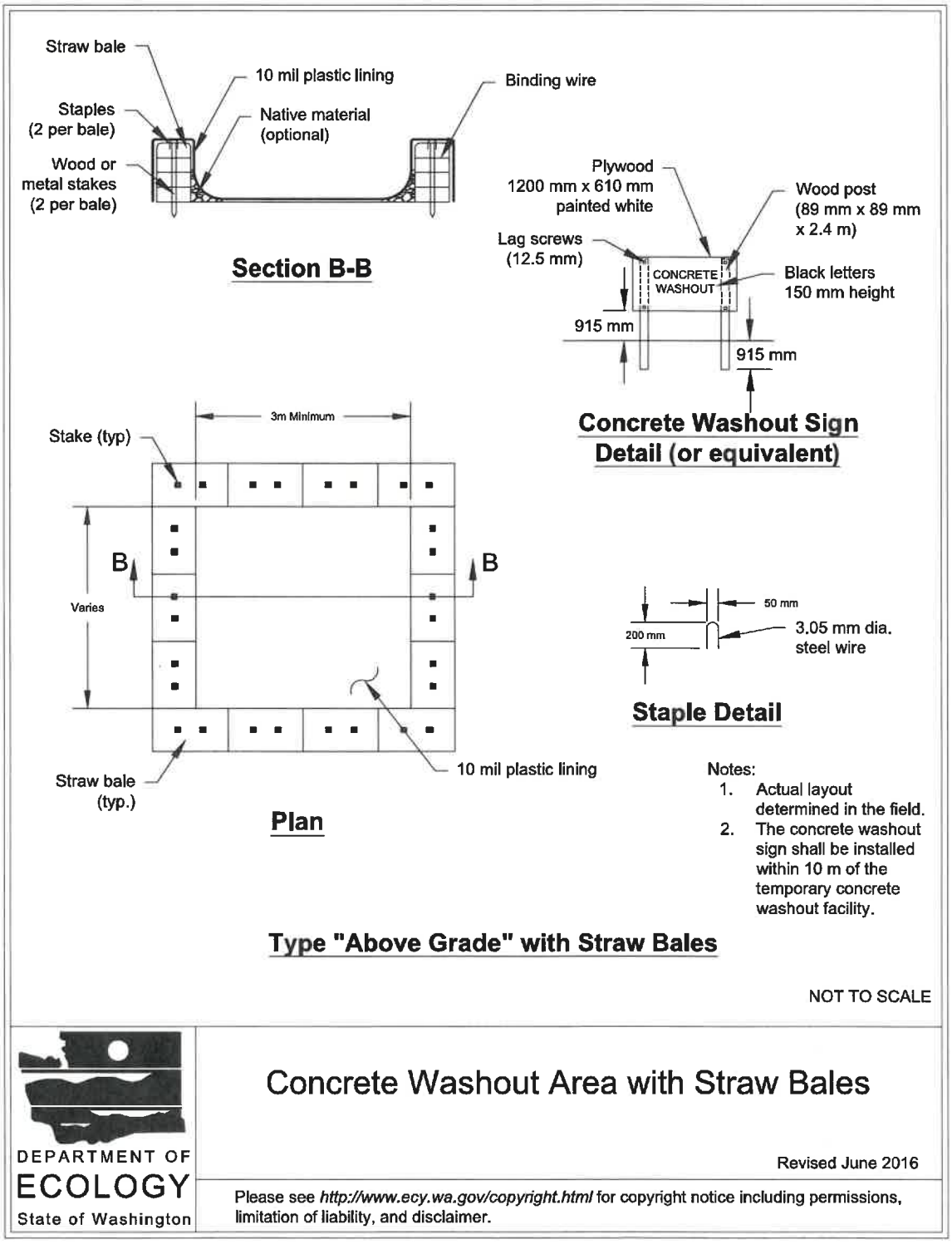
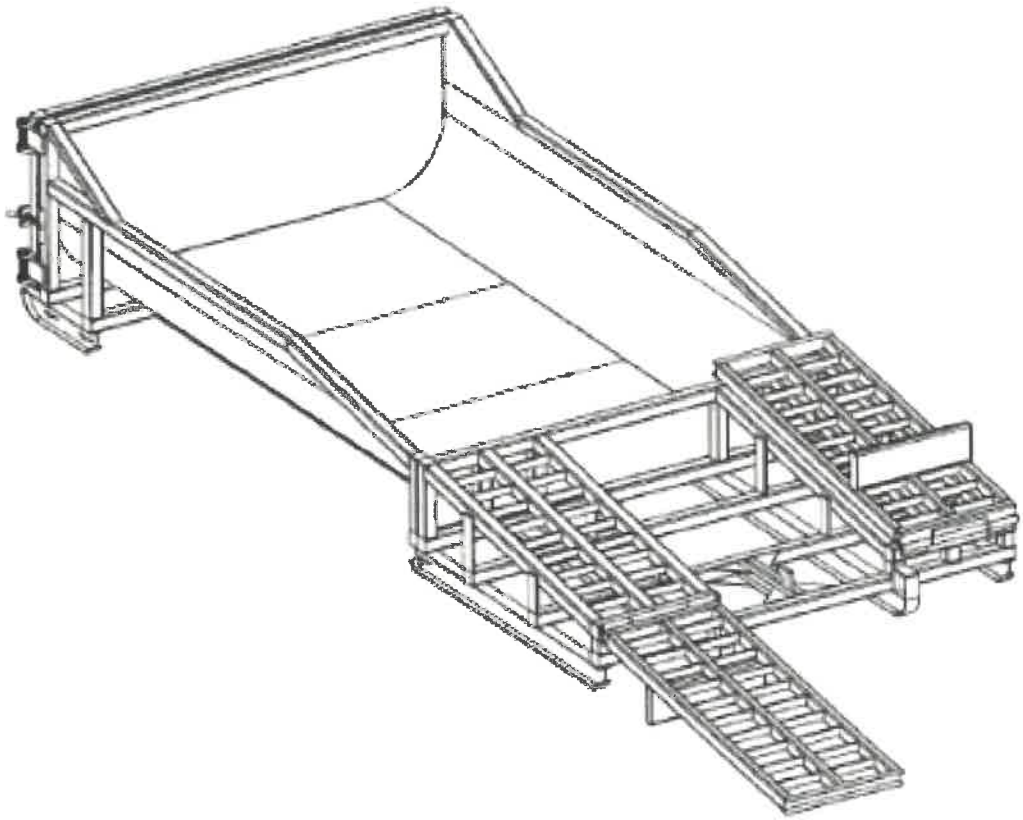


Figure 7.11: Prefabricated Concrete Washout Container with Ramp



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State of Washington

Prefabricated Concrete Washout Container with Ramp

Revised June 2016

BMP C160E: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC) and water quality protection. The designated employee or contact shall be the Certified Erosion and Sediment Control Lead (CESCL) who is responsible for ensuring compliance with all local, state, and federal ESC and water quality requirements.

Conditions of Use

A CESCL should be made available on projects ≥ 1 acre that discharge stormwater to surface waters of the state. Sites < 1 acre do not require a CESCL certification for conducting inspections; sampling is not required on sites that disturb < 1 acre. The CESCL shall meet one of the following requirements:

- Have a current certificate proving attendance in an ESC training course that meets the minimum ESC training and certification requirements established by Ecology. The minimum requirements for CESCL course training, as well as a list of ESC training and certification providers, are available on the Washington State Department of Ecology's Certified Erosion & Sediment Control Lead web page at the following address:

  https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information, see the Envirocert CPESC website at the following address:

  http://www.envirocertintl.org/cpesc/

Specifications

- CESCL certification shall remain valid for 3 years.
- The CESCL shall have authority to act on behalf of the contractor or developer and shall be available, on call, 24 hours per day throughout the period of construction.
- The Construction Stormwater Pollution Prevention Plan (SWPPP) shall include the name, telephone number, fax number, and address of the designated CESCL. See Chapter 3 - Preparation of Stormwater Site Plans and 7.2 Planning.
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region.
- Duties and responsibilities of the CESCL shall include, but are not limited to, the following:
  - Maintaining a permit file on-site at all times, which includes the SWPPP and any associated permits and plans
  - Directing BMP installation, inspection, maintenance, modification, and removal
  - Updating all project drawings and the Construction SWPPP with changes made

- Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR)
- Facilitating, participating in, and taking corrective actions resulting from inspections performed by outside agencies or the owner
- Keeping daily logs, and inspection reports. Inspection reports should include the following:
    - Inspection date/time
    - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection
    - Visual monitoring results, including a description of discharged stormwater and a notation of the presence of suspended sediment, turbid water, discoloration, and oil sheen, as applicable
    - Any water quality monitoring performed during inspection
    - General comments and notes, including a brief description of any BMP repairs, maintenance, or installations made as a result of the inspection
    - A summary or list of all BMPs implemented, including observations of all ESC structures or practices and the following:
        1. Locations of BMPs inspected
        2. Locations of BMPs that need maintenance
        3. Locations of BMPs that failed to operate as designed or intended
        4. Locations where additional or different BMPs are required

BMP C162E: Scheduling

Purpose

Sequencing a construction project can reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Conditions for Use

The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sediment control (ESC) BMPs planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of ground cover leaves a site vulnerable to erosion. Construction

sequencing that limits land clearing, provides timely installation of ESC BMPs, and restores protective cover quickly can significantly reduce the erosion potential of a site.

Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut-and-fill slopes as the work progresses.

7.3.3 Runoff Conveyance and Treatment BMPs

BMP C200E: Interceptor Dike and Swale

Purpose

Provide a dike of compacted soil or a swale at the top or base of a disturbed slope or along the perimeter of a disturbed construction area to convey stormwater. Use the dike and/or swale to intercept the runoff from unprotected areas and direct it to areas where erosion can be controlled. This can prevent storm runoff from entering the work area or sediment-laden runoff from leaving the construction site.

Conditions for Use

Use an interceptor dike or swale where runoff from an exposed site or disturbed slope must be conveyed to an erosion control BMP that can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering the disturbed area.
- When placed horizontally across a disturbed slope, it reduces the amount and velocity of runoff flowing down the slope.
- Locate downslope to collect runoff from a disturbed area and direct it to a sediment-trapping BMP (e.g., BMP C240E: Sediment Trap, or BMP C241E: Sediment Pond (Temporary).

Design Considerations

- Dike and/or swale and channel must be stabilized with temporary or permanent vegetation or other channel protection during construction.
- Steep grades require channel protection and check dams.
- Review construction for areas where overtopping may occur.
- Can be used at the top of new fill before vegetation is established.
- May be used as a permanent diversion channel to carry the runoff.
- Contributing area for an individual dike or swale should be ≤ 1 acre.
- Design the dike and/or swale capacity as follows:

- Temporary interceptor dikes: Sized to handle the expected peak flow rate from a 6-month, 3-hour storm for the developed condition, referred to as the short-duration storm.
- Permanent interceptor dikes: The peak volumetric flow rate is calculated using a 10-minute time step for a 25-year, 24-hour frequency storm for the developed condition.

Interceptor Dikes

Interceptor dikes shall meet the following criteria:

- Top Width: 2 feet minimum.
- Height: 1.5 feet minimum on berm.
- Side Slope: 2H:1V or flatter.
- Grade: Depends on topography; however, dike system minimum is 0.5%, and maximum is 1%.
- Compaction: Minimum of 90% ASTM D698 standard Proctor.
- Stabilization: Depends on velocity and reach. Inspect regularly to ensure stability.
- Ground Slopes < 5%: Seed and mulch should be applied within 5 days of dike construction (see BMP C121E: Mulching).
- Ground Slopes from 5% to 40%: Depends on runoff velocities and dike materials. Slope should be stabilized immediately using either sod or riprap, or other measures to avoid erosion.
- The upslope side of the dike shall provide positive drainage to the dike outlet. No erosion shall occur at the outlet. Provide energy dissipation measures as necessary. Sediment-laden runoff must be released through a sediment-trapping BMP.
- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.
- See Table 7.16: Horizontal Spacing of Interceptor Dikes Along Ground Slope for recommended horizontal spacing between dikes.

Table 7.16: Horizontal Spacing of Interceptor Dikes Along Ground Slope

Average Slope	Slope Percentage	Flow Path Length (feet)
20H:1V or less	3 to 5	300
(10 to 20)H:1V	5 to 10	200
(4 to 10)H:1V	10 to 25	100t
(2 to 4)H:1V	25 to 50	50

Interceptor Swales

Interceptor swales shall meet the following criteria:

- Bottom Width: 2 feet minimum; the bottom shall be level
- Depth: 1 foot minimum
- Side Slope: ≤ 2H:1V
- Grade: Maximum 5%, with positive drainage to a suitable outlet (such as BMP C241E: Sediment Pond (Temporary))
- Stabilization: Seed per BMP C120E: Temporary and Permanent Seeding or BMP C202E: Riprap Channel Lining, 12 inches thick of riprap pressed into the bank and extending ≥ 8 inches vertical from the bottom

Maintenance Standards

- Inspect diversion dikes and interceptor swales once a week and after every rainfall. Immediately remove sediment from the flow area.
- Damage caused by construction traffic or other activity must be repaired before the end of each working day.
- Check outlets and make timely repairs as needed to avoid gully formation. When the area below the temporary diversion dike is permanently stabilized, remove the dike and fill and stabilize the channel to blend with the natural surface.

BMP C201E: Grass-Lined Channels

Purpose

To provide a channel with a vegetative lining for conveyance of runoff. The purpose of the vegetative lining is to prevent transport of sediment and erosion.

Conditions of Use

This practice applies to construction sites where concentrated runoff needs to be contained to prevent erosion or flooding.

- Use this BMP when a vegetative lining can provide sufficient stability for the channel cross section and at lower velocities of water (normally dependent on grade). This means that the channel slopes are generally < 5% and space is available for a relatively large cross section.
- Typical uses include roadside ditches, channels at property boundaries, outlets for diversions, and other channels and drainage ditches in low areas.
- Channels that will be vegetated should be installed before major earthwork and hydroseeded with a bonded fiber matrix (BFM). The vegetation should be well established (i.e., 50% cover of all seeded areas after 3 months of active growth following germination during the growing season) before water is allowed to flow in the ditch. With channels that will have high flows,

BMP C207E: Check Dams

Purpose

Construction of check dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

Conditions of Use

Use check dams where temporary channels or permanent channels are not yet vegetated, channel lining is infeasible, and velocity checks are required.

- Check dams may not be placed in streams unless approved by the Washington State Department of Fish and Wildlife.
- Check dams may not be placed in wetlands without approval from a permitting agency.
- Do not place check dams below the expected backwater from any salmonid-bearing water between October 1 and May 31 to ensure that there is no loss of high-flow refuge habitat for overwintering juvenile salmonids and emergent salmonid fry.

Design and Installation Specifications

- Construct rock check dams from appropriately sized rock. The rock used must be large enough to stay in place given the expected design flow through the channel. The rock must be placed by hand or by mechanical means (do not dump the rock to form the dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Check dams may also be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be reusable, quick and easy to install, effective, and cost efficient.
- Place check dams perpendicular to the flow of water.
- The check dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the check dam rather than falling directly onto the ditch bottom.
- Before installing a check dam, impound and bypass upstream water flow away from the work area. Options for bypassing include pumps, siphons, or temporary channels.
- Check dams combined with sumps work more effectively at slowing flow and retaining sediment than a check dam alone. A deep sump should be provided immediately upstream of the check dam.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as check dams to prevent further sediment from leaving the site.
- The maximum spacing between the check dams shall be such that the downstream toe of the upstream dam is at the same elevation as the top of the downstream dam.

- Keep the maximum height at 2 feet at the center of the check dam.
- Keep the center of the check dam ≥ 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at ≤ 2H:1V.
- Key the rock into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.
- Use geotextile foundation under a rock or sand bag check dam. If a blanket ditch liner is used, geotextile is not necessary. A piece of organic or synthetic blanket cut to fit will also work for this purpose.
- In the case of grass-lined ditches and swales, all check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale—unless the slope of the swale is > 4%. The area beneath the check dams shall be seeded and mulched immediately after dam removal.
- Ensure that channel appurtenances, such as culvert entrances below check dams, are not subject to damage or blockage from displaced rocks.
- See Figure 7.18: Rock Check Dam.

Maintenance Standards

Check dams shall be monitored for performance and sediment accumulation during and after each rainfall that produces runoff. Sediment shall be removed when it reaches one-half the sump depth.

