Preliminary Stormwater Management Plan

Construction Stormwater General Permit

GP In-Water/Over Water Structures Removal Project

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1.0 INTRODUCTION

Georgia-Pacific Consumer Operations, LLC (GP), is planning to abate, remove, and demolish several structures associated with the mill prior operations in the City of Camas and in unincorporated areas of Clark County, Washington. The structures to be removed are located in-water and/or over water on the Columbia River and Camas Slough and are located within the City of Camas or Clark County Shoreline Management Zones.

This Preliminary Stormwater Management Plan (SMP) addresses management of stormwater runoff during construction activities associated with the Project. This SMP does not address spills of materials used during construction; as a separate Spill Prevention, Control, and Countermeasures Plan (SPCC) will be developed by the Contractor.

This project is considered to be within the Columbia River and Camas Slough waterways and is subject to the Section 404 Permit administered by the U.S. Army Corps of Engineers. Separate drainage reports have not been prepared.

1.1 Background

GP's mill in Camas has been in operation since the 1880s making pulp and paper through a variety of technologies. The mill covers approximately 190 acres adjacent to the north bank of the Camas Slough, as well as a portion of the approximate 450 acres of Lady Island. Currently, the mill is an active industrial site operating a single paper production line. The mill no longer manufactures pulp, does not perform any significant on-site chemical manufacturing/processing, nor does the mill utilize the river for shipping or log transport/storage.

GP plans to abate, remove, deconstruct, and demolish several structures that are located in and/or over water on the Columbia River and Camas Slough. The project footprint includes areas along the shoreline within the GP site, and several other locations in the Camas Slough and extending approximately 3 miles downriver from the mill.

GP's In-water and Over water Structures Removal Project is located at 401 NNE Adams Street, Camas. In **Attachment A**, Figure 1 shows the project location and Figures 2A-2E shows the area of the proposed demolition and removal of structures.

The In-water and Over water Removal Project will remove:

- A warehouse,
- Five docks/piers,
- Conveyor housings,
- An aboveground oil storage tank,
- Crane foundation, and
- Approximately 3,000 pilings that are associated with the above structures, serve as mooring dolphins, or are abandoned.

The structures to be removed are located adjacent to the shoreline or entirely or partly below the ordinary high-water mark (OHWM) of the Camas Slough/Columbia River and are located within the City of Camas Shoreline Management Zone or Clark County Shoreline Management Zone. Many of the structures (dolphins and pilings) to be removed are located on State-owned land and are currently leased by GP through the Washington Department of Natural Resources (WDNR). The Project will include removal of soils and sediments from the shoreline and intertidal zones on the GP property and within the Camas Slough waterway, demolition of building slabs and support pilings, and regrading to achieve final design slopes and contours in support of habitat restoration.

1.2 Purpose and Basis

The purpose of this SMP is to describe the proposed construction activities and all temporary erosion and sedimentation control (TESC) measures, pollution prevention measures, inspection/monitoring activities, and record keeping that will be implemented during construction. The objectives of the SMP are to:

- Describe the best management practices (BMPs) to be followed to prevent erosion and sedimentation and to identify, reduce, and eliminate or prevent stormwater contamination and water pollution arising due to construction activities.
- Describe measures to protect surface water quality and groundwater quality.
- Describe measures to control peak volumetric flow rates and velocities of construction stormwater discharges.

The SMP addresses the intents of the Clark County Code (Clark County Code 13.26A and 40.386) and the City of Camas (Camas Municipal Code Chapter 14.02) for implementing restoration activities. This SMP was prepared using Ecology's Construction Stormwater Pollution Prevention Plan Template downloaded from the Ecology website on August 17, 2020, as a starting point. The template was modified to address requirements of the City of Camas and Clark County requirements as needed.

The primary BMPs that will be implemented during construction of the corrective measures are specified in the BMPs from the Stormwater Management Manual for Western Washington (SWMMWW) (Ecology 2019). Additionally, the Clark County Stormwater Manual (2021) and Camas Stormwater Design Standards Manual (2016) were applied in the development of this SMP. The construction contractor hired by GP to conduct the various components of the Project will also develop a Stormwater Pollution Prevention Plan (SWPPP) specific to their means and methods to complete the work prior to initiating work consistent with the concepts presented in this SMP.

1.3 Organization

This SMP was prepared based on the requirements set forth in the SWMMWW. This SMP is divided into the following eight main sections:

- **Section 1.0 – Introduction.** This section describes the objectives and organization of this SMP.
- **Section 2.0 – Project Overview and Description.** This section describes the project location, existing conditions in the work area, and proposed construction activities.

- **Section 3.0 – Stormwater Management.** This section provides details regarding stormwater management compliance with applicable Ecology SWMMWW Minimum Requirements (MRs). It also provides detailed descriptions of the BMPs to be implemented based on the 13 key elements specified in the SWMMWW for a Stormwater Pollution Prevention Plan (SWPPP).
- **Section 4.0 – Pollution Prevention Team.** This section identifies the appropriate contact names (emergency and non-emergency), monitoring personnel, and on-site temporary erosion and sedimentation control inspector.
- **Section 5.0 – Monitoring and Sampling Requirements.** This section provides a description of the inspection, monitoring and sampling requirements for managing pollutant discharge from disturbed areas.
- **Section 6.0 – Discharges to 303(d) Listed and Total Maximum Daily Load (TMDL) Waterbodies.** This section summarizes the 303(d) Listed and Total Maximum Daily Load (TMDL) waterbodies applicable to the project.
- **Section 7.0 – Reporting and Recordkeeping Requirements.** This section describes the requirements for documentation of BMP implementation, site inspections/monitoring, and BMP modifications during construction.
- **Section 8.0 – References.** This section provides complete citations for references cited in the text.

2.0 PROJECT OVERVIEW AND DESCRIPTION

The In-water and Over water Structures Removal project site lies along the Columbia River and its shoreline at Camas, Washington, and includes aquatic portions and shorelines of the Columbia River, including the Camas Slough; Lady Island; and the developed Mill Site within the City of Camas and Clark County, Washington. The project area is within Water Resources Inventory Area (WRIA) 28. The overall facility footprint including Lady island is approximately 700 acres with approximately 10.8 acres to be disturbed due to this demolition project.

The project is located between approximate Columbia River Mile (RM) 117 and 121 (National Oceanic and Atmospheric Administration [NOAA] 2017), with much of the proposed activity at approximately RM 119 to 120 located in the Camas Slough. The Camas Slough branches from the mainstem Columbia River, forming the northern extent of Lady Island and the southern shore of the City of Camas. The Washougal River flows into the Camas Slough outside of the project area, in the eastern portion of the city near the BNSF Railway Company railroad tracks and State Route (SR) 14 bridges.

The project area also includes terrestrial portions of Lady Island. Lady Island is approximately 510 acres in size and includes both developed and undeveloped areas, including wastewater treatment facilities for GP, a dredged materials landfill, and overhead electrical infrastructure. SR 14 crosses the northeast portion of the island, connecting to the City of Camas via bridges across the Camas Slough to the north and east. Undeveloped portions of Lady Island are mainly forested. Lady Island is designated as Industrial land use and is classified as Medium Intensity and High Intensity shoreline designations (City of Camas 2015, 2016; Clark County 2019).

The Camas Slough forms the aquatic portions of the project area. Much of the project area has been previously altered by development (see **Attachment A** for Figures 2A through 2E). The project site will include the removal of several in-water and over water structures. This would occur in a manner that is not disruptive to on-going operations at GP. Because completion of the demolition will result in reduced river access from GP, in-water structures will be completed first, followed by demolition of over water structures, which will approximately take place in the following order:

1. In-water piles and dolphins,
2. Berger Crane foundation,
3. Dock warehouse piers and dock warehouse's upper stories,
4. PECO Dock and dock warehouse lower floor and foundation,
5. Tug Dock and piles,
6. Truck Dock and conveyer housing, and
7. Aboveground storage tank.

All activities will occur during work periods approved by regulatory agencies. Currently, it is understood that all in-water demolition activities would occur during the open in-water work period. Work activities below the OHWM would occur during the approved construction work window for the Camas Slough and Columbia River in this location. Input from multiple agencies with jurisdiction over these activities will be incorporated in the permit process to establish an approved work window for in-water and overwater work activities. The currently published in-water work window for this reach of the Columbia River is November 1 to February 28 in any year.

To minimize construction duration, the project is proposing an in-water work window to occur from August 1 to February 28 in any year (pending regulatory approval). Upland work involves establishment of on-site staging areas and construction access, traffic control, installation of new stormwater facilities, and on-site restoration and enhancement. Due to the large number of features to be removed, the project will require about eight months in total and will likely span two to three years of in-water work periods. Actual work timing would depend on weather, river flows, contractor logistics, equipment availability, and regulatory constraints.

Existing or known contamination identified in the NOI:

Washington Department of Ecology (Ecology) notified GP in 2020 of credible evidence of liability for previous releases of hazardous substances under the state's Model Toxics Control Act (MTCA) based on previously known spills (no new or recent occurrences). Ecology assigned soils on the main GPGP parcel to Site No. 15156 and did not assign groundwater, surface waters, or sediments. The presence of contaminants has not been confirmed and no site actions have been identified at this time. GP is currently working with Ecology to evaluate surface water and sediments separately from the upland soils. No other sites are listed in the project vicinity.

Permitted construction outfalls identified in the NOI:

During demolition, all stormwater that is impacted from uplands demolition activities will be contained and discharged to the Lady Island Wastewater Treatment plant under the existing Industrial Stormwater NPDES Permit No. WA0000256. The Columbia River is 303(d) listed for temperature and dissolved oxygen. No TMDL exists for the river's reach in the vicinity of the Camas Slough or the Lady Island Outfalls (Lady Island range). Stormwater from the project site already discharges to Columbia River and will continue to throughout the project.

2.1 Project Location

The project area lies within the City of Camas, Washington, except for one dolphin to be removed on the Columbia River that is located outside the City limits within unincorporated Clark County, Washington. **Attachment A**-Figure 1 shows the project location.

The project area lies within Township 1 North, Range 3 East, Sections 8, 9, 10, 11, 15, and 16, Willamette Meridian.

The project area consists of a portion of the Camas Slough, which runs between Lady Island and the City of Camas, Washington located on the north bank of the main channel, lower Columbia River. Lady Island lies between the Camas Slough and the Columbia River main channel. The project is between RM 117 and 121, with the majority of activity at approximately RM 119 to 120.

The project would primarily occur on property owned or leased by GP from the State of Washington. The structures to be removed are located adjacent to the riverbank or entirely or partly below the ordinary high-water mark (OHWM) of the Camas Slough/Columbia River and are located within either the City of Camas Shoreline Management Zone or Clark County Shoreline Management Zone. Some of the structures to be removed are located on State-owned land and are currently leased by GP through the Washington State Department of Natural Resources (DNR). Table 1 indicates the parcel numbers and owner of the land where the work will occur.

Table 1. Parcels Included in the Project Area

Assessor Number	Owner 1/	Parcel Type Description / Zoning
08370-0000	Fort James Camas, LLC (GP)	Manufacturing—paper products/Heavy Industrial/ Lady Island
09104-4013	Georgia-Pacific Corporation	Manufacturing—lumber and wood products/Heavy Industrial
09104-4015	Fort James Camas, LLC (GP)	Manufacturing—paper products/Heavy Industrial/ Main Mill Parcel
09104-4027	Specialty Minerals Inc.2/ (GP)	Storage warehouse/Heavy Industrial
50090-1000	Fort James Camas, LLC (GP)	Tidelands/Water
50090-2000	Fort James Camas, LLC (GP)	Tidelands/Water
50090-3000	Fort James Camas, LLC (GP)	Tidelands/Water
50090-4000	Fort James Camas, LLC (GP)	Tidelands/Water
50081-4000	Fort James Camas, LLC (GP)	Tidelands/Water
50081-4001	Fort James Camas, LLC (GP)	Tidelands/Water
50081-7000	Fort James Camas, LLC (GP)	Tidelands/Water

Assessor Number	Owner 1/	Parcel Type Description / Zoning
50081-8000	Fort James Camas, LLC (GP)	Tidelands/Water
08370-0000	Fort James Camas, LLC (GP)	Manufacturing—paper products/Heavy Industrial/ Lady Island

1/ The previous corporate name, Fort James Camas LLC, is shown on County's tax parcel information.
2/ Specialty Minerals was a part of Fort James Camas, LLC.

2.2 Soils

Soils comprising the Camas Slough shoreline bank along the main mill area within the project consist primarily of fill materials representing developed areas with non-native materials. Other riverbanks in the project area are mapped as either Newburg silt loam or Sauvie silt loam series (NRCS 2018). The north Columbia riverbank and the north shore of Lady Island were mapped as Newburg silt loam series, while the western extent of Lady Island were mapped as Sauvie silt loam series.

Newberg silt loam series soils are somewhat excessively drained and located on floodplains with slopes of 3 to 8 percent. They are formed in loamy and sandy alluvium derived from mixed sedimentary and basic volcanic rocks. The soils are subject to frequent-to-occasional flooding from December through March.

Deep, poorly drained Sauvie silt loam series soils are also mapped on floodplains. This hydric soil is saturated to the surface in most years from December to March and subject to river overflow and tidal flooding. Sauvie soils form in mixed alluvium with volcanic ash on flat to 3 percent slopes. When artificially drained and protected from flooding, both soils may be used for agriculture. Mapping of Sauvie series soils on Lady Island by NRCS largely coincides with provisional identification of wetland areas by the City of Camas.

2.3 Climate

Climate and precipitation data were collected from a National Weather Service station at the Vancouver Pearson Field Airport, located approximately 12 miles west of the project area. The project area is characterized by 36.60 inches of annual precipitation, average annual mean air temperature of 54.1 degrees Fahrenheit (°F), and average summer air temperature of 66.5°F (NRCS 2019). As with most of western Washington, the highest monthly precipitation generally occurs between October 1 and March 31 of each year, with summer rainfall accounting for about 30 percent of annual precipitation.