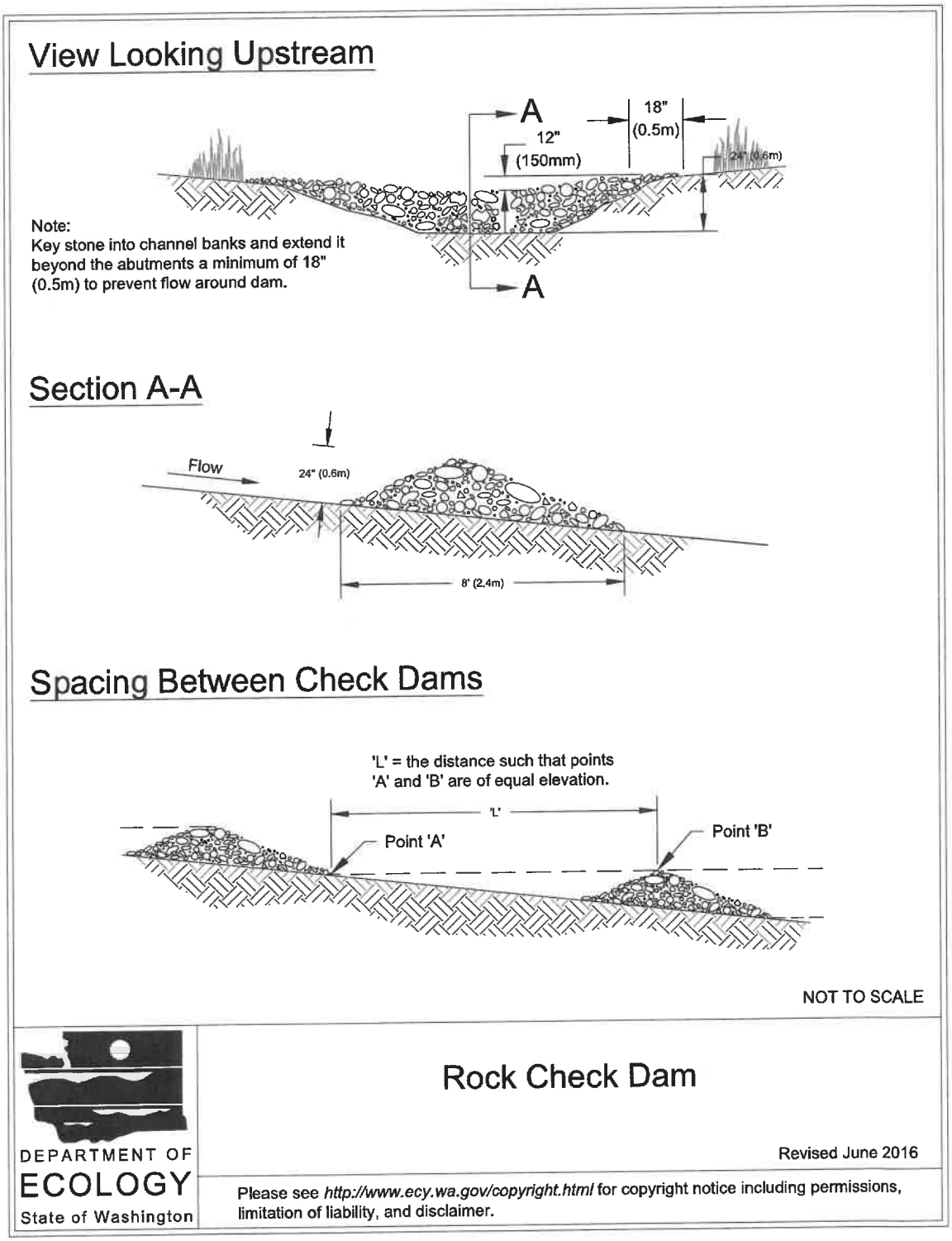
- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel. See BMP C202E (Riprap Channel Lining).

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol–Ecology (TAPE) process. Local jurisdictions may choose not to accept these products or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's Emerging Stormwater Treatment Technologies (TAPE) web page at the following address:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

Figure 7.18: Rock Check Dam



and staples.

- In the case of grass-lined ditches and swales, check dams and accumulated sediment shall be removed when the grass has matured sufficiently to protect the ditch or swale unless the slope of the swale is > 4%. The area beneath the check dams shall be seeded and mulched immediately after dam removal.

Maintenance Standards

- Inspect TSDs for performance and sediment accumulation during and after each rainfall that produces runoff. Remove sediments when it reaches one-half the height of the TSD.
- Anticipate submergence and deposition above the TSD and erosion from high flows around the edges of the TSD. Immediately repair any damage or any undercutting of the TSD.

BMP C209E: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of Use

Use outlet protection at the outlets of all ponds, pipes, ditches, or other conveyances that discharge to a natural or constructed drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

- The receiving channel at the outlet of a culvert shall be protected from erosion bylining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1 foot above the maximum tailwater elevation or 1 foot above the crown, whichever is higher. For pipes > 18 inches in diameter, the outlet protection lining of the channel shall be four times the diameter of the culvert.
- Standard wing walls, tapered outlets, and paved channels should also be considered when appropriate for permanent culvert outlet protection (see the latest version of the Washington State Department of Transportation Hydraulics Manual).
- BMP C122E: Nets and Blankets or BMP C202E: Riprap Channel Lining provides suitable options for lining materials.
- With low flows, BMP C201E: Grass-Lined Channels can be an effective alternative for lining material.
- The following guidelines shall be used for riprap outlet protection with riprap:
  - If the discharge velocity at the outlet is < 5 feet per second (ft/sec), use 2- to 8-inch riprap. Minimum thickness is 1 foot.
  - For a discharge velocity of 5 to 10 fps at the outlet, use 24- to 4-foot riprap. Minimum thickness is 2 feet.

- For outlets at the base of steep slope pipes (pipe slope > 10%), use an engineered energy dissipater.
- Geotextile or erosion control blankets should always be used under riprap to prevent scour and channel erosion. See BMP C122E: Nets and Blankets.

- Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a Hydraulic Project Approval (HPA) from the Washington State Department of Fish and Wildlife.

  For more information: See 1.4.9 Hydraulic Project Approvals.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipater if sediment builds up.

BMP C220E: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment–trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18 inches of sod around each finished lawn and yard drain.

Table 7.18: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to become plugged and require a high frequency of maintenance. Limit contributing areas for an individual inlet to ≤ 1 acre. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table 7.18: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding will occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30-feet by 30-feet/acre
Block and gravel drop inlet protection	Yes	Paved or earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with a wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	Not applicable	Not applicable	18-month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth 1 to 2 feet as measured from the crest of the inlet structure.
- Side slopes of excavation should be ≤ 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.
- Clear the area of all debris.
- Grade the approach to the inlet uniformly.

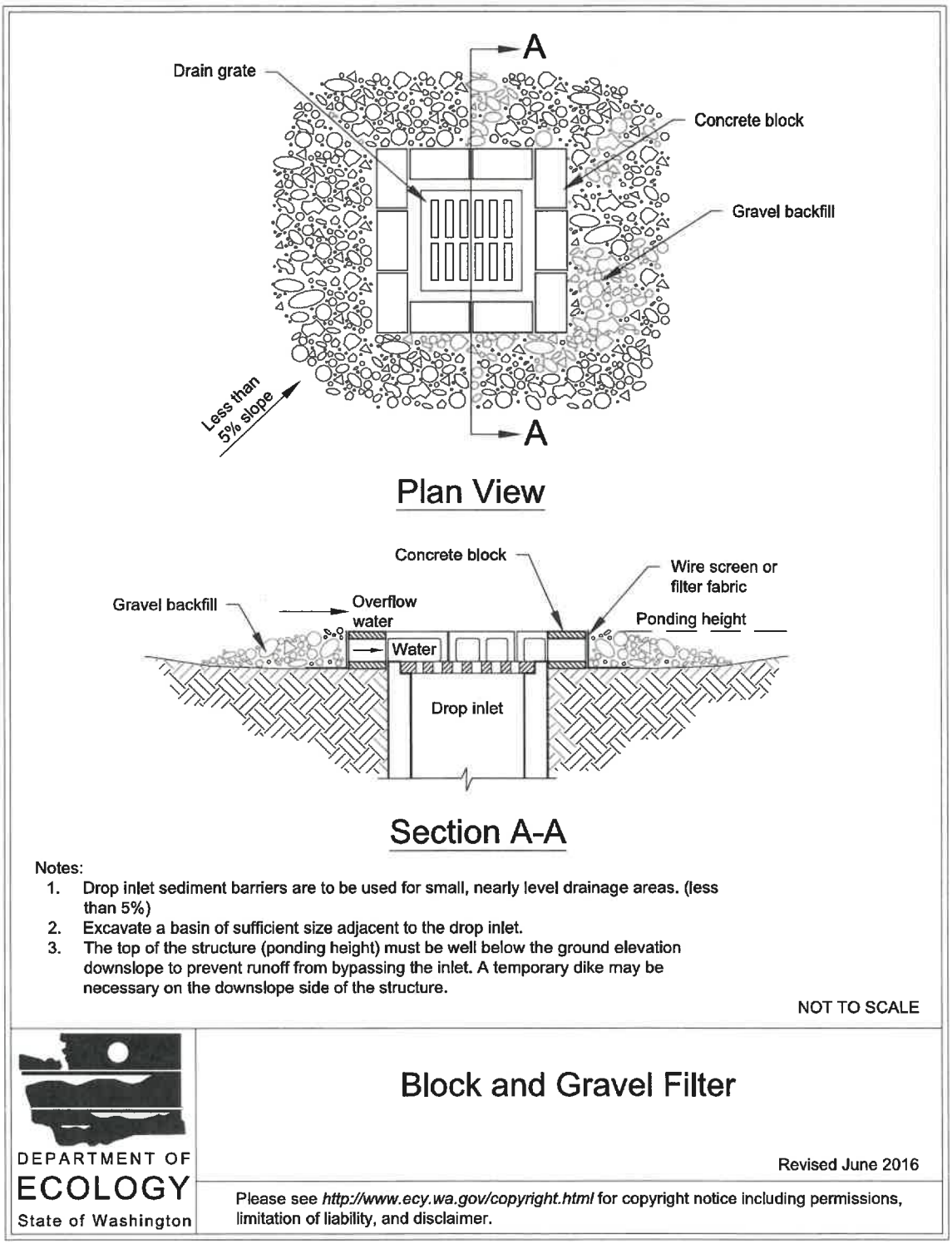
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the downslope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure 7.19: Block and Gravel Filter. Design and installation specifications for block and gravel filters include:

- Provide a height 1 to 2 feet above the inlet.
- Recess the first row of blocks 2 inches into the ground for stability.
- Support subsequent courses by placing a piece of pressure-treated wood (2x4) through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with 0.5-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
    - Provide a slope of 3H:1V on the upstream side of the berm.
    - Provide a slope of 2H:1V on the downstream side of the berm.
    - Provide a 1-foot-wide level rock area between the gravel berm and the inlet.
    - Use rocks ≥ 3 inches in diameter on the upstream slope of the berm.
    - Use gravel with a diameter of 0.5 to 0.75 inches at a minimum thickness of 1 foot on the downstream slope of the berm.

Figure 7.19: Block and Gravel Filter



Notes:

1. Drop inlet sediment barriers are to be used for small, nearly level drainage areas. (less than 5%)
2. Excavate a basin of sufficient size adjacent to the drop inlet.
3. The top of the structure (ponding height) must be well below the ground elevation downslope to prevent runoff from bypassing the inlet. A temporary dike may be necessary on the downslope side of the structure.

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Block and Gravel Filter

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Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with 0.5-inch openings.
    - Place wire mesh over the drop inlet so that the wire extends a minimum of 1 foot beyond each side of the inlet structure.
    - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
    - Provide ≥ 12-inch depth of aggregate over the entire inlet opening and extend ≥ 18 inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This combined inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provide 5 cubic feet of storage.
- Require dewatering provisions.
- Provide a high-flow bypass that will not become clogged under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection With Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

- Use wire mesh with 0.5-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure 7.20: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with 0.5-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Curb and Gutter Sediment Barrier

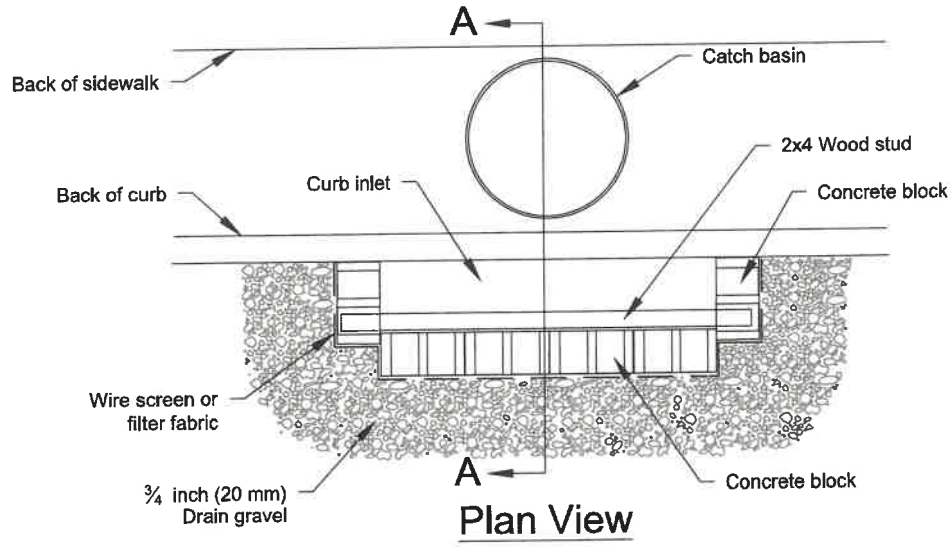
A curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure 7.21: Curb and Gutter Barrier. Design and installation specifications for curb and sediment barriers include:

- Construct a horseshoe-shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, ≥ 2 feet from the inlet.
- Construct a horseshoe-shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

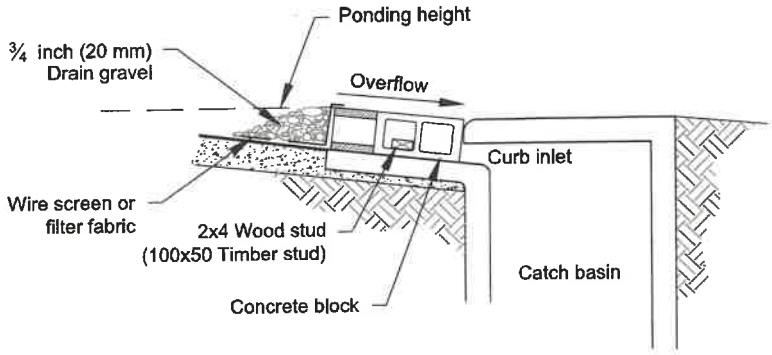
Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull, away the rocks from the inlet and clean or replace. An alternative approach is to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Figure 7.20: Block and Gravel Curb Inlet Protection



Plan View



Section A-A

Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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Block and Gravel Curb Inlet Protection

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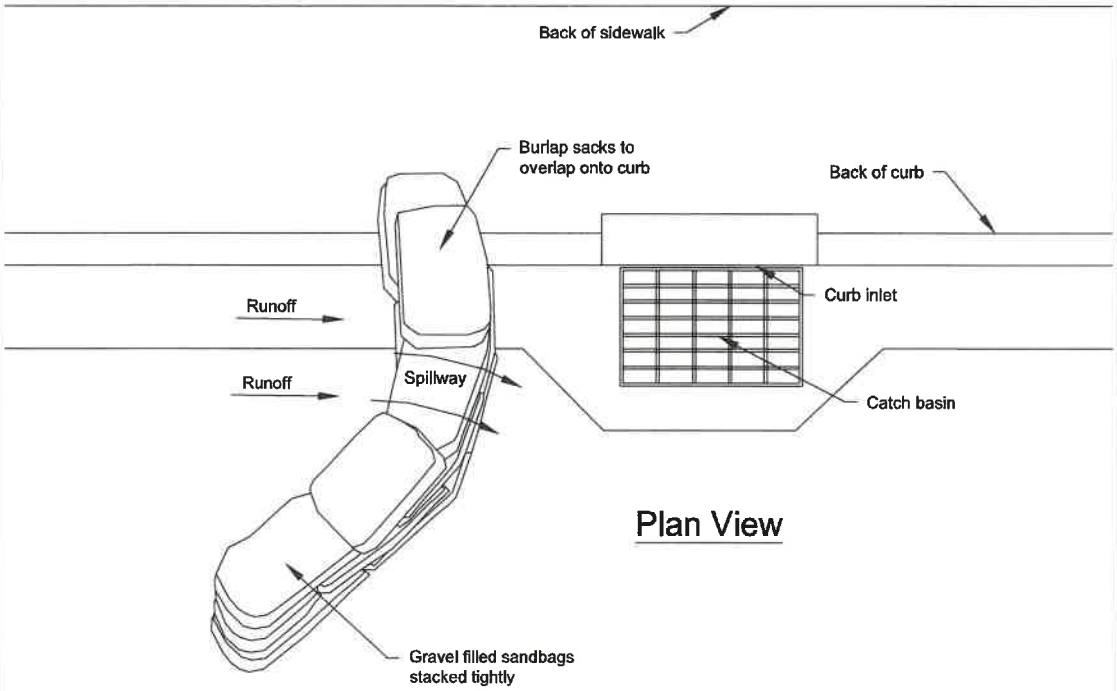
Figure 7.21: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

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Curb and Gutter Barrier

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BMP C233E: Silt Fence

Purpose

Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Silt fence may be used downslope of all disturbed areas.
- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment-trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Design and Installation Specifications

- Contributing area of ≤ 1 acre or in combination with sediment basin in a larger site.
- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) of 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows > 0.5 cubic feet per second.
- Use geotextile fabric that meets the standards indicated in Table 7.19: Geotextile Fabric Standards for Silt Fence. All of the listed geotextile properties are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in Table Table 7.19: Geotextile Fabric Standards for Silt Fence).