2.4 Topography

Prior to industrial development in the late 1800s, the Columbia River within the project area included extensive riparian habitat which lead to gradual slopes along the shoreline and riverbanks. Industrial development, dam development, and channelization along the Columbia River to provide river transport and hydroelectricity resulted in infrastructure to harden riverbanks, create and stabilize navigational channels, and isolate floodplains behind levees. These river channel modifications have greatly altered the river's channels and associated riparian habitats. Structures to be removed at the GP site are built on or into an artificially formed terrace created from fill materials, with the terrace

elevation of approximately 35-38 feet (NAVD88). Depending on the river level, pilings and dolphins are present in water depths not usually greater than 30 feet, and often between 10 and 15 feet.

Additionally, local volcanic activity at the basin's margins has resulted in volcanic cones, vents, and flows, including Prune Hill, a volcanic cone that rises from the riverbank of the project area. In general, basaltic bedrock is found at the surface to no deeper than about 30 feet below surface throughout the project area. Importantly, some of the features scheduled to be demolished are embedded in this basalt bedrock.

2.5 Vegetation

Most of the nearby GP site is covered with buildings or paved roads and parking areas. In the vicinity of the project site, vegetation is generally sparse to absent around the structures to be removed and wherever plant communities are present are comprised of predominantly weedy and invasive species. The riverbanks consist primarily of fill, are generally steep, and are armored with bounder-sized riprap. Areas are either vegetated with non-native plants and few native species present or are unvegetated. Highly altered riverbank also includes the areas at the Mill where structures are built out over water, completely removing the natural riverbank. Most of the buildings that are to be removed are supported by timber or steel pilings; however, concrete does support the Truck Dock, Dock Warehouse, and Berger Crane footing.

Lady Island is the location of the wastewater treatment plant for mill operations and consists of buildings, settling basins, and unpaved roads. The majority of Lady Island's riverbanks do consist of native soils and sediments, and is relatively undisturbed by development. Above the ordinary high-water mark (OHMW) the riverbanks are forested with a mix of deciduous and coniferous trees, along with native understory trees and shrubs. Below the OHWM, a zone of shrubs extends downslope transitioning to beach-like conditions in some areas at the lower shore and if vegetation does persist it is typically continuously submerged.

2.6 Drainage

The Columbia River is one of the largest rivers in North America, extending approximately 1,240 miles, draining approximately 258,000 square miles, and emptying into the Pacific Ocean (Kammerer 1990 as cited by Clark County 2011). The project area is within the Lower Columbia Reach, approximately 120 river miles from the Pacific Ocean.

The Camas Slough branches from the mainstem at the tip of Lady Island forming the northern extent of Lady Island and the southern shore of the City of Camas. The Camas Slough is an approximately 2.4-mile-long side channel. The confluence with the Washougal River occurs at the far upriver end of the Camas Slough. In the project vicinity, SR 14 crosses the slough twice on bridges, initially near the head of the slough onto Lady Island, then approximately through the middle of the slough's length back to the north riverbank (**Attachment A** Figure 1). The project area is within WRIA 28 which is the Washougal-Salmon sub-basin.

Within the project area, the Columbia River and the Camas Slough are tidal, with a mean daily tidal range of approximately 1.19 feet (NOAA 2019a). Tidal influence extends upriver to the Bonneville Dam,

located approximately 20 river miles upstream from the project area. Water elevations in the project area are primarily controlled by releases at the Bonneville Dam; however, at low water levels, the diurnal tidal fluctuation is readily observed. In general, tidal influence decrease as the volume of water increases in this system.

2.6.1 Floodplain

Proposed removals would occur entirely within the Columbia River and Camas Slough's regulatory floodway (Zone AE), with the 100-year floodplain (areas with a 1 percent annual chance of flooding) water surface elevation of between 34 feet (western project area extent) and 35 feet (FEMA 2019).

2.7 Groundwater

2.7.1 Critical Aquifer Recharge Area

The Project is within the Clark County Critical Aquifer Recharge Area (CARA). A portion of the main mill site reside within a Category II CARA.

2.8 Sensitive Areas

The project area resides between the Camas Slough and Columbia River, both of which contain fish habitat. Additionally, Table 2 lists all of the wetlands within the project limits, though none are directly affected by the project work, along with their receiving waterbody, wetland rating, and associated buffer:

Table 2. Sensitive Areas

Sensitive Area	Receiving Waterbody	Wetland Rating	Buffer
Wetland 1	Columbia River/Camas Slough	Category II	180 feet
Wetland 2	Columbia River/Camas Slough	Category II	180 feet
Wetland 3	Columbia River/Camas Slough	Category II	180 feet
Wetland 4	Columbia River/Camas Slough	Category II	180 feet
Wetland 5	Columbia River/Camas Slough	Category II	180 feet
Wetland 6	Columbia River/Camas Slough	Category II	180 feet
Wetland 7	Columbia River/Camas Slough	Category II	180 feet

2.9 Proposed Construction Activities

This section describes the construction activities that will occur as a result of this project.

2.9.1 In-Water Dredging Areas

The in-water dredging areas encompass areas where dredging will occur using excavators operating from barges. The following location and activities are proposed for dredging:

- Barge access to enable removal of the Dock Warehouse piers and portion of the Camas Slough riverbank will require dredging of sediments.

- Structures and approximately 3,000 piles would be removed, including those along approximately 1,000 feet of Camas Slough riverbank where portions of the riverbank would be reshaped to slope of approximately 3 horizontal to 1 vertical.

Table 3 provides details on the proposed activities that will involve dredging. Figure 1 of **Attachment A** shows the overall project locations indicating structures to be removed. The shaded area on Figure 5 (**Attachment A**) shows the approximate boundary where the proposed sediment dredging will be performed.

Table 3. Dredging Locations and Descriptions

Location	Structure	Description of location and activity
Camas Slough	Access dredging for Dock Warehouse Pier removals	Sediment would be removed at the three piers at the Dock Warehouse to create draft for demolition barges. Several known occurrences of previous dredging immediately adjacent to the area at the PECO dock (Attachment A Figure 2E).
Camas Slough	Structure/pile removal and bank reshaping	Piles and structures to be removed along approximately 1,000 feet of riverbank. Currently, the area supports various docks/piers. Removals of piles and riverbank shaping would occur.

Abbreviations:
RM = river mile

An estimated 10,500 CY of dredge materials is to be dredged from the Camas Slough. Dredging will be performed using an enclosed bucket, and dredged material will consist of both sediment and water. The water will be actively pumped from dredged material barges to the degree practical, processed to remove excess suspended sediment, and returned to the Camas Slough as dredging return water.

Following dredging, GP proposes that dredged materials would be managed according to the requirements of the WDNR lease agreement (Lease No. 20-B1285) and according to the following protocol:

1. If found suitable for in-water disposal and reuse, sediments would be beneficially reused by this project for:
    a. Fill for riverbank and riverbed shaping following structure removal in the Camas Slough, or
    b. Fill for other holes created by removals on other portions of the project, including on Camas Mill property and in other locations.
2. If found suitable for in-water disposal but not able to be beneficially reused, then sediments would be disposed of in-water.
3. If found suitable as fill for upland areas, use where needed, including on the Camas Mill property and in other locations.
4. If the material is found not to be suitable for in-water disposal and not usable in upland locations, then sediment material would be barged to the upland disposal site at the Lady Island dredged materials area (DMA).

5. If materials are found not to be suitable for storage at the DMA or for other upland reuse, then the material would be disposed of at another appropriate approved upland location.

Transportation to the Lady Island DMA would be via barge in the Camas Slough to the Lady Island north shore to a landing where materials would be off-loaded and conveyed to the DMA via a short dirt access road. The material would be moved from the barge by a clamshell crane. As dredged materials are placed for storage, the material will be spread and sorted to remove extraneous material that may have been recovered incidental to dredging. The piles will be shaped with 2:1 sloping sides for stability.

Dredged materials will be managed throughout the process in a manner that prevents the return of sediment to the water. Best management practices will be implemented during transportation and placement so that material does not wash from barges during transfer to the site or from the site after placement.

2.9.2 In-Water Structures to be Removed

In-water structures are those that completely lie below the River's OWHM and are located throughout the Camas Slough and within the Columbia River. In-water structures to be removed are indicated in Table 4 and are located within approved state aquatic lands lease areas (LAs) or within easements from the state. Because these structures are built in water, removal requires access by barge at river stages that enable safe access.

Table 4. Summary of In-water Structures to be Removed

Structure to be Demolished	Aquatic Lands Lease Area Number or Easement	Filling or Dredging Planned?	Estimated Disturbance Area (SF)	Quantity of Fill or Dredge (Cubic Yards)
Dolphins and piles	LAs: 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, and 19	Filling of voids	890	-0-
Downriver dolphin in Clark County	LA 1	Filling of voids	30	-0-
Dock Warehouse piers	LA 17	Dredging	58,710	-10,500
Berger Crane foundation	LA 17	Filling	19,370	+3,500
Tug Dock	LA 17	None	-0-	-0-

Abbreviations:
DNR = Washington State Department of Natural Resources
LA = DNR Lease Area
SF = square feet

Additionally, a substantial portion of the project includes removal of approximately 3,000 timber and steel piles and several dolphins (see Table 5). They will be extracted using a vibratory hammer and log chokers. If a pile cannot be extracted in its entirety, it would be cut off as determined by the BMPs for the removal of derelict piling (DNR 2017, EPA 2016). All extract piles and attached sediment would be contained on a barge deck until they could be off-loaded to an upland location, per state requirements for creosote pile and BMPs. Any cavities remaining following the extraction would be backfilled to the mud line with clean sand.

Table 5. Locations of Dolphins and Piles for Removal

Location	In-water or Overwater	Approximate Number of Pilings 1/
Open-water dolphins and pilings	In-water	250
One downriver dolphin in Clark County	In-water	9
Piling at riverbank that is associated with in-water structures2/	In-water	200
Piling associated with overwater structure foundations 3/	Overwater	2,500
Estimated Total Number of Pilings		Approximately 3,000

1/ Numbers of pilings are estimates and the total estimated number has been rounded up.
2/ In-water pilings include pilings associated with mooring dolphins, remnant riverbank pilings, sheet pilings, and pilings supporting the Dock Warehouse Piers, and pilings at the Tug Dock.
3/ Overwater pilings include pilings associated with the foundations supporting the Dock Warehouse, PECO Dock, and Truck Dock along the riverbank.

The Berger Crane foundation removal may require several demolition methods which may include mechanical approaches using demolition claws and/or expanding demolition grouts, for example. One suggested method will be removed using a hoe-ram operation to break up the reinforced concrete structure that below the OWHM, which is approximately +2 Columbia River Datum (CRD). It would probably not be possible to remove the interior piles that extend through the foundation deep into the bedrock. These would be exposed by removing the exterior concrete and then cutting them off and fill will be placed to cover the retained lower columns, creating bottom contours that match the natural riverbed in this previously dredged location. A floating debris boom would be placed around the piers to retain any debris that might fall from the piers. Additionally, if a hole were created during demolition, clean fill materials will be specified at the minimum size to be stable for this river location. To finish the site, the adjacent nearly vertical riverbank could be reshaped to a shallower slope extending 40 feet to cover the remains of the foundation, thus creating nearshore habitat.

Concrete piers from the dock warehouse would be extracted or excavated using a vibratory hammer to rock the pilings out. If by chance the piling breaks during this process, saw cutting would be utilized to remove the remainder of the pile. Piers would be removed from river barges after dredging occurs to allow for access. A floating debris boom would be placed around the piers to retain any debris that might fall from the piers.

2.9.3 Over Water Structures to be Removed

The Overwater structures are located on the north bank of the Camas Slough. Table 6 summarizes the overwater structures to be removed. The removal of several non-operational structures on-site will occur from the adjacent asphalted upland area of the project site.

Table 6. Summary of Over Water Structures to be Removed

Structure to be Demolished	Filling or Excavation/Dredging	Ground Disturbance Area (SF)	Fill (+)/Excavate (-) Quantity (Cubic Yard)	
			Below existing OHWM	Above existing OHWM
Riverbank Structures: Truck Dock, Dock Warehouse & PECO Dock	Excavation/dredging and filling	40,450	+1,230 / -2,990	+18,300 / -17,100
Approximate net change in fill or dredge at Riverbank			- 1,760	+1,200

Note:
Together, the Truck Dock, Dock Warehouse, and PECO Dock cover approximately 1,055 lineal feet along the riverbank. Given the contiguous nature of the structures, removal activities are summarized for all three structures together.

Abbreviation:
OHWM = ordinary high water mark
SF = square feet

Several riverbank structures that would be removed include the Dock Warehouse, Truck Dock and PECO Dock. All demolition would be conducted from the land, with demolition staging at the Truck Dock. Hazardous materials would be abated prior to building demolition, except for any lead-containing paint passing the toxicity characteristic leaching procedure. All miscellaneous materials would be removed prior to the beginning of structure demolition. It would occur in phases, starting from the initial phase of demolishing and removing the wooden structure itself, while leaving the foundation in place. The second phased would involve demolishing and removing the buildings piling support system and foundation. The final phase would involve removal or cutting of the pilings along the riverbank. Once removed, the riverbank would be reshaped to a maximum 4:1 slope and be revegetated.

The PECO Dock would be demolished by removing the crane and all utilities and miscellaneous supporting materials on the dock. For the Truck Dock and PECO Dock, asphalt and concrete decking would be cut or broken up and removed, followed by removing piling caps, and support beams would then be rigged and removed. The Dock Warehouse will be demolished from the upland side first toward the riverbank, leaving the riverside wall being the last piece to be removed to reduce the risk of materials entering into the river. A floating silt fence would be placed around the dock to filter turbidity and also retain any debris that might fall. The dock's decking would be cut, rigged, and removed. Piling caps would then be rigged and removed. After these steps, pilings would then be removed as described above for piling and dolphins from the upland or river barge and the riverbank would be reshaped to shallower slopes (5 to 1 and 4 to 1), grading to slopes that match existing grades on either end. and revegetated.