Table 7.19: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh Apparent Opening Size (ASTM D4751)	0.60 mm maximum for slit film wovens (No. 30 sieve) 0.30 mm maximum for all other geotextile types (No. 50 sieve) 0.15 mm minimum for all fabric types (No. 100 sieve)
Water Permittivity (ASTM D4491)	0.02 sec-1 minimum
Grab Tensile Strength (ASTM D4632)	180 lb minimum for extra strength fabric 100 lb minimum for standard strength fabric
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles shall be supported with wire mesh, chicken wire, 2- by 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.
- 100% biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- See Figure 7.24: Silt Fence. Include the following standard notes for silt fence on construction plans and specifications:

    1. The contractor shall install and maintain temporary silt fences at the locations shown in the plans.
    2. Construct silt fences in the areas of clearing, grading, or drainage prior to starting those activities.
    3. The silt fence shall have a 2-foot minimum and a 2.5-foot maximum height above the original ground surface.
    4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided the contractor can demonstrate, to the satisfaction of the licensed professional, that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
    5. Attach the geotextile fabric on the upslope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
    6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of

the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the upslope of the posts with the geotextile fabric upslope of the mesh.

7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2 inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be ≥ 180 pounds grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.

8. Bury the bottom of the geotextile fabric 4 inches minimum below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric support mesh is used, the wire or polymeric mesh shall extend into the ground 3 inches minimum.

9. Drive or place the silt fence posts into the ground 18 inch minimum. A 12-inch minimum depth is allowed if topsoil or other soft subgrade soil is not present and 18 inches cannot be reached. Increase fence post minimum depths by 6 inches if the fence is located on slopes of ≥ 3H:1V and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.

10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6 feet. Posts shall consist of one of the following:

    - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
    - No. 6 steel rebar or larger.
    - ASTM A120 steel pipe with a minimum diameter of 1 inch.
    - U-, T-, L-, or C-shaped steel posts with a minimum weight of 1.35 pounds per foot.
    - Other steel posts having strength and bending resistance equivalent to the post sizes listed above.

11. Locate silt fences on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall be ≤ 3H:1V.

    - Check dams shall be approximately 1 foot deep at the back of the fence and shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
    - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast and shall be located every 10 feet along the fence where the fence must cross contours.

- See Figure 7.25: Silt Fence Installation by Slicing Method for slicing method details. The following are specifications for silt fence installation using the slicing method:

    1. The base of both end posts must be ≥ 2 to 4 inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
    2. Install posts 3 to 4 feet apart in critical retention areas and 6 to 7 feet apart in standard applications.
    3. Install posts 24 inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
    4. Install posts with the nipples facing away from the geotextile fabric.
    5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8 inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture ≥ 1 inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
    6. Wrap approximately 6 inches of the geotextile fabric around the end posts and secure with three ties.
    7. No more than 24 inches of a 36-inch geotextile fabric is allowed above ground level.
    8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting ≥ 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the installation for any deviation before compaction. Use a flat-bladed shovel to tuck fabric deeper into the ground if necessary.

Figure 7.24: Silt Fence

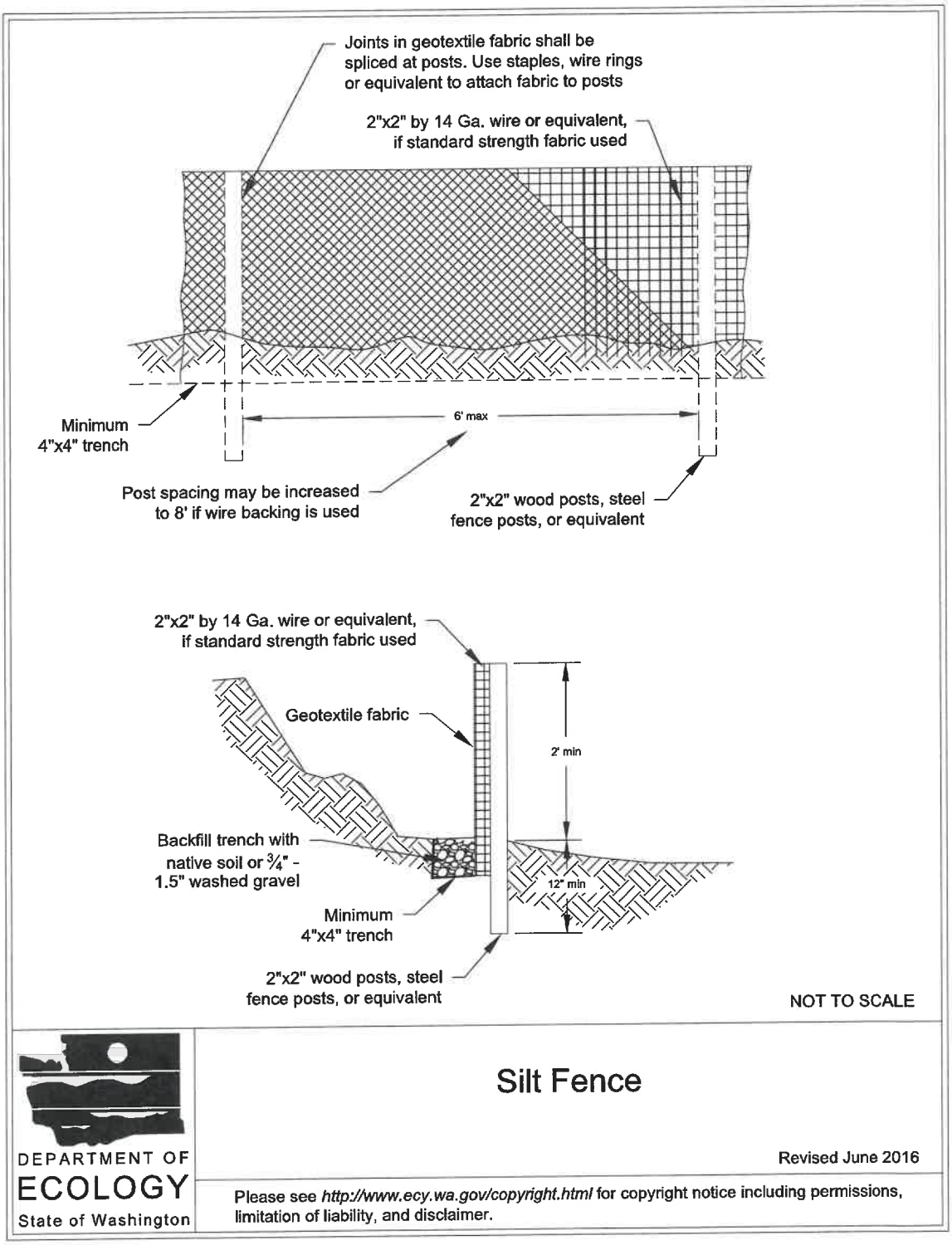
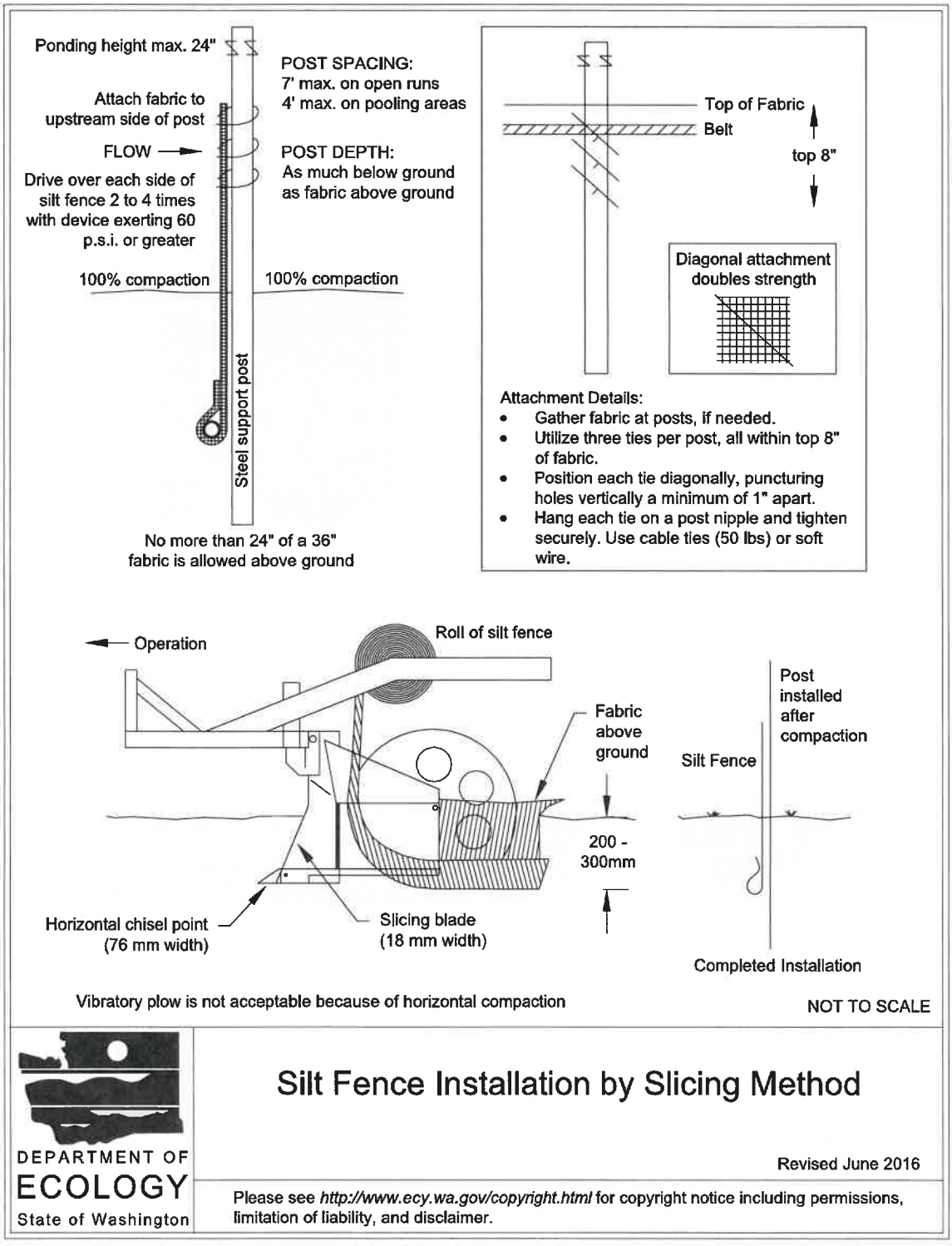


Figure 7.25: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed to a sediment-trapping BMP.
- It is important to check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediments deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C234E: Vegetated Strip

Purpose

Vegetated strips reduce the transport of coarse sediment from a construction site by providing a physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

- Vegetated strips may be used downslope of all disturbed areas.
- Vegetated strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to BMP C241E: Sediment Pond (Temporary) or other sediment-trapping BMP. The only circumstance in which overland flow can be treated solely by a vegetated strip rather than a sediment-trapping BMP, is when the following criteria are met (see Table 7.20: Contributing Area for Vegetated Strips):

Table 7.20: Contributing Area for Vegetated Strips

Average Contributing Area Slope	Average Contributing Area Percentage Slope	Maximum Contributing Area Flow Path Length (feet)
≤ 1.5H:1V	≤ 67	100
≤ 2H:1V	≤ 50	115
≤ 4H:1V	≤ 25	150
≤ 6H:1V	≤ 16.7	200
≤ 10H:1V	≤ 10	250

Design and Installation Specifications

- The vegetated strip shall consist of a continuous strip of dense vegetation with topsoil for a minimum length of 25 feet along the flow path. Grass-covered, landscaped areas are generally not adequate because the volume of sediment overwhelms the grass. Ideally,

vegetated strips shall consist of undisturbed native growth with a well-developed soil that allows for infiltration of runoff.

- The slope within the vegetated strip shall be ≤ 4H:1V.
- The uphill boundary of the vegetated strip shall be delineated with clearing limits.

Maintenance Standards

- Any areas damaged by erosion or construction activity shall be seeded immediately and protected by mulch.
- If > 5 feet of the original vegetated strip width has had vegetation removed or is being eroded, sod must be installed.
- If there are indications that concentrated flows are traveling across the vegetated strip, stormwater runoff controls must be installed to reduce the flows entering the vegetated strip, or additional perimeter protection must be installed.

BMP C235E: Wattles

Purpose

Wattles are temporary erosion and sediment control barriers consisting of straw, compost, or other material that is wrapped in biodegradable tubular plastic or similar encasing material. They reduce the velocity and can spread the flow of rill and sheet runoff and can capture and retain sediment.

Conditions of Use

- Use wattles under the following conditions:
    - In disturbed areas that require immediate erosion protection
    - On exposed soils during the period of short construction delays or over winter months
    - On slopes requiring stabilization until permanent vegetation can be established
- The material used dictates the effectiveness period of the wattle. Generally, wattles are effective for one to two seasons.
- Prevent rilling beneath wattles by entrenching and overlapping wattles to prevent water from passing between them.

Design Criteria

- See Figure 7.26: Wattles for typical construction details.
- Wattles are typically 8 to 10 inches in diameter and 25 to 30 feet in length.
- Install wattles perpendicular to the flow direction and parallel to the slope contour.
- Place wattles in shallow trenches staked along the contour of disturbed or newly constructed slopes. Dig narrow trenches across the slope (on contour) to a depth of 3 to 5 inches on clay

soils and soils with gradual slopes. On loose soils, steep slopes, and areas with high rainfall, the trenches should be dug to a depth of 5 to 7 inches or one-half to two-thirds the thickness of the wattle.

- Start building trenches and installing wattles from the base of the slope and work up. Spread excavated material evenly along the uphill slope and compact it using hand tamping or other methods.
- Construct trenches at contour intervals of 3 to 30 feet apart depending on the steepness of the slope, soil type, and rainfall. The steeper the slope the closer together the trenches.
- Install the wattles snugly into the trenches and overlap the ends of adjacent wattles 12 inches behind one another.
- Install stakes at each end of the wattle and at 4-foot centers along entire length of wattle.
- If required, install pilot holes for the stakes using a straight bar to drive holes through the wattle and into the soil.
- Wooden stakes should be 0.75 by 0.75 by 24 inches minimum. Willow cuttings or 3/8-inch rebar can also be used for stakes.
- Stakes should be driven through the middle of the wattle, leaving 2 to 3 inches of the stake protruding above the wattle.

Maintenance Standards

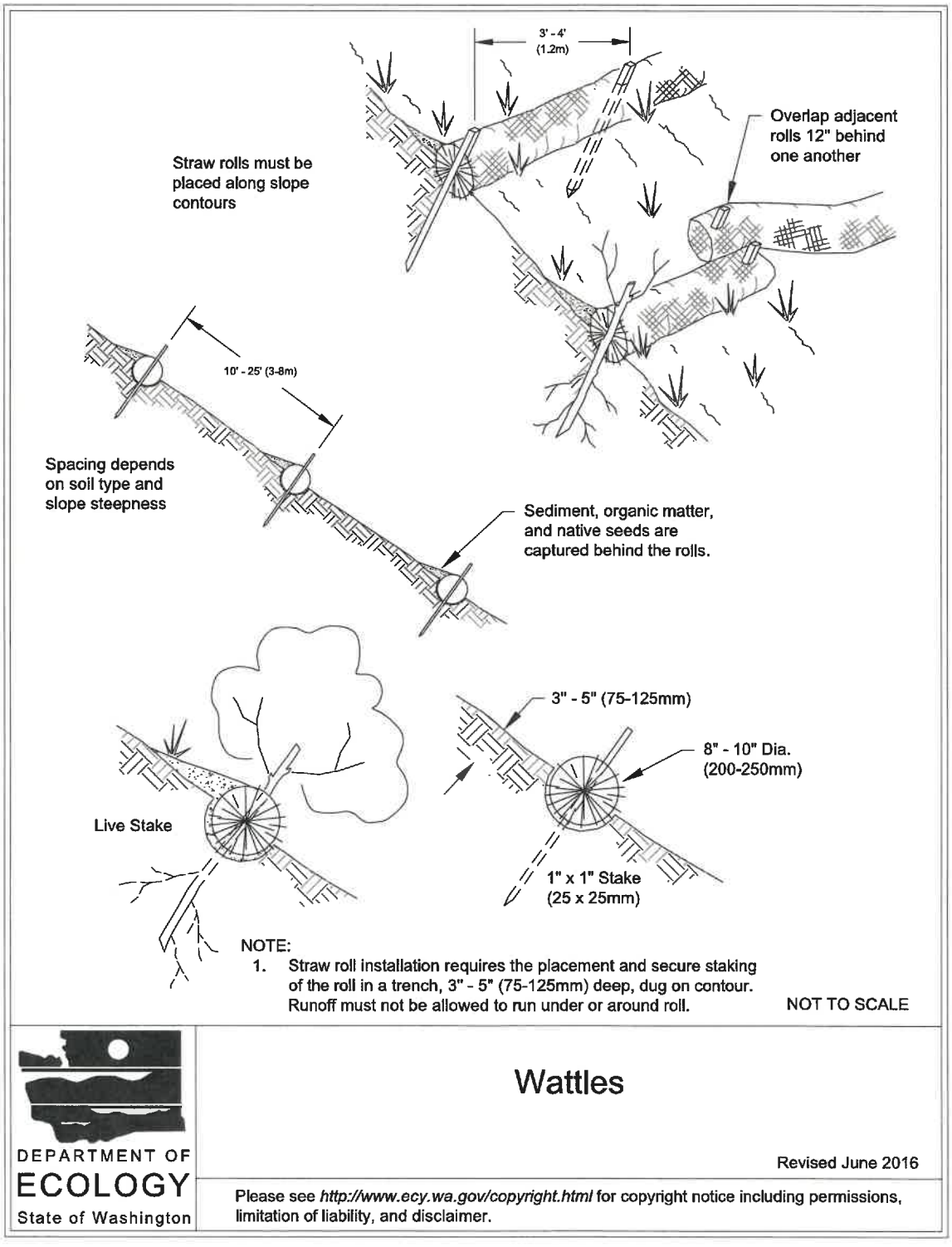
- Wattles may require maintenance to ensure they are in contact with soil and thoroughly entrenched, especially after significant rainfall on steep sandy soils.
- Inspect the slope after significant storms and repair any areas where wattles are not tightly abutted or water has scoured beneath the wattles.