2.9.4 Other Structures to be Removed

The final structures to be removed and deconstructed will be an aboveground tank, conveyor housings, and associated utilities (Table 7). Additionally, the south wood chip storage area would be backfilled to design grades. All of the work would occur entirely on land.

Table 7. Other Structures to be Removed in Shoreland Zone

Structure	Filling or Excavation	Total Ground Disturbance (SF)	Notes
Aboveground Oil Storage Tank	None	-0-	Demolition is to slab, and no ground disturbance planned
South Wood Chip Storage Area	Excavate remaining wood chips and backfill to previous grade	155,580	Approximately 11,100 CY of fill for restoration of area topography (all located landward of OHWM)
Product Conveyor Housing[1]	None	-0-	Elevated housing
Wood Chip Conveyor Housings[1/]	None	-0-	Elevated housing

Note:
1/ Conveyor housings are elevated and cross over the Wood Chip Storage Areas and the Truck Dock area. The adjacent North Wood Chip Storage Area is approximately 3.0 acres of upland habitat outside of the shoreline zone, but will be graded and reclaimed collectively with activities proposed in the South Wood Chip Storage Area.

Abbreviations:
CY = cubic yard
OHWM = ordinary high water mark
SF = square feet

3.0 STORMWATER MANAGEMENT

In Accordance with Camas Municipal Code Chapter 14.02, the Stormwater Management Manual for Western Washington (SWMMWW) (Ecology 2019) was utilized as basis for stormwater management for this project in the upland areas. Since this project proposes to disturb an area over 7,000 SF, it was determined via SWMMWW definitions that this project is considered a Redevelopment.

Minimum Requirement (MR) criteria prescribed by Ecology's SWMMWW were followed in development of this Stormwater Management Plan. For the applicable Ecology MR criteria, the SWMMWW flowchart shown in Figure 1 below was utilized to determine that MRs 1 through 5 apply.

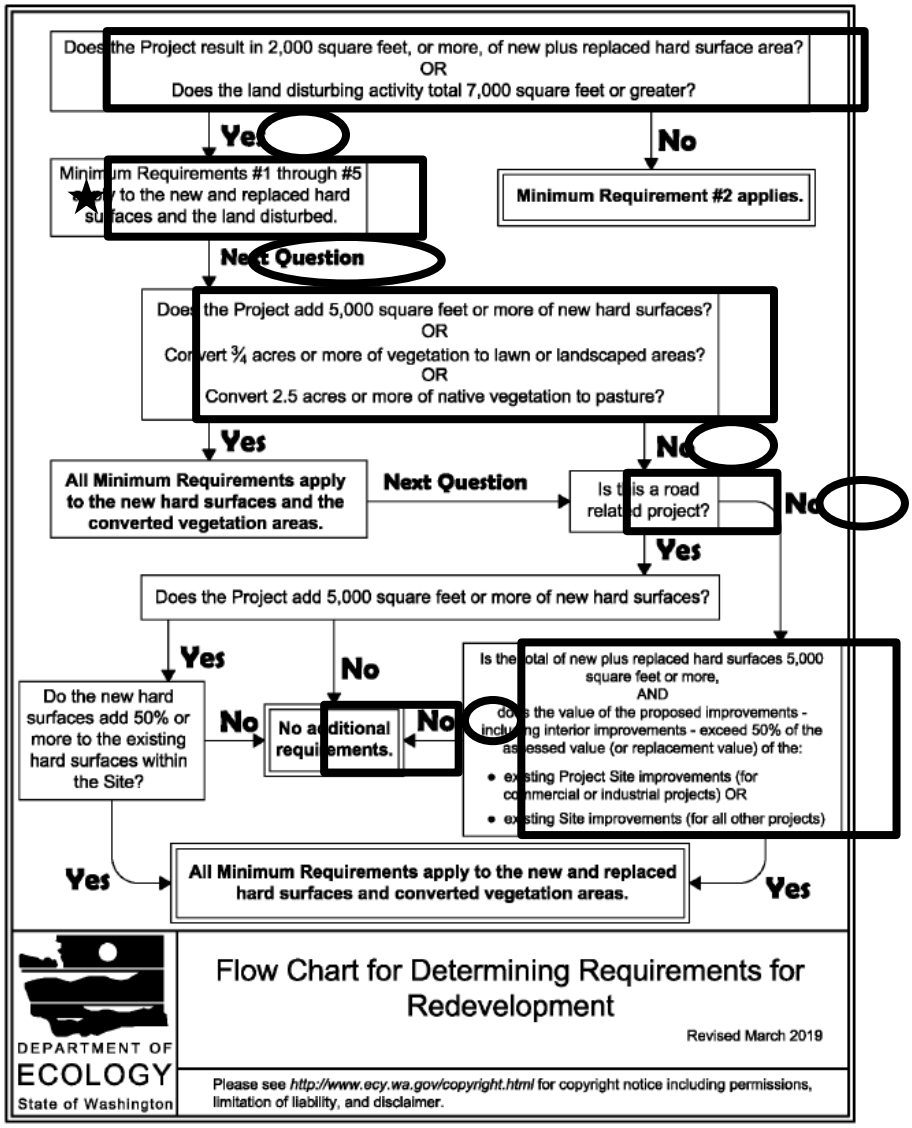


Figure 1. Flow Chart for Determining Requirements for Redevelopment

The below subsections detail MRs 1 through 5 and include details regarding compliance with each of the MR criteria provided by the Ecology SWMMWW.

3.1 MR1 – Preparation of Stormwater Site Plans ("SSP")

The Stormwater Site Plan (SSP) consist of drawings including a grading plan to facilitate stormwater conveyance. Also included in the SSP is a Temporary Erosion and Sediment Control Plan (TESC Plan) sheet. See **Attachment A** for the project SSP.

3.2 MR2 – Construction Stormwater Pollution Prevention Plan ("Construction SWPPP")

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the Certified Erosion and Sediment Control Lead (CESCL) has noted a deficiency in BMPs or deviation from original design.

The SWPPP prepared for this project includes this report narrative, and construction plans/details attached. In addition to the report narrative and construction plans/details, key Elements of Construction Stormwater Pollution Prevention (Elements 1 through 13) are listed and described in detail within this section.

3.2.1 SWPPP 13 Elements

BMPs will be implemented prior to the initiation of the project. BMPs are included in **Attachment B** (BMP Detail) as a quick reference tool for the on-site inspector in the event the BMPs listed for the elements below are deemed ineffective or inappropriate during construction to satisfy the requirements set forth in the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit (CSWGP). To avoid potential erosion and sediment control issues that may cause a violation(s) of the CSWGP, the Certified Erosion and Sediment Control Lead (CESCL) will promptly initiate the implementation of one or more alternative BMPs listed in **Attachment B** after the first initial sign that existing BMPs are ineffective or failing.

3.2.1.1 Element 1: Preserve Vegetation/Mark Clearing Limits

To protect adjacent property, protect workers at the job site, and reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. However, because work will occur in a tidal area, the construction area will not be marked on the waterward (generally north) side of the work area. Figure 1 (**Attachment A**) shows the project limits. The construction documents require the contractor to install temporary fencing at the upper project limits, which will demarcate areas where soil may be exposed to construction. No natural vegetation in the work area will be retained, and therefore BMP C101 (Preserving Natural Vegetation) is not applicable. The Columbia River and Camas Slough may be considered a sensitive area; however, because construction activities occur within the tidal zone, the placement of BMP C102 (Buffer Zones) is impracticable.

- High Visibility Fence (BMP C103)
- Silt Fence (BMP C233)

Within the Project limits, all environmentally sensitive areas and the buffers of environmentally sensitive areas will be fenced with high visibility construction fence (HVF) where possible prior to commencing construction activities, including equipment staging, materials storage, and parking of workers' vehicles.

- The HVF will be applied, as stated above, prior to commencing construction activities for each stage of the Project.

- All field staff will be trained to recognize HVF and understand its purpose.
- HVF will be maintained until all work is completed for each stage of the Project.
- All clearing limits, stockpile sites, staging areas, and trees to be preserved will be clearly marked prior to commencing construction activities.
- All clearing limits, stockpile sites and staging areas will be maintained until all work is completed for each stage of the Project.
- No equipment will enter, operate, be stored, or be parked within any sensitive area except as specifically provided for in permits issued for the Project.
- Where HVF is not appropriate (such as over water), the environmentally sensitive areas will be clearly marked by other means to ensure that these areas are protected.

Existing sensitive areas will be preserved as shown on the Temporary Erosion and Sediment Control (TESC) Plan in Figure 6 in **Attachment A**, and as described herein. Marking the perimeter of areas to be preserved will occur before clearing and grubbing operations in each area commences. Within disturbed areas compost soil amendment will be incorporated upon completion of grading consistent with BMP T5.13: Post-Construction Soil Quality and Depth.

3.2.1.2 Element 2: Establish Construction Access

Construction access or activities occurring on unpaved areas will be minimized, yet where necessary, access points will be stabilized to minimize the tracking of sediment onto public roads. Once equipment enters excavation areas, equipment will be brushed or shoveled off prior to leaving the excavations, and street sweeping and street cleaning will be employed to prevent sediment from entering state waters.

The specific BMPs related to establishing construction access that could be used on this project include:

- Stabilized Construction Entrance (BMP C105)
- Construction Road/Parking Area Stabilization (BMP C107)

A stabilized construction entrance will be constructed as shown on the TESC Plans and as described here and in the Project Specifications. Stabilized construction entrances will be installed at each access location used by construction vehicles. A paved staging area is available for use during the project; construction road/parking area and stabilization area BMPs would be implemented only if the contractor's means and methods warrant use of areas that are currently unpaved.

3.2.1.3 Element 3: Control Flow Rates

Will you construct stormwater retention and/or detention facilities?

☐ Yes ☒ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?

☐ Yes ☒ No

As part of the project, many areas that are currently above the OHWM will be converted to intertidal lands. This project also includes extensive in-water work, including dredging and pile removal, within the Camas Slough and Columbia River to remove treated timber piles and other structures. Stormwater from the intertidal areas will be managed as dredge return water consistent with a United States Army Corp of Engineers (USACE) Section 10/404 permit. Dredge return water requiring processing to clarify the water and the water will be returned to the waterways. Furthermore, the water quality goals for the Columbia River and Camas Slough waterways set forth in the Joint Aquatic Resources Permit Application (JARPA) Permit will be met during all aspects of the construction. The water quality goals are reviewed by multiple agencies and are deemed to be protective of these waterways. Therefore, meeting the water quality requirements of the JARPA Permit should be adequate and appropriate to protect downstream properties and receiving waters.

In addition to meeting the requirements of the JARPA Permit, a floating turbidity curtain will be installed along the toe of the shoreline excavation for the duration of major earthwork to protect the intertidal zone as tide levels rise and fall each day. This turbidity curtain will act, in effect, as a temporary sediment pond. A conventional sediment pond or basin built within the intertidal zone would have no additional benefit; as a result, a temporary sediment Pond (BMP C241) will not be constructed in the intertidal zone (see Elements #4 and #9 for details).

For the portions of work that occur up slope of the intertidal zone, construction runoff from disturbed areas in those locations where runoff can be intercepted will be collected in sumps and pumped to the dredge return water processing system for treatment (see Element #4).

Additionally, to protect properties and waterways downstream while construction occurs on land, stormwater discharges from the demolition area will be contained as shown in the TESC Plans and conveyed via the existing Process Sewer Line to the Lady Island Wastewater Treatment facility.

The specific BMPs related to controlling flow rates that will be used on this project include:

- Water Bars (BMP C203)
- Straw Wattles (BMP C235)

Several locations are proposed for the temporary stormwater collection points prior to discharge to the process sewer line. Collection points will be located and moved, as appropriate based on the site activities and locations best suited for collection. Additionally, water bars will be implemented to direct stormwater towards receiving inlets where the stormwater will be pumped to the Process Sewer line.

3.2.1.4 Element 4: Install Sediment Controls

Within the demolition area, all stormwater runoff from disturbed areas will pass through an appropriate sediment-removal BMP before collection and discharge into the Process Sewer line. Soil stockpiles will be placed on plastic sheeting, surrounded by berms, and covered with plastic.

During precipitation events, stormwater will fall on disturbed areas that are sloped toward the Camas Slough waterway or Columbia River waterway. Because the majority of construction will take place in the intertidal zone, BMPs would become inundated by daily rising tides and would be damaged or otherwise rendered ineffective. However, construction will not cause water quality impacts in the Camas Slough and Columbia River waterways that do not meet the water quality goals set forth in the JARPA Permit. When feasible, erosion controls, such as filter berm (BMP C232) or straw wattles (BMP C235), will be placed on cut slopes to reduce surface water velocities and sediment entrainment.

Runoff and sediment generated during interim excavation will remain within the isolated area. A sediment catchment area will be constructed so that sediment-laden stormwater can be collected and pumped to the Lady Island wastewater treatment facility prior to discharge into the Columbia River. Stormwater collected during in-water work will be routed to the dredge return water processing system for treatment prior to discharge.

The dredge return water processing system will be designed, implemented, maintained, and operated by the dredging contractor. This system will meet the requirements of the project water quality permits (JARPA and Section 10/404).

The specific BMPs to be used for controlling sediment on this project include:

- Plastic Covering (BMP C123)
- Silt Fence (BMP C233)
- Straw Wattles (BMP C235)
- Dredge return water processing system,
- Filter Berms (BMP C232)

Other BMPs that could be used for controlling sediment on this project include:

- Sediment Trap (BMP C240)
- Construction Stormwater Filtration (BMP C251)
- Portable Water Storage Tanks (e.g., Baker Tank)
- Materials on Hand (BMP C150) may also be applicable

Sediment control BMPs will be constructed as shown on the TESC Plan and prescribed within the SMP. BMPs will be installed prior to start of demolition activities. Stormwater drains in the surrounding areas, including on nearby public roads, will be protected by inlet inserts.