Approved as Functionally Equivalent

The Washington State Department of Ecology (Ecology) has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol–Ecology (TAPE) process. Local jurisdictions may choose not to accept these products or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's Emerging Stormwater Treatment Technologies (TAPE) web page at the following address:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

Figure 7.26: Wattles



The sediment pond or tank should be sized to hold 1.5 times the volume of runoff generated from the site during the 6-month, 3-hour storm for the developed condition, referred to as the short-duration storm, minus the filtration treatment system flow rate for an 8-hour period. For a chitosan-enhanced sand filtration system (CESF), the filtration treatment system flow rate should be sized using a hydraulic loading rate between 6 and 8 gpm/sf. Other hydraulic loading rates may be more appropriate for other systems. Bypass should be provided around the filtration treatment system to accommodate extreme storm events. Runoff volume shall be calculated using the methods presented in Chapter 4 - Hydrologic Analysis and Design.

If the filtration treatment system design does not allow discharge at the rates required by Element #3: Control Flow Rates and if the site has a permanent flow control BMP that will serve the planned development, the discharge from the filtration treatment system may be directed to the permanent flow control BMP to comply with Element #3: Control Flow Rates. In this case, all discharge (including water passing through the treatment system and stormwater bypassing the treatment system) will be directed into the permanent flow control BMP. If site constraints make locating the sediment pond or tank difficult, the permanent flow control BMP may be divided to serve as the sediment pond or tank and the posttreatment temporary flow control pond. In this case, a berm or barrier must be used to prevent the untreated water from mixing with the treated water. Both untreated stormwater storage requirements and adequate posttreatment flow control must be achieved. The designer must document in the Construction Stormwater Pollution Prevention Plan (SWPPP) how the permanent flow control BMP is able to attenuate the discharge from the site to meet the requirements of Element #3: Control Flow Rates. If the design of the permanent flow control BMP was modified for temporary construction flow control purposes, the construction of the permanent flow control BMP must be finalized, as designed for its permanent function, at project completion.

Maintenance Standards

- Rapid sand filters typically have automatic backwash systems that are triggered by a preset pressure drop across the filter. If the backwash water volume is not large or substantially more turbid than the untreated stormwater stored in the holding pond or tank, backwash return to the sediment pond or tank may be appropriate. However, other means of treatment and disposal may be necessary.
- Screen, bag, and fiber filters must be cleaned and/or replaced when they become clogged.
- Disposal of filtration equipment must comply with applicable local, state, and federal regulations.
- Sediment shall be removed from the sediment pond or tank as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the pond or tank.

BMP C252E: Treating and Disposing of High pH Water

Purpose

When pH levels in stormwater increase to >8.5, it is necessary to lower the pH levels to the acceptable range of 6.5 to 8.5 prior to discharge to surface or ground water. A pH range of 6.5 to 8.5 is typical for most natural receiving waters, and this neutral pH is required for the survival of aquatic

organisms. Should the pH deviate from this range, fish and other aquatic organisms may become stressed and may die.

Conditions of Use

- The water quality standard for pH in Washington State is in the range of 6.5 to 8.5. Stormwater with pH levels exceeding water quality standards may be either neutralized on-site or disposed of in a sanitary sewer or concrete batch plant with pH neutralization capabilities.
- Neutralized stormwater may be discharged to receiving waters under the Construction Stormwater General Permit.
- Neutralized process water such as concrete truck washout, hydrodemolition, or sawcutting slurry must be managed to prevent discharge to receiving waters. Any stormwater contaminated during concrete work is considered process wastewater and must not be discharged to receiving waters or drainage systems.
- The process used for neutralizing and/or disposing of high pH stormwater from the site must be documented in the Construction Stormwater Pollution Prevention Plan (SWPPP).

Causes of High pH

High pH at construction sites is most commonly caused by the contact of stormwater with poured or recycled concrete, cement, mortars, and other Portland cement or lime containing construction materials. (See BMP C151E: Concrete Handling for more information on concrete-handling procedures.) The principal caustic agent in cement is calcium hydroxide (free lime).

Calcium hardness can contribute to high pH values and cause toxicity that is associated with high pH conditions. A high level of calcium hardness in waters of the state is not allowed. Ground water standard for calcium and other dissolved solids in Washington State is < 500 milligrams per liter (mg/L).

Treating High pH Stormwater by Carbon Dioxide Sparging

Advantages of Carbon Dioxide Sparging

- Rapidly neutralizes water with a high pH.
- Cost effective and safer to handle than acid compounds.
- Carbon dioxide (CO_2) is self-buffering. It is difficult to overdose and create harmfully low pH levels.
- Material is readily available.

Chemical Process of Carbon Dioxide Sparging

When CO_2 is added to water (H_2O), carbonic acid (H_2CO_3) is formed, which can further dissociate into a proton (H^+) and a bicarbonate anion (HCO_3) as shown:

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3^-$$

The free proton is a weak acid that can reduce the pH. Water temperature has an effect on the reaction as well. The colder the water temperature is, the slower the reaction. The warmer the water temperature is, the quicker the reaction. Most construction applications in Washington State have water temperatures of ≥ 50°F; therefore, the reaction is almost simultaneous.

Treatment Process of Carbon Dioxide Sparging

High pH water may be treated using continuous treatment, continuous discharge systems. These manufactured systems continuously monitor influent and effluent pH to ensure that pH values are within an acceptable range before being discharged. All systems must have fail-safe automatic shutoff switches in the event that pH is not within the acceptable discharge range. Only trained operators may operate manufactured systems. System manufacturers often provide trained operators or training on their devices.

The following procedure may be used when not using a continuous discharge system:

1. Prior to treatment, the appropriate jurisdiction should be notified in accordance with the regulations set by the jurisdiction.
2. Every effort should be made to isolate the potential high pH water in order to treat it separately from other stormwater on-site.
3. Water should be stored in an acceptable storage facility, detention pond, or containment cell prior to pH treatment.
4. Transfer water to be treated for pH to the pH treatment structure. Ensure that the pH treatment structure size is sufficient to hold the amount of water that is to be treated. Do not fill the pH treatment structure completely; allow ≥ 2 feet of freeboard.
5. The operator samples the water within the pH treatment structure for pH and notes the clarity of the water. As a rule of thumb, less CO_2 is necessary for clearer water. The results of the samples and water clarity observations should be recorded.
6. In the pH treatment structure, add CO_2 until the pH falls into the range of 6.9 to 7.1. Adjusting pH to within 0.2 standard units of receiving water (background pH) is recommended. It is unlikely that pH can be adjusted to within 0.2 standard units using dry ice. Compressed CO_2 gas should be introduced to the water using a CO_2 diffuser located near the bottom of the pH treatment structure, this will allow CO_2 to bubble up through the water and diffuse more evenly.
7. Slowly discharge the water, making sure water does not get stirred up in the process. Release about 80% of the water from the pH treatment structure, leaving any sludge behind. If turbidity remains above the maximum allowable, consider adding filtration to the treatment train. See BMP C251E: Construction Stormwater Filtration.
8. Discharge treated water through a pond or drainage system.
9. Excess sludge needs to be disposed of properly as concrete waste. If several batches of water are undergoing pH treatment, sludge can be left in the treatment structure for the next batch treatment. Dispose of sludge when it fills 50% of the treatment structure volume. Disposal must comply with applicable local, state, and federal regulations.

Treating High pH Stormwater by Food-Grade Vinegar

Food-grade vinegar that meets Food and Drug Administration standards may be used to neutralize high pH water. Food-grade vinegar is only 4% to 18% acetic acid with the remainder being water. Food-grade vinegar may be used if the dose is just enough to lower pH sufficiently. Use a treatment process as described above for CO_2 sparging, but add food-grade vinegar instead of CO_2.