All existing stormwater drains will be blocked, and stormwater collection points established where stormwater can be captured and discharged into the Process Sewer line for conveyance to the Lady Island Treatment facility. Straw wattle or coir log will be placed around major demolition areas to control possible flow of loose debris. Silt fence and a temporary containment berm will be installed around the perimeter of the limit of work. In addition, sediment may be removed from paved areas in and adjacent to demolition work areas manually, or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash-off of sediments from adjacent streets.

Imported earthen material for berms will be stockpiled on paved areas and protected against erosion while not in use. Per Project Specifications, materials will not be stored within 50 feet of any open water conveyance and will not be deposited or stored in or alongside wetlands, wetland buffers, streams, or watercourses where the materials can be eroded by high water or storm runoff.

Damaged controls will be repaired when they are observed. Removal of sediment will occur from silt fence and storm drain inlet protection when sediment reaches 30 percent of the height of the BMP. Removed sediment will be disposed off-site in an approved location as described in Section 2.9.1.

3.2.1.5 Element 5: Stabilize Soils

Table 8. Stabilize Soil Dates West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: **Start date:** 2023 **End date:** 2026

Will you construct during the wet season?

☒ Yes ☐ No

Construction of this project will be implemented under a Section 10/404 permit, and all materials excavated will be considered dredged material. An exception will be the over water structure removal that will occur outside of the in-water work window. This work will be under a Construction Stormwater permit obtained from Ecology. Construction within the intertidal zones will be sequenced such that work will be conducted during low tides in the "dry." Above this zone, surface roughening ("track walking") will be performed, and mulching will be used once final grades are achieved. Final grade conditions will be consistent with BMP T5.13: Post-Construction Soil Quality and Depth with an approved seed mix for disturbed areas. Soil stockpiles will be covered in plastic. Soil stockpiles outside excavation footprints will be stored on bermed plastic sheeting and covered in plastic. Water will be applied to control airborne dust.

Exposed and unworked soils will be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that could be used on this project include:

- Post-Construction Soil Quality and Depth (BMP T5.13)
- Nets and Blankets (BMP C122)
- Plastic Covering (BMP C123)
- Temporary and Permanent Seeding (BMP C120)
- Mulching (BMP C121)

- Surface Roughening (BMP C130)
- Dust Control (BMP C140)

Other BMPs for soil stabilization that could be used on this project include:

- Sodding (BMP C124)
- Topsoiling (BMP C125)
- Early application of gravel base on areas to be paved.
- Materials on Hand (BMP C150) may also be applicable

Soil stabilization BMPs will be installed as shown on the TESC Plan and as described herein. Soil removed by excavation will be temporarily stockpiled on-site. Plastic covering will be used, as necessary, to protect stockpiles. In general, stockpiled soils will be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from waterways and drainage channels.

Temporary mulching (e.g., straw) or plastic covering will be used to stabilize exposed soils and protect against erosion, as necessary. All soil stabilization BMPs will be installed as soon as practicable after soil disturbance. No topsoil removal is proposed; however, should any need to be removed, native topsoil will be stockpiled for reuse on site.

3.2.1.6 Element 6: Protect Slopes

Will steep slopes be present at the site during construction?

☒ Yes ☐ No

Where adjacent areas shed stormwater toward the construction area, diversion dikes, perimeter berms, and swales will be used to prevent run-on.

The specific BMPs for slope protection that may be used on this project include:

- Slope Protection Mulch (Standard Specification Section 9-14.4(1))
- Temporary and Permanent Seeding (BMP C120)
- Mulching (BMP C121)
- Nets and Blankets (BMP C122)
- Plastic Covering (BMP C123)
- Surface Roughening (BMP C130)

Slope protection BMPs will be installed as shown on the TESC Plans and as described here and in the Project Specifications. The existing slopes throughout the project are expected to remain in place and will be protected against erosion, however where needed to ensure proper drainage of stormwater post-construction slopes will be graded, as necessary.

3.2.1.7 Element 7: Protect Drain Inlet

No storm drain inlets are present in or downgradient of the construction areas. However, several inlets are located along off-site travel paths. All storm drain inlets and culverts operable during demolition will be protected to prevent unfiltered or untreated water from entering the drainage conveyance system.

The specific BMPs to protect the nearby storm drain system include:

- Storm Drain Inlet Protection (BMP C220)
- Stormwater discharge from the mill is regulated under an Industrial NPDES stormwater permit issued by Ecology. Stormwater system sampling, pollutant control, management, and maintenance are conducted in accordance with GP's Stormwater Pollution Prevention Plan (SWPPP).

Inlet protection BMPs will be installed as shown on the TESC Plans and as described in the Project Specifications. Prior to starting demolition in each work area, drop and/or curb inlet protection will be installed in catch basins and curb-inlets that could potentially be impacted by sediment-laden runoff on.

BMPs will be inspected and maintained frequently, especially after storm events. Catch basin filters will be cleaned or replaced if sediment has filled the device by one third, or as specified by the manufacturer. Sediment, debris, trash, and all other material collected will be properly disposed of off-site at an approved location.

3.2.1.8 Element 8: Stabilize Channels and Outlets

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

The project site is located along the shoreline of the Columbia River and Camas Slough Waterways, and a large portion of stormwater flows are expected to travel as sheet flow. Temporary channels may be used during construction, particularly during the over water structure removal on the south shoreline of the GP site. For temporary channels used to manage stormwater during construction (BMP 200), check dams (BMP 207) will be installed to provide additional settling and sediment retention capacity.

The specific BMPS to be used for protecting temporary channels on this project include:

- Interceptor Dike and Swale (BMP C200), and
- Check Dams (BMP 207).

Other BMPs for channel and outlet stabilization that could be used on this project include:

- Channel Lining (BMP C202)
- Triangular Silt Dike (Geotextile-Encased Check Dam - BMP C208)
- Materials on Hand (BMP C150)

The project site is located west of the Cascade Mountain Crest. As such, any temporary on-site conveyance channels will be designed, constructed, and stabilized to prevent erosion from the expected peak 10-minute flow rate from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Alternatively, the 10-year, 1-hour flow rate predicted by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

3.2.1.9 Element 9: Control Pollutants

Table 9. Example Pollutants/Sources to Control

Pollutant	Source to Control
Petroleum and other chemical products	Equipment, Vehicles, and Refueling
Turbid dewatering water	Clearing/grading activities, Excavations, and Dredging
Concrete debris	Sawcutting, and Demolition

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

☒ Yes ☐ No - Only in a designated area and on contained paved surfaces.

Will wheel wash or tire bath system BMPs be used during construction?

☐ Yes ☒ No

Will pH-modifying sources be present on-site?

☒ Yes ☐ No - Only demolition debris will be removed from the site.

Table 10. pH-Modifying Sources

☐	None
☐	Bulk cement
☐	Cement kiln dust
☐	Fly ash
☐	Other cementitious materials
☐	New concrete washing or curing waters
☒	Waste streams generated from concrete grinding and sawing
☐	Exposed aggregate processes
☐	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?

☐ Yes ☒ No – Not applicable

All pollutants, including waste materials and demolition debris, which occur on-site will be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

Vehicles, Construction Equipment, and/or Petroleum Product Storage/Dispensing:

Camas Mill has an existing SPCC plan and the demolition activities will be compatible with the existing plan. All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills. On-site fueling tanks and petroleum product/chemical storage containers shall include secondary containment. Secondary containment means placing materials within an impervious structure capable of containing 110% of the volume contained in the largest container. Spill prevention measures, such as drip pans and absorbent pads, will be used when conducting maintenance and repair of vehicles or equipment.

To perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle. A sufficient quantity of stocked spill response kits will be available on-site, including smaller portable spill kits carried within equipment and construction vehicles.

In addition, the following steps are required:

- Contain and clean up spills immediately.
- Spills and contaminated surfaces shall be cleaned immediately following any discharge or spill incident, using dry cleanup measures.
- Eliminate the source of the spill to prevent a discharge.

Demolition debris will be handled in a manner that does not cause contamination of stormwater. Debris will not be processed on site, and handling will only occur on existing slabs or adjacent asphalted areas. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well-organized, and free of debris. Site access is fully controlled by fencing and patrolled to eliminate vandalism. All debris will be removed from the site and disposed at an approved location.

The following measures are required to provided best management practices for waste management:

Concrete and Grout BMPs:

- Dust Control (BMP C140).
- Storm Drain Inlet Protection (BMP C220 as described above for Element 7: Protect Drain Inlets).

- Saw cutting and surfacing Pollution Prevention (BMP C152)—Collection of wastewater will include vacuuming during cutting operations if wet cutting is employed.

Contaminated Soil or Sediment:

- The following precautions will be taken to minimize exposure of stormwater to contaminated soils:
  - Suspected contaminated soils will be loaded directly into trucks or stockpiled appropriately.
  - Suspected contaminated soils will be stockpiled on bermed plastic sheeting and covered in plastic sheeting in according with BMP C123 to prevent exposure to stormwater and mobilization of contaminated soils.
  - Water accumulating from stockpiled soils suspected of contamination will be treated through the Lady Island wastewater treatment facility prior to discharge.

Chemical Storage: All chemicals shall have cover, containment, and protection provided on site, in accordance with BMP C153.

Sanitary Wastewater: Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.

Solid Waste: Solid waste will be stored in secure, clearly marked containers.

Wheel wash wastewater: The use of a Wheel Wash (BMP C106) on-site is not anticipated, but if installed, wastewater will be discharged to the Lady Island Treatment Plant.

Spill Prevention Control and Countermeasures Plan: Per Project Specifications, a separate Spill Prevention, Control, and Countermeasures Plan will be developed by the Contractor.

3.2.1.10 Element 10: Control Dewatering

Dewatering will not be required during this project. However, if dewatering is required, a sediment catchment area will enable the contractor to collect and pump water if needed to the Lady Island wastewater treatment facility prior to discharge. The effluent will be tested in accordance with the requirements stipulated in the Industrial Wastewater Discharge Approval.

The specific BMPs applied to dewatering on this project include:

- Concrete Handling (BMP C151)
- Dredge return water processing system.
- Ecology Construction Stormwater Permit BMPs and water pretreatment system.

Other dewatering treatment or disposal methods may include:

- Infiltration.
- Transport off-site for legal disposal in a manner that does not pollute state waters.

Clean, non-contaminated, non-turbid dewatering water, such as well-point groundwater, will not be routed through stormwater sediment traps, and will be discharged to systems tributary to the

receiving waters of the State in a manner that does not cause erosion, flooding, or a violation of State water quality standards in the receiving water.

The anticipated treatment and disposal options for dewatering water to be used on the project are included in Table 11.

Table 11. Dewatering BMPs

☒	Infiltration
☒	Transport off-site in a vehicle (vacuum truck for legal disposal)
☒	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to catch basin, ditch or swale (small volumes of localized dewatering)

3.2.1.11 Element 11: Maintain BMPs (Permit Condition S9.D. 11)

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.

Maintenance and repair shall be conducted in accordance with each particular BMP specification. See **Attachment B** including the BMP specifications from the SWMMWW.

Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.

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

No ground disturbance will occur, and therefore no permanent BMPs are anticipated. In the event BMPs are installed for the permanent control of stormwater from sediment and compaction, protection must be provided for these BMPs. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed, and the facility shall be returned to conditions specified in the construction documents.

3.2.1.12 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:

- Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
- Site inspections and monitoring are required in accordance with Special Condition S4 of the CSWGP. All stormwater generated during demolition activities will be contained and diverted to the existing wastewater treatment facility on Lady Island. As such, no stormwater monitoring is required, and no sampling locations have been designated. Should monitoring be required, sampling station(s) would be located in accordance with applicable requirements of the CSWGP.

- Maintain an updated SWPPP.
  - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Management BMPs that apply to the site are shown in Table 12 and the BMP implementation schedule is provided in Table 13.

Table 12. Management BMPs

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☒	Schedule major earthwork during the dry season
☒	Other (please describe) – Leave paved surfaces intact.

The construction project is being phased to the extent practicable to prevent soil erosion, and, to the maximum extent possible, the transport of sediment from the site during construction.

Excavation activities in the intertidal zone will be phased such that excavations will be conducted during low tide (“in the dry”).

The BMP implementation schedule shown below in Table 13 will be driven by the construction schedule. BMPs will be installed in each demolition area prior to any soil-disturbing activity.

Table 13. BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
Prior to Construction	Clearing Limit BMPs	Upon Receipt of Permit Approvals—Expected late 2023	Wet and Dry
	Stabilized Construction Entrance		
	Delineate Construction Staging and Parking Areas		

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
	Control Flow Rate BMPs		
	Sediment Controls BMPs		
	Protect Storm Drain Inlets		
	Manage Materials		
During/After construction or as needed.	Stabilize Soils BMPs	Immediately following preconstruction BMP implementation	Wet and Dry
	Protect Slopes BMPs		
	Manage Demolition Materials		
	Repair/modification/replacement of BMPs as needed.		
	Install additional BMPs as needed		

3.2.1.13 Element 13: Protect Low Impact Development Facilities

Not applicable as no LID occurs on the site or is proposed by the project.

3.3 MR3 – Source Control of Pollution

Source control BMP's should be implemented where applicable. The Ecology SWMMWW Volume IV lists a number of BMP's for source control of pollutants. The source control BMP's applicable to this project include:

- S410 BMP - Correcting Illicit Discharges to Storm Drains;
- S453 BMP - Formation of a Pollution Prevention Team;
- S454 BMP - Preventive Maintenance / Good Housekeeping;
- S455 BMP - Spill Prevention and Cleanup;
- S456 BMP - Employee Training;
- S457 BMP - Inspections; and
- S458 BMP - Record Keeping.

See **Attachment B** for details regarding the above source control BMPs.

3.4 MR4 – Preservation of Natural Drainage Systems and Outfalls

The majority of the proposed areas of disturbance currently drain into an onsite stormwater collection, conveyance, and treatment system with an outfall to the Columbia River. This project proposes to demo and regrade approximately 10.8 acres of the area currently being routed through the stormwater treatment system. See Figure 5 in **Attachment A** for a plan view of this area. The native natural drainage system for this area consisted of sheet flow to the Columbia River. The proposed grading plan shown on Figure 5 in **Attachment A** restores sheet flow to the Columbia River and restores the natural drainage system and sheet flow outfall.

3.5 MR5 – On-Site Stormwater Management

Based on the Ecology SWMMWW, this project requires MR 1-5 criteria to be met with stormwater design and management. These specific MRs and flow control exemption criteria lead to certain MR5

requirements. Figure 2 below shows a flow chart to determine the requirements of MR5 for this project.

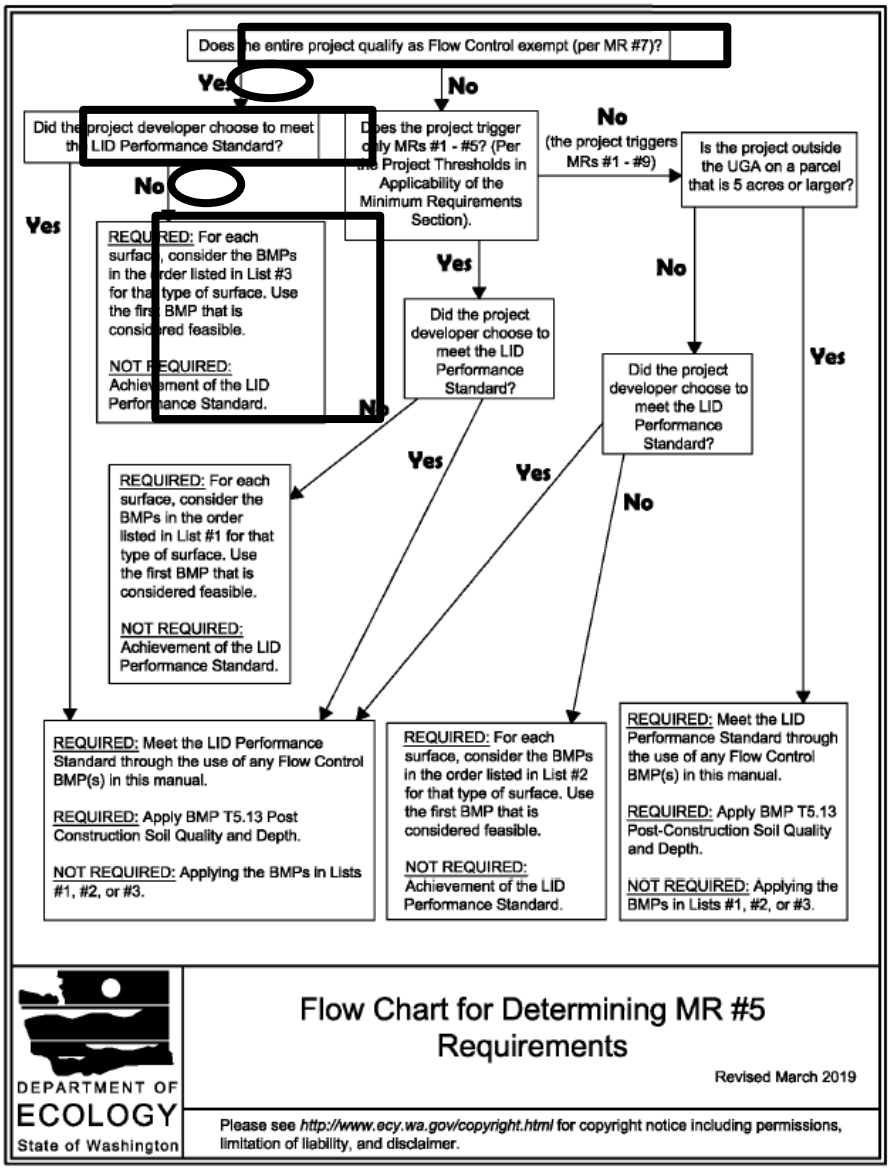


Figure 2. Flow Chart for Determining MR5 Requirements

List #3 from the Ecology SWMMWW was referenced to determine what BMP to implement for new, replaced and disturbed land surfaces for the project. List #3 prescribes BMPs for three types of surfaces including lawn and landscaped areas, roofs areas, and other hard surfaces. For this project, there will be no new or replaced roofs or other hard surfaces. All new, replaced, or disturbed land surfaces for this project are proposed to be lawn or landscaped areas for final conditions. Based on List #3, BMP T5.13: Post-Construction Soil Quality and Depth applies to these areas.

4.0 POLLUTION PREVENTION TEAM

The pollution prevention team listed in Table 14 is responsible for implementation of the SWPPP.

Table 14. Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	TBD	TBD
Resident Engineer	TBD	TBD
Emergency Ecology Contact	Southwest Region Office	(360) 407-6300
Emergency Permittee/ Owner Contact	TBD	TBD
Non-Emergency Owner Contact	TBD	TBD
Monitoring Personnel	TBD	TBD
Ecology Regional Office	Southwest Region Office Permit Administrator (Clark County): Joyce Smith	(360) 407-6300 (360) 407-6858

5.0 MONITORING AND SAMPLING REQUIREMENTS

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site logbook. A site logbook will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements.
- A record of Site inspections.
- Stormwater sampling data, where needed.

A Construction Stormwater Site Inspection Form is included in **Attachment C**.

The site logbook must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

5.1 Site Inspection

Site inspections will be conducted at least once every calendar week. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month. Note that no surface discharge points are proposed at the site as the stormwater will be routed to Lady Island for treatment.

5.2 Stormwater Quality Sampling

There are no requirements for stormwater sampling as all stormwater in the project area will be treated off-site. The treatment facility has regulated discharges under existing NPDES permits.

5.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.

Method for sampling turbidity:

N/A: Sampling for turbidity will not occur since cumulative soil disturbance on this project is less than one (1) acre.

Table 15. Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The benchmark for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.

If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the benchmark.
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site logbook.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
   - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the benchmark. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
3. Document BMP implementation and maintenance in the site logbook.
4. Continue to sample discharges daily until one of the following is true:
   - Turbidity is 25 NTU (or lower).
   - Transparency is 33 cm (or greater).
   - Compliance with the water quality limit for turbidity is achieved
     - 1 - 5 NTU over background turbidity, if background is less than 50 NTU

- 1% - 10% over background turbidity, if background is 50 NTU or greater
- The discharge stops or is eliminated.

5.2.2 pH Sampling

pH monitoring is required for "Significant concrete work" (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:

N/A, as sampling for pH will not occur because significant concrete work is not part of this project.

Table 16. pH Sampling Method

☐	pH meter
☒	pH test kit
☐	Wide range pH indicator paper

6.0 DISCHARGES TO 303(D) LISTED AND TOTAL MAXIMUM DAILY LOAD (TMDL) WATERBODIES

6.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?

☐ Yes ☒ No

List the impairment(s): N/A - There are no listed impairments for the receiving waters.

6.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges: N/A, as there are no waste load allocations for discharges to the receiving waters.

List and describe BMPs: N/A

7.0 REPORTING AND RECORDKEEPING REQUIREMENTS

7.1 Record Keeping

7.1.1 Site Logbook

A site logbook will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements.
- Site inspections.

7.1.2 Record Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Logbook

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

7.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

7.2 Reporting

7.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is less than one (1) acre; therefore, Discharge Monitoring Reports will not be submitted to Ecology because water quality sampling is not being conducted at the site. Moreover, stormwater impacted by uplands demolition activities will be routed to treatment during demolition and managed under separate NPDES permits.

If there was no discharge during a given monitoring period the DMR will be submitted as required, reporting "No Discharge." The DMR due date is fifteen (15) days following the end of each calendar month.

DMRs will be reported online through Ecology's WQWebDMR System (http://www.ecy.wa.gov/programs/wq/permits/paris/webdmr.html).

7.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit are not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately, and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Southwest Region** at (360) 407-6300

Include the following information:

1. Your name and phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

8.0 REFERENCES

Ecology 2019, Stormwater Management Manual for Western Washington, Department of Ecology, July 2019

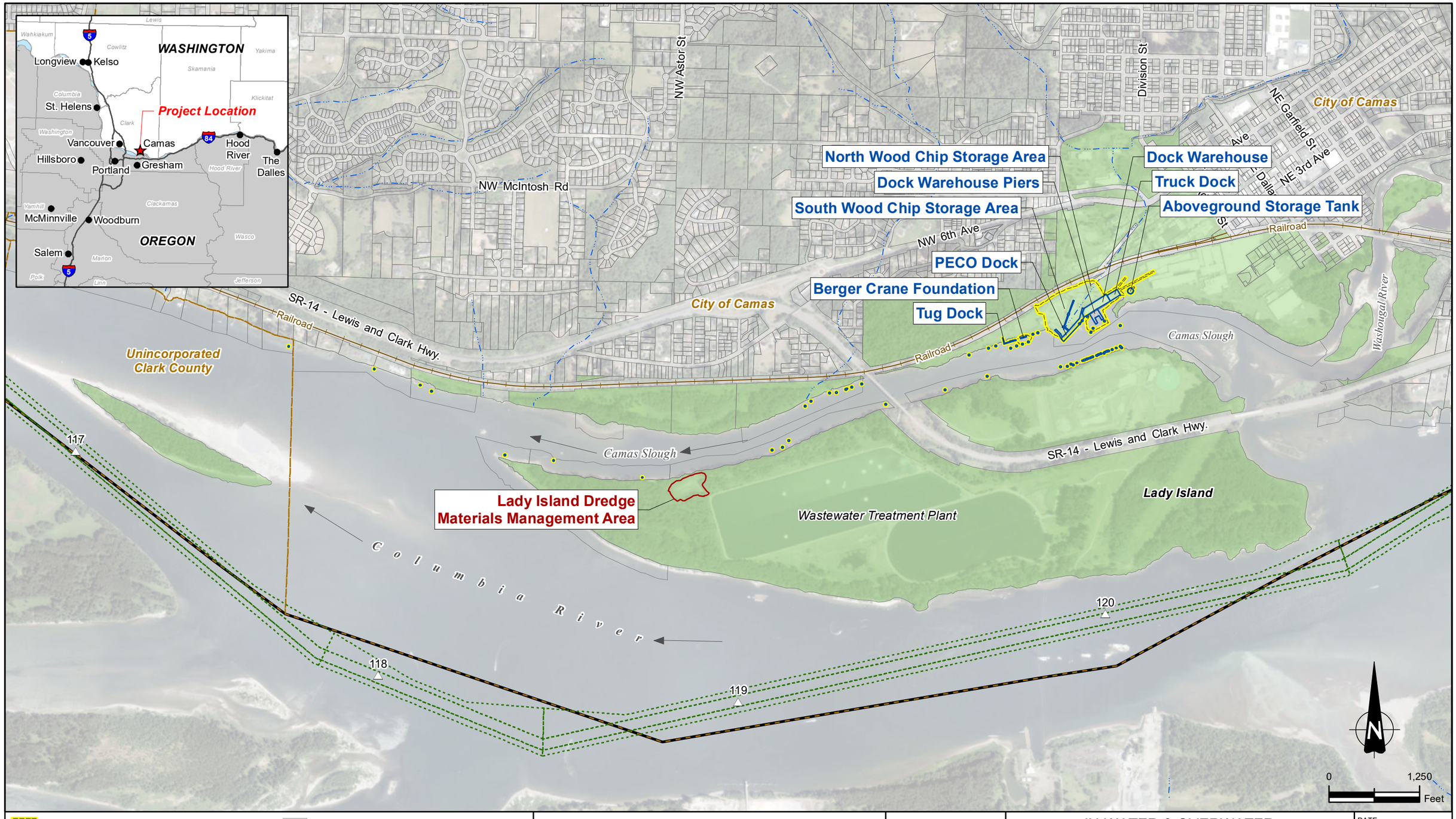
Clark County 2015, Clark County Stormwater Manual, November 2021.

City of Camas 2016, Camas Stormwater Design Standards Manual, November 2016.

DNR 2017, Washington Department of Natural Resources, Derelict Creosote Piling Removal Best Management Practices for Pile Removal & Disposal, January 2017.

EPA 2016, EPA Region 10, Best Management Practices for Piling Removal and Placement in Washington State, February 2016.