This treatment option for high pH stormwater does not apply to anything but food-grade vinegar. Acetic acid does not equal vinegar. Any other product or waste containing acetic acid must go through the evaluation process in Appendix G of *Whole Effluent Toxicity Testing Guidance and Test Review Criteria* (Marshall, 2016).

Disposal of High pH Stormwater

Sanitary Sewer Disposal

- Local sewer authority approval is required prior to disposal via the sanitary sewer.

Concrete Batch Plant Disposal

- Only permitted facilities may accept high pH water.
- Contact the facility to ensure it can accept the high pH water.

Maintenance Standards

Safety and Materials Handling

- All equipment should be handled in accordance with Occupational Safety and Health Administration (OSHA) rules and regulations.
- Follow manufacturer's guidelines for materials handling.

Each operator should provide the following:

- A diagram of the monitoring and treatment equipment
- A description of the pumping rates and capacity the treatment equipment is capable of treating

Each operator should keep a written record of the following:

- Client name and phone number
- Date of treatment
- Weather conditions
- Project name and location
- Volume of water treated
- pH of untreated water
- Amount of CO_2 or food-grade vinegar needed to adjust water to a pH range of 6.9 to 7.1

- pH of treated water
- Discharge point location and description

A copy of this record should be given to the client/contractor, who should retain the record for 3 years.

Operation and Maintenance Manual

Project Description

The Hunter Road Development project is located on a 480 acre site in Kittitas County. The development area is 14.89 acres and includes the construction of 12 acres of 22' wide BST roadway and an irrigation system. Stormwater runoff will be routed to dispersion areas adjacent to the roadway. For steeper sections of roadway where sheet flow dispersion cannot be utilized, stormwater is conveyed to roadside ditches, then outfalls to a dispersion trench or rock pads. In addition, culverts are located at stream crossings.

Facilities Requiring Maintenance

Onsite facilities requiring maintenance include the following (see facilities map on page 2):

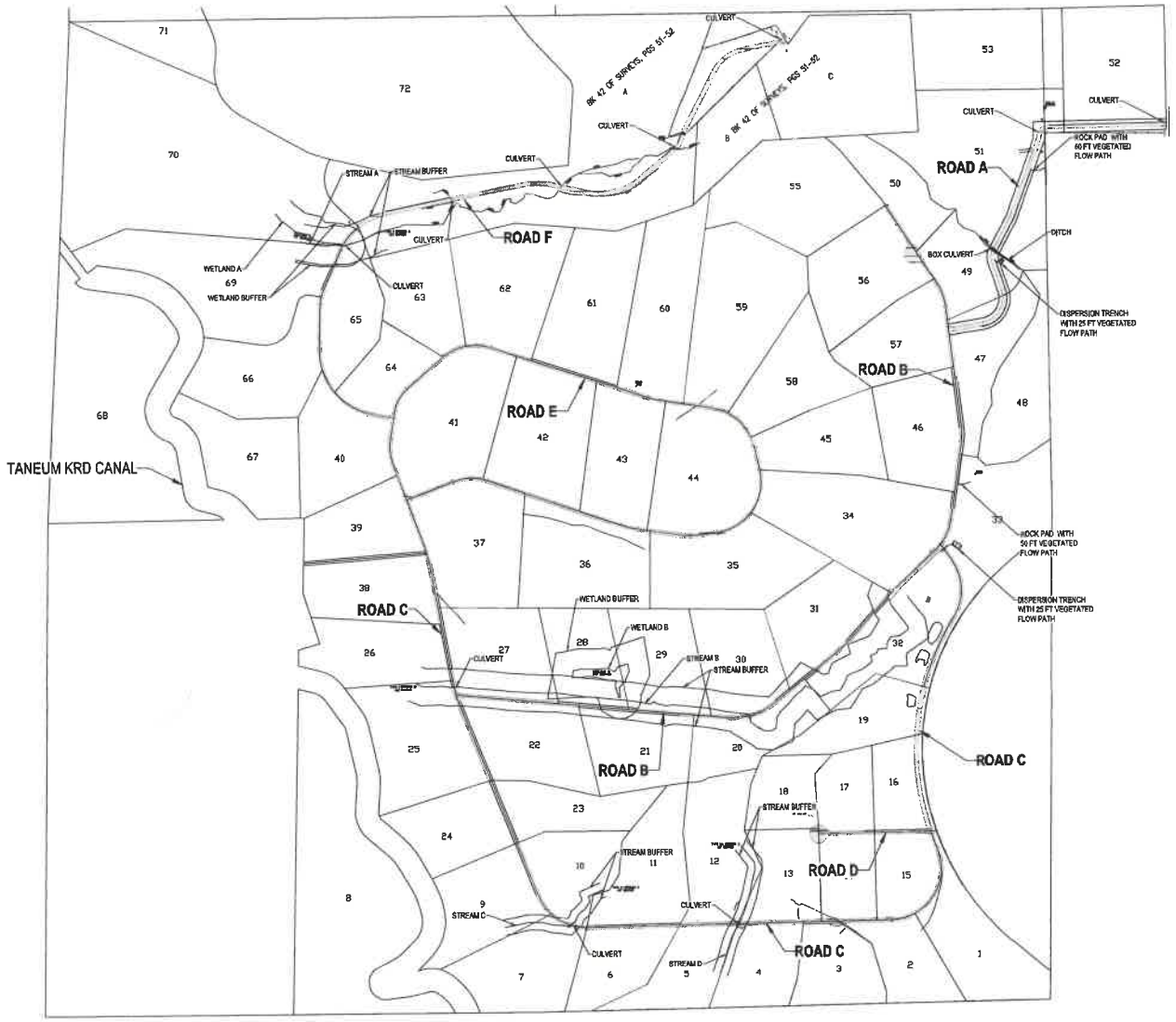
- Catch basins
- Rock pads
- Dispersion trenches
- Conveyance system (outlet pipes to rock pads, inlet pipe to dispersion trench, culverts)

Routine site inspections should be conducted at least once per month and thorough inspections should occur at least once per year. A log book should be maintained for all inspections and maintenance activities.

See pages 3 - 4 for additional maintenance criteria.

Party Responsible for Maintenance and Operation

Vic Jansen
P.O. Box 57
Moses Lake, Washington 98837



MARK	REVISION DESCRIPTION	BY	APP.	DATE

simpliCIVIL
253.579.2212 | PO Box 745, Moses Lake, WA 98837

DRAWN BY	JB / KB
DESIGN BY	TS
CHECK BY	TS
PROJECT MGR	TS

HUNTER ROAD DEVELOPMENT

STORM FACILITIES MAP

DRAWING NO.	
PROJECT NO.	20.022
DATE:	02/02/24
SHEET NO.	2

5.A.6 Maintenance Criteria for Catch Basins

Table 5.40: Maintenance Criteria for Catch Basins

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	Trash or debris that is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by > 10%.	No trash or debris located immediately in front of catch basin or on grate opening.
		Trash or debris (in the basin) > 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case < 6 inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
		Trash or debris in any inlet or outlet pipe blocking > one-third of its height.	Inlet and outlet pipes free of trash or debris.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) > 60% of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case < 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes > 2 square inches or cracks > 0.25 inches (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of > 0.75 inches of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
	Fractures or Cracks in Basin Walls/ Bottom (cont'd)	Grout fillet has separated or cracked > 0.5 inches and > 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking > 10% of the basin opening.	No vegetation blocking opening to basin.
		Vegetation growing in inlet/outlet pipe joints that is > 6 inches tall and < 6 inches apart.	No vegetation or root growth present.
	Contamination and Pollution	See "Wetponds" (Table 5.36: Maintenance Criteria for Wetponds).	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have < 0.5 inches of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening > 0.875 inches.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking > 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

5.A.8 Maintenance Criteria for Energy Dissipaters

Table 5.42: Maintenance Criteria for Energy Dissipaters

Maintenance Components	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
External			
Rock Pad	Missing or Moved Rock	Only one layer of rock exists above native soil in area ≥ 5 square feet (sf), or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged With Sediment	Accumulated sediment > 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not Discharging Water Properly	Visual evidence of water discharging at concentrated points along trench (normal condition is a "sheet flow" of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations Plugged	> 50% of the perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water Flowing out Top of "Distributor" Catch Basin	Maintenance person observes or receives credible report of water flowing out during any storm less than the design storm or is causing or appears likely to cause damage.	Energy dissipater rebuilt or redesigned to standards.
	Receiving Area Oversaturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal			
Manhole/ Chamber	Worn or Damaged Post, Baffles, or Side of Chamber	Structure dissipating flow deteriorates to one-half the original size or any concentrated worn spot > 1 sf, which would make structure unsound.	Structure replaced to design standards.
	Other Defects	See criteria in Table 5.40: Maintenance Criteria for Catch Basins.	See criteria in Table 5.40: Maintenance Criteria for Catch Basins.