Appendix A: Site Maps



- Project Limits
- Columbia River Mile Marker
- Stream/River
- Structure To Be Removed
- Dolphin To Be Removed
- Lady Island Dredge Materials Management Area
- Tax Lot
- Tax Lot Owned by Georgia-Pacific
- City Boundary
- County Boundary
- Federal Navigation Channel

GEORGIA-PACIFIC CONSUMER OPERATIONS LLC

Tetra Tech

TETRA TECH

IN-WATER & OVERWATER STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

PROJECT LOCATION

DATE: OCTOBER 2022
SCALE: 1 " = 1,250 '
PROJECT NO.
FIGURE: 1

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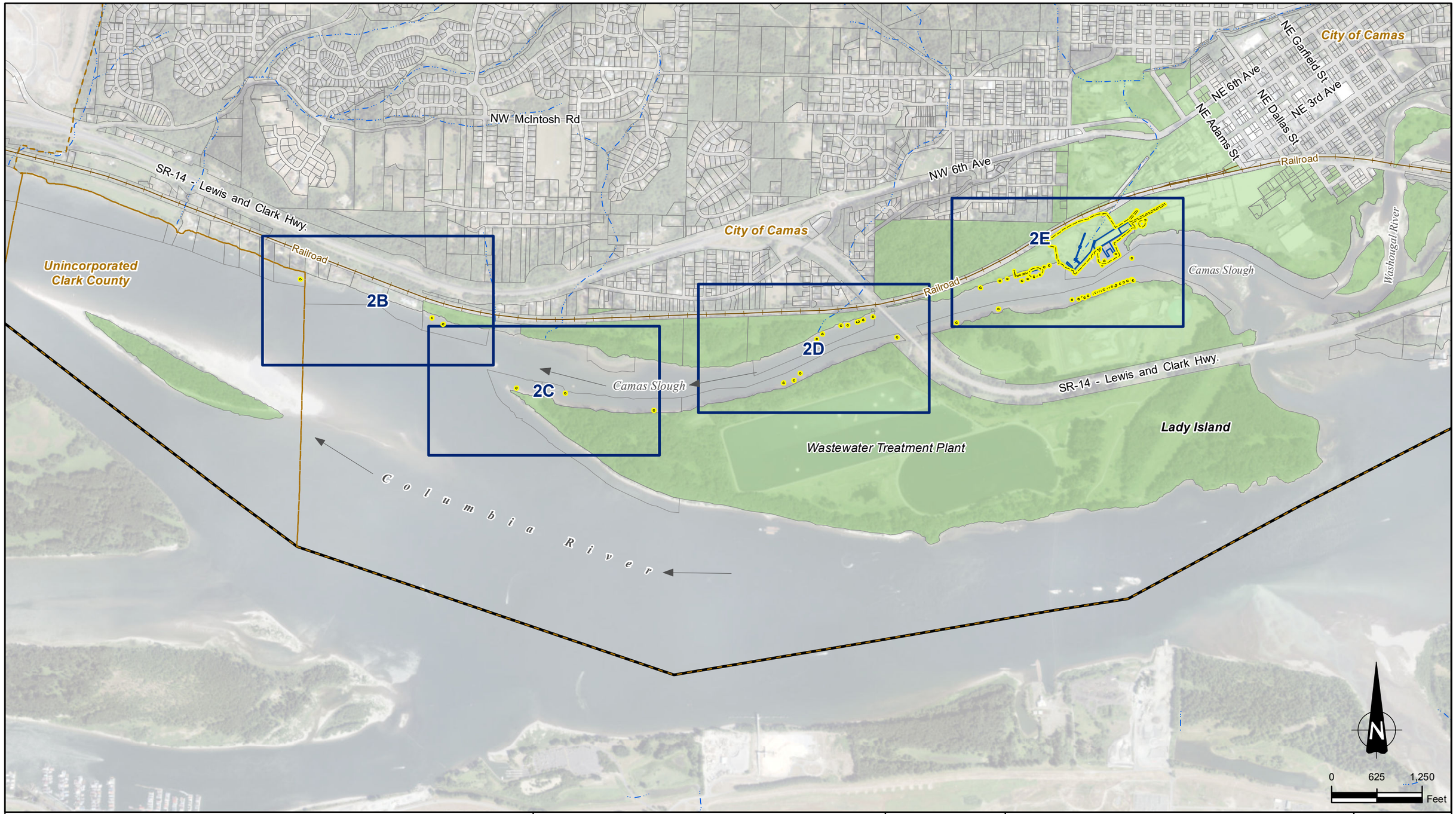

Project Limits
Structure To Be Removed
Dolphin To Be Removed
Stream/River
Tax Lot
Tax Lot Owned by Georgia-Pacific
City Boundary
County Boundary

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IN-WATER & OVERWATER
STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

STRUCTURES TO BE REMOVED
AND STUDY AREA MAP
OVERVIEW

DATE
OCTOBER 2022

SCALE
1 " = 1,250 '

PROJECT NO.

FIGURE
2A

R:\PROJECTS\CAMAS_0117-0064\FIGURES_UPDATE\MAPS\Figure 2A - Study Area Map - Overview.mxd - sierra.marrs - 10/19/2022 - 3:36:05 PM

Project Limits
Structure To Be Removed
Dolphin To Be Removed
Tax Lot
Tax Lot Owned by Georgia-Pacific
City Boundary

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IN-WATER & OVERWATER
STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

STRUCTURES TO BE REMOVED
AND STUDY AREA MAP

DATE
OCTOBER 2022

SCALE
1 " = 200 '

PROJECT NO.

FIGURE
2B

R:\PROJECTS\CAMAS_0117-0064\FIGURES_UPDATE\MAPS\Figure 2B-2E - Study Area Map - Mapbook.mxd - sierra.marrs - 10/19/2022 - 3:36:17 PM

Project Limits
Structure To Be Removed
Dolphin To Be Removed
Tax Lot
Tax Lot Owned by Georgia-Pacific

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IN-WATER & OVERWATER
STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

STRUCTURES TO BE REMOVED
AND STUDY AREA MAP

DATE
OCTOBER 2022

SCALE
1 " = 200 '

PROJECT NO.

FIGURE
2C

R:\PROJECTS\CAMAS_0117-0064\FIGURES_UPDATE\MAPS\Figure 2B-2E - Study Area Map - Mapbook.mxd - sierra.marrs - 10/19/2022 - 3:36:20 PM

Project Limits
Structure To Be Removed
Dolphin To Be Removed
Tax Lot
Tax Lot Owned by Georgia-Pacific

GEORGIA-PACIFIC
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TETRA TECH

IN-WATER & OVERWATER
STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

STRUCTURES TO BE REMOVED
AND STUDY AREA MAP

DATE
OCTOBER 2022

SCALE
1 " = 200 '

PROJECT NO.

FIGURE
2D

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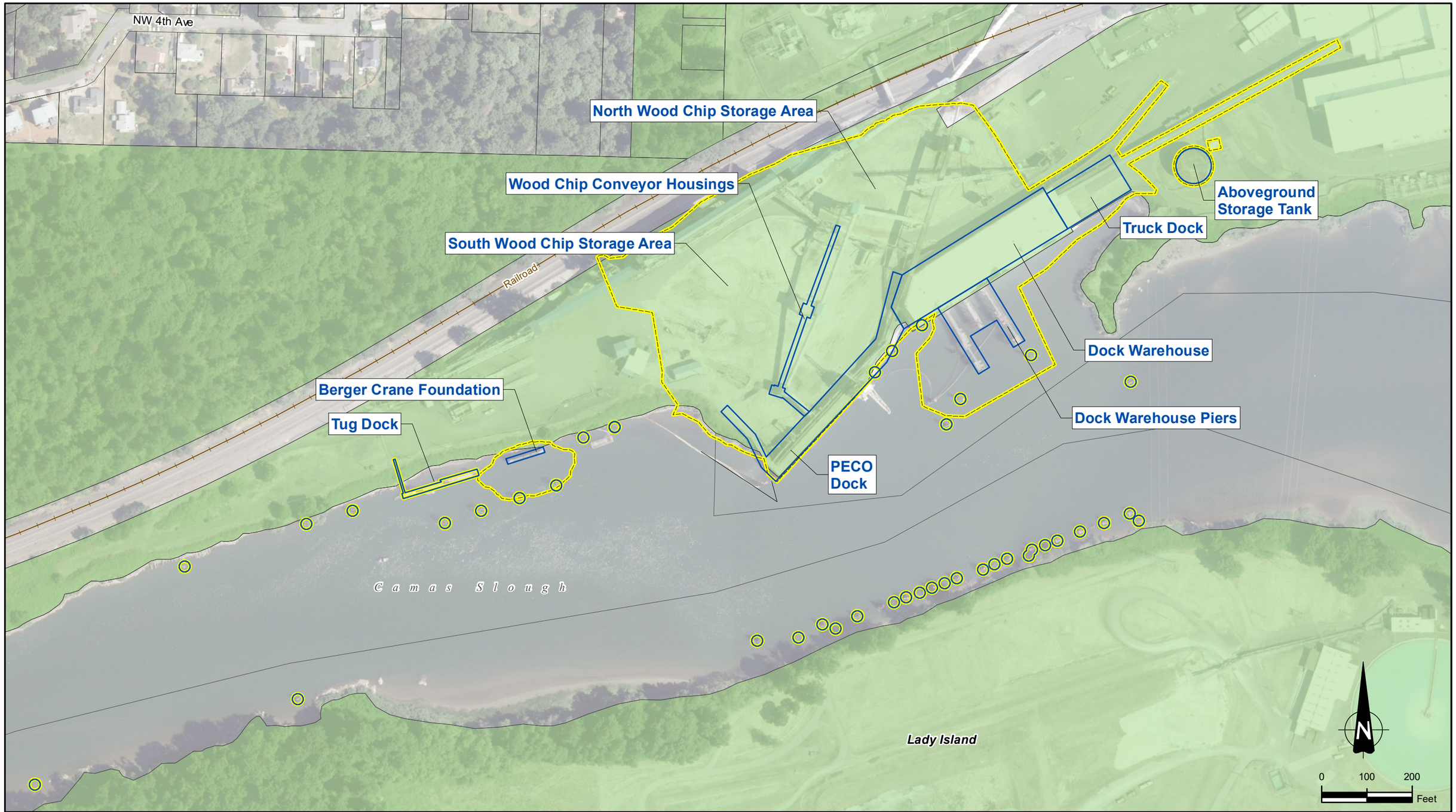

Project Limits
Structure To Be Removed
Dolphin To Be Removed
Tax Lot
Tax Lot Owned by Georgia-Pacific

GEORGIA-PACIFIC
CONSUMER OPERATIONS LLC

Tetra Tech

TETRA TECH

IN-WATER & OVERWATER
STRUCTURES REMOVAL PROJECT
CAMAS MILL, CAMAS, WASHINGTON

STRUCTURES TO BE REMOVED
AND STUDY AREA MAP

DATE
OCTOBER 2022

SCALE
1 " = 200 '

PROJECT NO.

FIGURE
2E

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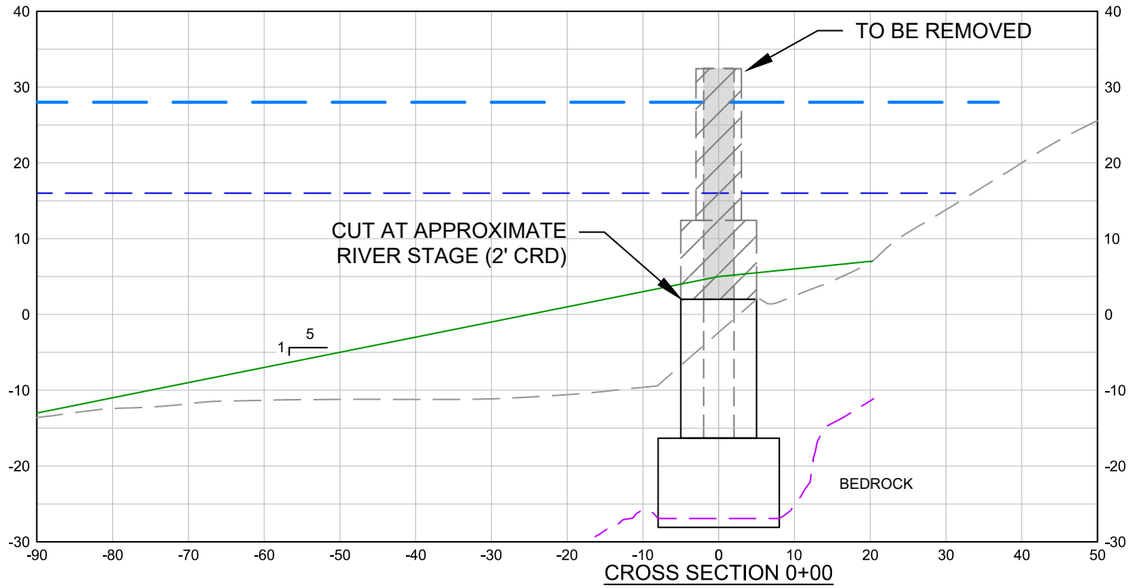
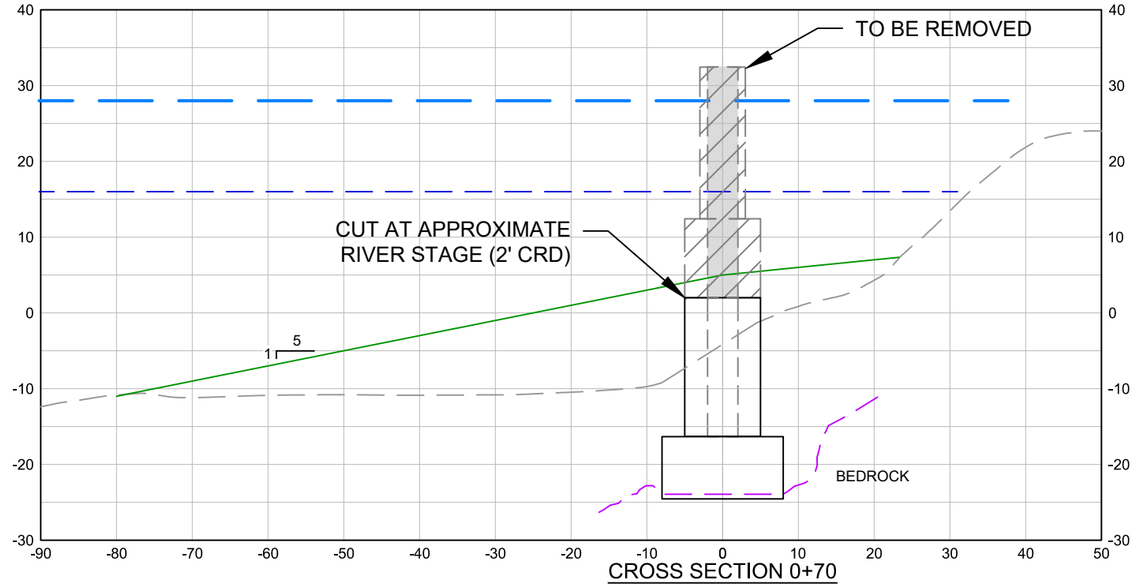


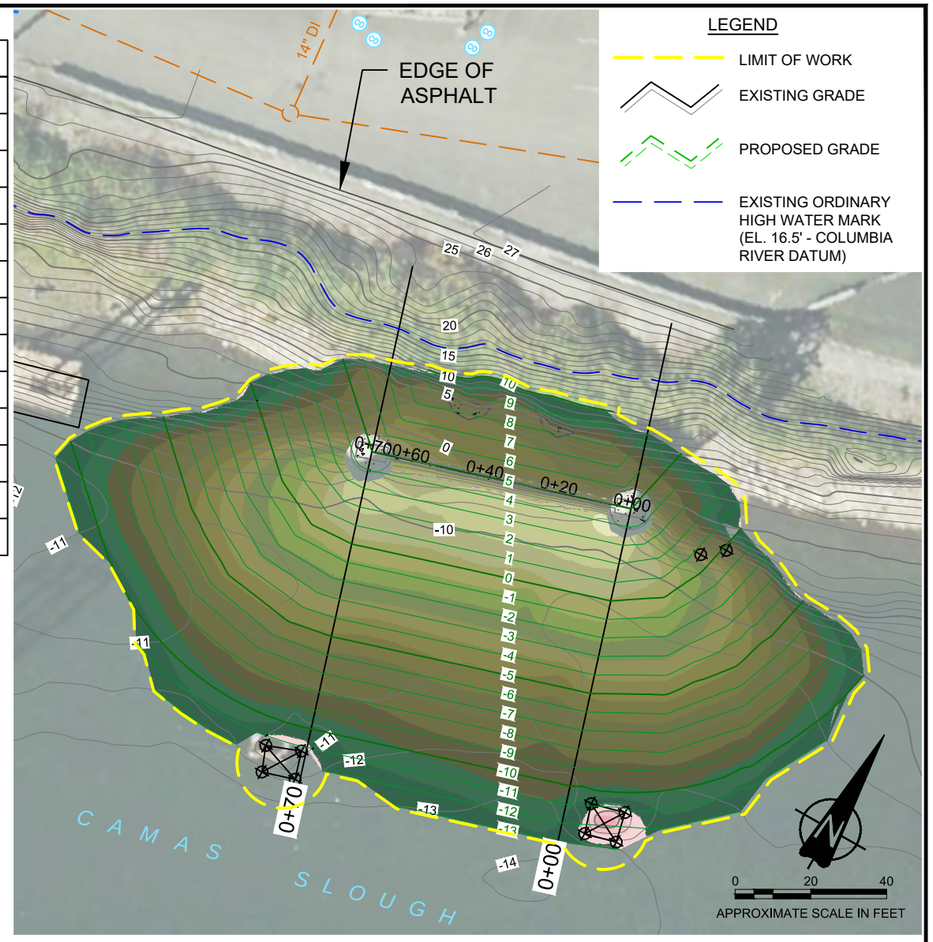
CROSS SECTION 0+00

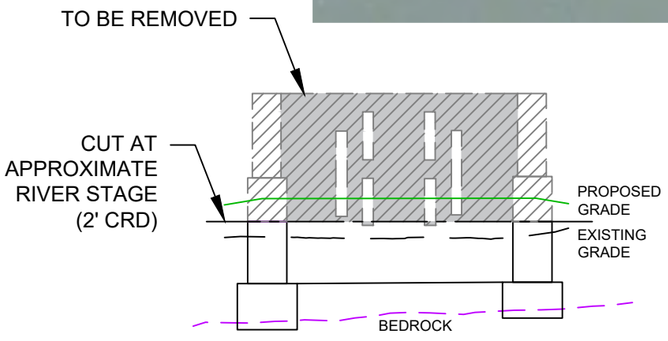


CROSS SECTION 0+70

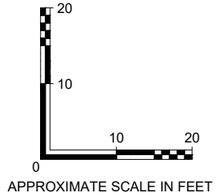
Depth Thickness Table in Ft		
MIN	MAX	Color
0	+1	
+1	+2	
+2	+3	
+3	+4	
+4	+5	
+5	+6	
+6	+7	
+7	+8	
+8	+9	
+9	+10	
+10	+11	
+11	+12	

3,500 c□ FILL





BERGER CRANE FOUNDATION PHOTO

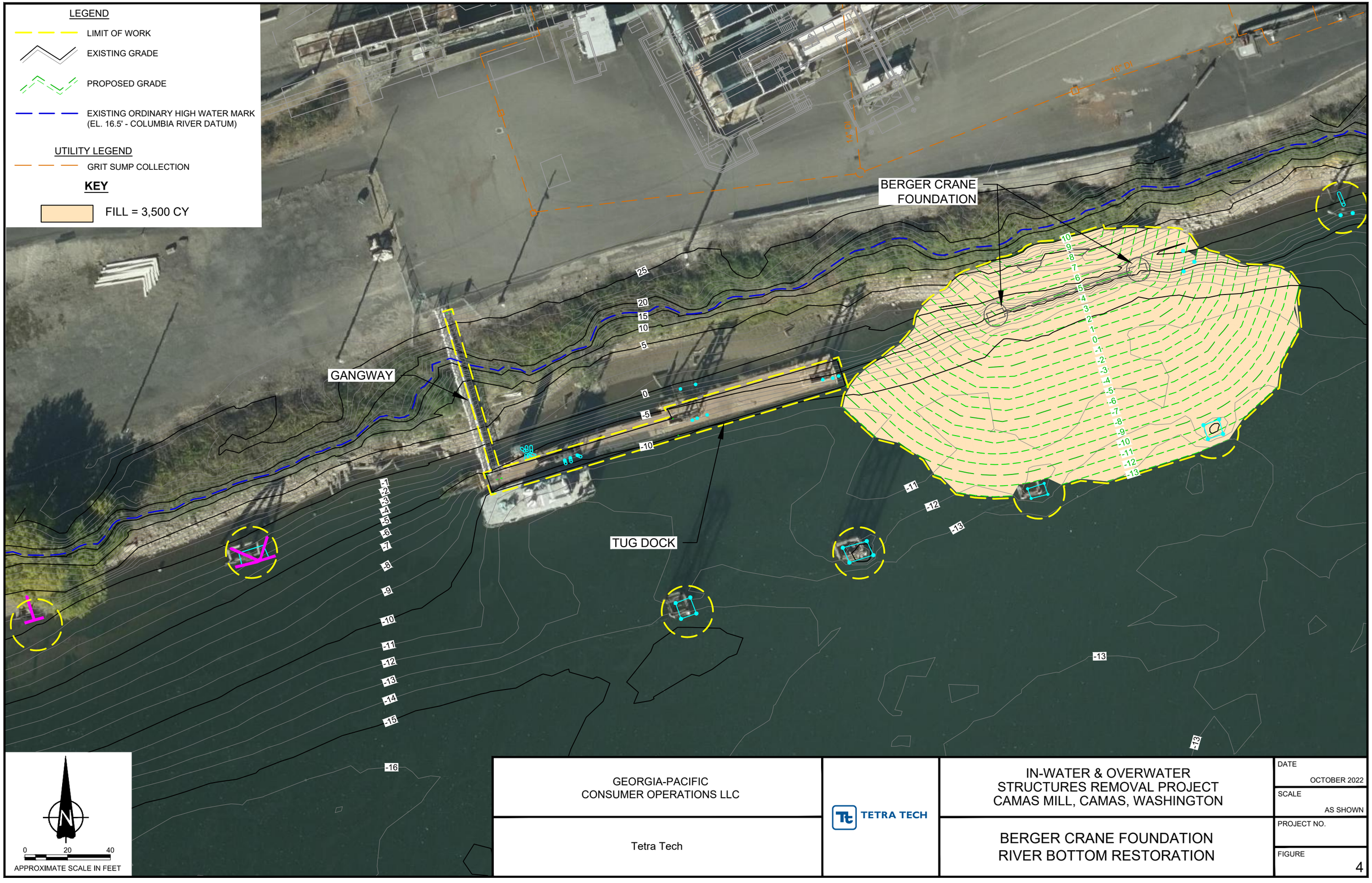


APPROXIMATE SCALE IN FEET

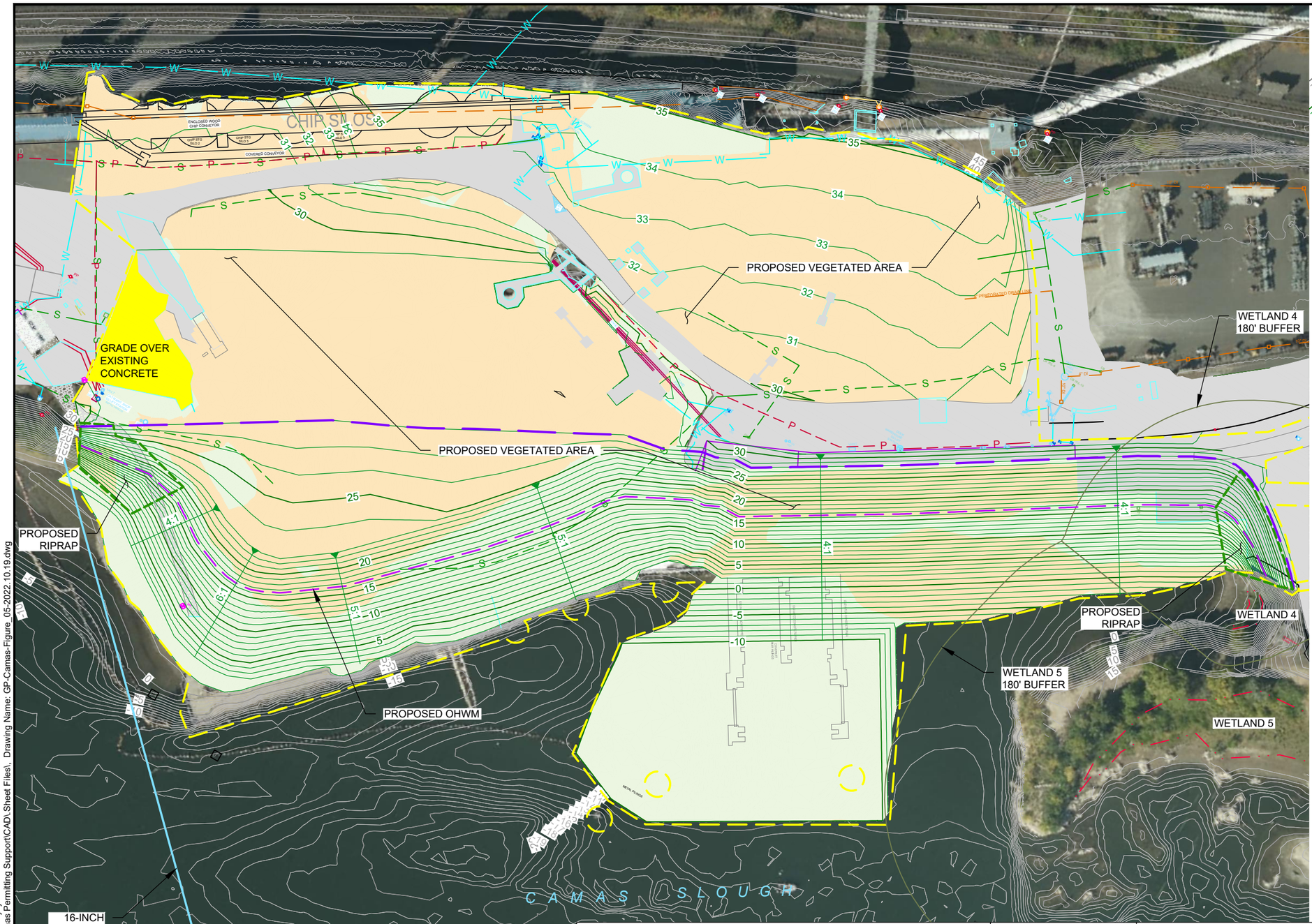
CROSS SECTION LEGEND

- ORDINARY HIGH WATER MARK (EL. 16.5' - COLUMBIA RIVER DATUM)
- 100-YEAR FLOOD PLAIN (EL. 28' - COLUMBIA RIVER DATUM)
- EXISTING GRADE
- PROPOSED FINAL GRADE

GEORGIA-PACIFIC CONSUMER OPERATIONS LLC	TETRA TECH	IN-WATER & OVERWATER STRUCTURES REMOVAL PROJECT CAMAS MILL, CAMAS, WASHINGTON	DATE: OCTOBER 2022
			SCALE: AS SHOWN
Tetra Tech		GRADING PLAN BERGER CRANE FOUNDATION	PROJECT NO.
			FIGURE: 3



GEORGIA-PACIFIC CONSUMER OPERATIONS LLC	TETRA TECH	IN-WATER & OVERWATER STRUCTURES REMOVAL PROJECT CAMAS MILL, CAMAS, WASHINGTON	DATE: OCTOBER 2022 SCALE: AS SHOWN PROJECT NO.:
Tetra Tech		BERGER CRANE FOUNDATION RIVER BOTTOM RESTORATION	FIGURE: 4



LEGEND

- LIMIT OF WORK
- EXISTING GRADE CONTOURS (SITEWIDE LAND SURVEYING 7/07/20)
- PROPOSED FINAL GRADE CONTOURS
- PROPOSED ORDINARY HIGH WATER MARK (OHWM) (EL. 16.5' - COLUMBIA RIVER DATUM)
- PROPOSED 100-YEAR FLOOD PLAIN (EL. 28' - COLUMBIA RIVER DATUM)
- EXISTING WETLAND

UTILITY LEGEND

- FIRE MAIN
- W — WATER
- S — PROCESS SEWER
- GRIT SUMP COLLECTION
- OL — OVERHEAD POWER LINE
- P — UNDERGROUND POWER LINE
- NATURAL GAS

EARTHWORK QUANTITIES

NORTH WOOD CHIP AREA:
130,730 SF (3.00 ACRE)
CUT = 5,678 CY
FILL = 32,943 CY

SOUTH WOOD CHIP AREA, PECO DOCK, WAREHOUSE, AND PIERS:
340,088 SF (7.81 ACRE)
CUT = 32,676 CY
FILL = 20,788 CY

DRAFT

0 50 100
APPROXIMATE SCALE IN FEET

CLIENT
Georgia-Pacific
CAMAS MILL
Camas, Washington 98607

TETRA TECH
www.tetratech.com
19803 North Creek Parkway
Bothell, Washington 98011
Phone: 425-482-7600 Fax: 425-482-7652

GEORGIA-PACIFIC CONSUMER OPERATIONS LLC
CAMAS MILL
CAMAS, WASHINGTON

GRADING PLAN - PECO DOCK, DOCK WAREHOUSE, AND DOCK WAREHOUSE PIERS

DATE 10/19/22
SCALE AS SHOWN
PROJECT No. 194-0117
FIGURE 5

Plot Date: 10/19/22 - 5:03pm, Plotted by: joel.cameron
Drawing Path: P:\194-0117-0064 Camas Permitting Support\CAD\ Sheet Files\, Drawing Name: GP-Camas-Figure_05-2022.10.19.dwg

PROPOSED TEMPORARY SILT FENCE (BMP C233)

PROPOSED VEGETATED AREA

GRADE OVER EXISTING CONCRETE

PROPOSED VEGETATED AREA

PROPOSED RIPRAP

PROPOSED TEMPORARY STRAW WADDLE (BMP C235)

WETLAND 4 180' BUFFER

WETLAND 4

PROPOSED RIPRAP

WETLAND 5 180' BUFFER

WETLAND 5

PROPOSED OHWM

PROPOSED TEMPORARY SILT CURTAIN

16-INCH WOODMLL PIPELINE

C A M A S S L O U G H

LEGEND

- LIMIT OF WORK
- EXISTING GRADE CONTOURS (SITEWIDE LAND SURVEYING 7/07/20)
- PROPOSED FINAL GRADE CONTOURS
- PROPOSED ORDINARY HIGH WATER MARK (OHWM) (EL. 16.5' - COLUMBIA RIVER DATUM)
- PROPOSED 100-YEAR FLOOD PLAIN (EL. 28' - COLUMBIA RIVER DATUM)
- EXISTING WETLAND
- SF — TEMPORARY SILT FENCE (BMP C233)
- TEMPORARY SILT CURTAINS
- TEMPORARY STRAW WADDLES (BMP C235)

UTILITY LEGEND

- FIRE MAIN
- W — WATER
- S — PROCESS SEWER
- GRIT SUMP COLLECTION
- OL — OVERHEAD POWER LINE
- P — UNDERGROUND POWER LINE
- NATURAL GAS

TESC NOTES:

1. INSTALL ALL TEMPORARY BMPS SHOWN PRIOR TO GROUND DISTURBANCE. SEE THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) NARRATIVE IN THE STORMWATER MANAGEMENT PLAN (SMP) FOR ADDITIONAL BMPS NOT SHOWN ON PLAN.
2. ESTABLISH A TEMPORARY CONSTRUCTION ENTRANCE PER ECOLOGY DETAIL BMP C105 WITH LOCATION BASED ON PROPOSED CONSTRUCTION METHODS.
3. INSTALL TEMPORARY SILT CURTAINS AROUND ALL IN-WATER WORK BELOW THE OHWM. IN-WATER WORK AREAS TO INSTALL TEMPORARY SILT CURTAIN INCLUDE THE TUG DOCK, BERGER CRANE FOUNDATION, PECO DOCK, DOCK WAREHOUSE PIERS AND ALL PIERS TO BE REMOVED.
4. THE SWPPP NARRATIVE IN THE SMP SHALL BE FOLLOWED AS PART OF THE TESC PLAN, AND COPIES OF BOTH THE TESC PLAN AND SMP SHALL BE KEPT ONSITE THROUGHOUT THE DURATION OF CONSTRUCTION.
5. ALL STORM DRAIN CATCH BASIN INLETS ADJACENT TO THE WORK AREAS SHALL HAVE INLET PROTECTION FILTERS INSTALLED PER ECOLOGY DETAIL BMP C220.
6. ALL UPLAND DISTURBED AREAS SHALL BE RESTORED PER ECOLOGY DETAIL BMP T5.13 (MIN 8 INCHES TOPSOIL, ETC), AND SHALL BE SEEDED WITH AN APPROVED SEED MIX.
7. EXISTING ACCESS ROADS SHALL NOT BE DISTURBED AS PART OF THIS PROJECT.
8. REMOVE ALL TEMPORARY BMPS UPON COMPLETION OF CONSTRUCTION AND STABILIZATION OF DISTURBED AREAS.

DRAFT

0 50 100
APPROXIMATE SCALE IN FEET

Plot Date: 03/07/23 - 5:10pm, Plotted by: joel.cameron
Drawing Path: P:\194-0117-0064 Camas Permitting Support\CAD\Sheet Files\, Drawing Name: GP-Camas-Figure_06-2023.03.07.dwg

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CAMAS MILL
CAMAS, WASHINGTON

TEMPORARY EROSION & SEDIMENT CONTROL PLAN (TESC)

DATE 03/07/23
SCALE AS SHOWN
PROJECT No. 194-0117
FIGURE 6

Appendix B: BMP Details

BMP C102: Buffer Zones

Purpose

Creation of an undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and stormwater runoff velocities.

Conditions of Use

Buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Contractors can use vegetative buffer zone BMPs 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 local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

The types of buffer zones can change the level of protection required as shown below:

Designated Critical Area Buffers - buffers that protect Critical Areas, as defined by the Washington State Growth Management Act, and are established and managed by the local permitting authority. These should not be disturbed and must protected with sediment control BMPs to prevent impacts. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Vegetative Buffer Zones - areas that may be identified in undisturbed vegetation areas or managed vegetation areas that are outside any Designated Critical Area Buffer. They may be utilized to provide an additional sediment control area and/or reduce runoff velocities. If being used for preservation of natural vegetation, they should be arranged in clumps or strips. They can be used to protect natural swales and incorporated into the natural landscaping area.

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 waterways shall be established by the local permitting authority 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. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: 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.
- 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:

- 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 material and shall be at least four 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 six 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 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with BMP C233: Silt Fence to act as high-visibility fence. Silt fence shall be at least 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 at least 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 C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses 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 a stabilized construction access 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 accesses not shown in the initial Construction 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 Specifications

See Figure II-3.1: Stabilized Construction Access for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch 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 access stabilization because these products raise pH levels in stormwater and concrete discharge to 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 standards listed in Table II-3.2: Stabilized Construction Access Geotextile Standards.

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
Grab Tensile Strength (ASTM D4751)	200 psi min.

Table II-3.2: Stabilized Construction Access Geotextile Standards (continued)

Geotextile Property	Required Value
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (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 access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High-Visibility Fence) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access 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

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access 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. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) (WSDOT, 2016) for ballast except for the following special requirements.

The grading and quality requirements are listed in Table II-3.3: Stabilized Construction Access Alternative Material Requirements.

Table II-3.3: Stabilized Construction Access Alternative Material Requirements

Sieve Size	Percent Passing
2½"	99-100

Table II-3.3: Stabilized Construction Access Alternative Material Requirements (continued)

Sieve Size	Percent Passing
2″	65-100
¾″	40-80
No. 4	5 max.
No. 100	0-2
% Fracture	75 min.

- 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.

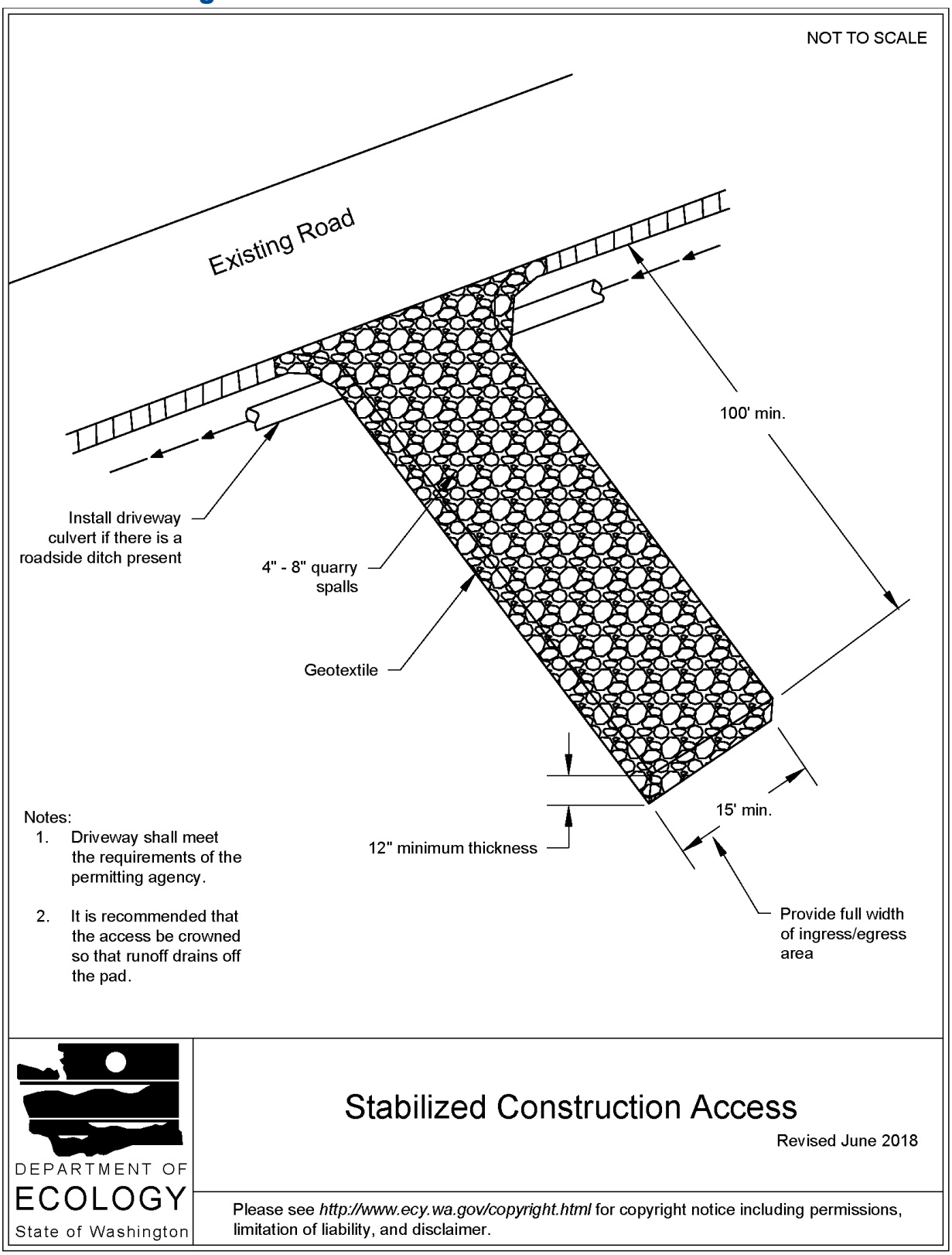
Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access 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 access, or the installation of BMP C106: 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 high efficiency 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 wash water 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 access(es), BMP C103: 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.

Figure II-3.1: Stabilized Construction Access



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 website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C106: Wheel Wash

Purpose

Wheel washes reduce the amount of sediment transported onto paved roads by washing dirt from the wheels of motor vehicles prior to the motor vehicles leaving the construction site.

Conditions of Use

- Use a wheel wash when BMP C105: Stabilized Construction Access is not preventing sediment from being tracked off site.
- Wheel washing is generally an effective BMP when installed with careful attention to topography. For example, a wheel wash can be detrimental if installed at the top of a slope abutting a right-of-way where the water from the dripping truck can run unimpeded into the street.
- Pressure washing combined with an adequately sized and surfaced pad with direct drainage to a large 10-foot x 10-foot sump can be very effective.
- Wheel wash wastewater is not stormwater. It is commonly called process water, and must be discharged to a separate on-site treatment system that prevents discharge to waters of the State, or to the sanitary sewer with local sewer district approval.
- Wheel washes may use closed-loop recirculation systems to conserve water use.
- Wheel wash wastewater shall not include wastewater from concrete washout areas.
- When practical, the wheel wash should be placed in sequence with BMP C105: Stabilized Construction Access. Locate the wheel wash such that vehicles exiting the wheel wash will enter directly onto BMP C105: Stabilized Construction Access. In order to achieve this, BMP C105: Stabilized Construction Access may need to be extended beyond the standard installation to meet the exit of the wheel wash.

Design and Installation Specifications

Suggested details are shown in Figure II-3.2: Wheel Wash. The Local Permitting Authority may allow other designs. A minimum of 6 inches of asphalt treated base (ATB) over crushed base material or 8 inches over a good subgrade is recommended to pave the wheel wash.

Use a low clearance truck to test the wheel wash before paving. Either a belly dump or lowboy will work well to test clearance.

Keep the water level from 12 to 14 inches deep to avoid damage to truck hubs and filling the truck tongues with water.

Midpoint spray nozzles are only needed in extremely muddy conditions.

Wheel wash systems should be designed with a small grade change, 6- to 12-inches for a 10-foot-wide pond, to allow sediment to flow to the low side of pond to help prevent re-suspension of sediment. A drainpipe with a 2- to 3-foot riser should be installed on the low side of the pond to allow for easy cleaning and refilling. Polymers may be used to promote coagulation and flocculation in a closed-loop system. Polyacrylamide (PAM) added to the wheel wash water at a rate of 0.25 - 0.5 pounds per 1,000 gallons of water increases effectiveness and reduces cleanup time. If PAM is already being used for dust or erosion control and is being applied by a water truck, the same truck can be used to change the wash water.

Maintenance Standards

The wheel wash should start out each day with fresh water.

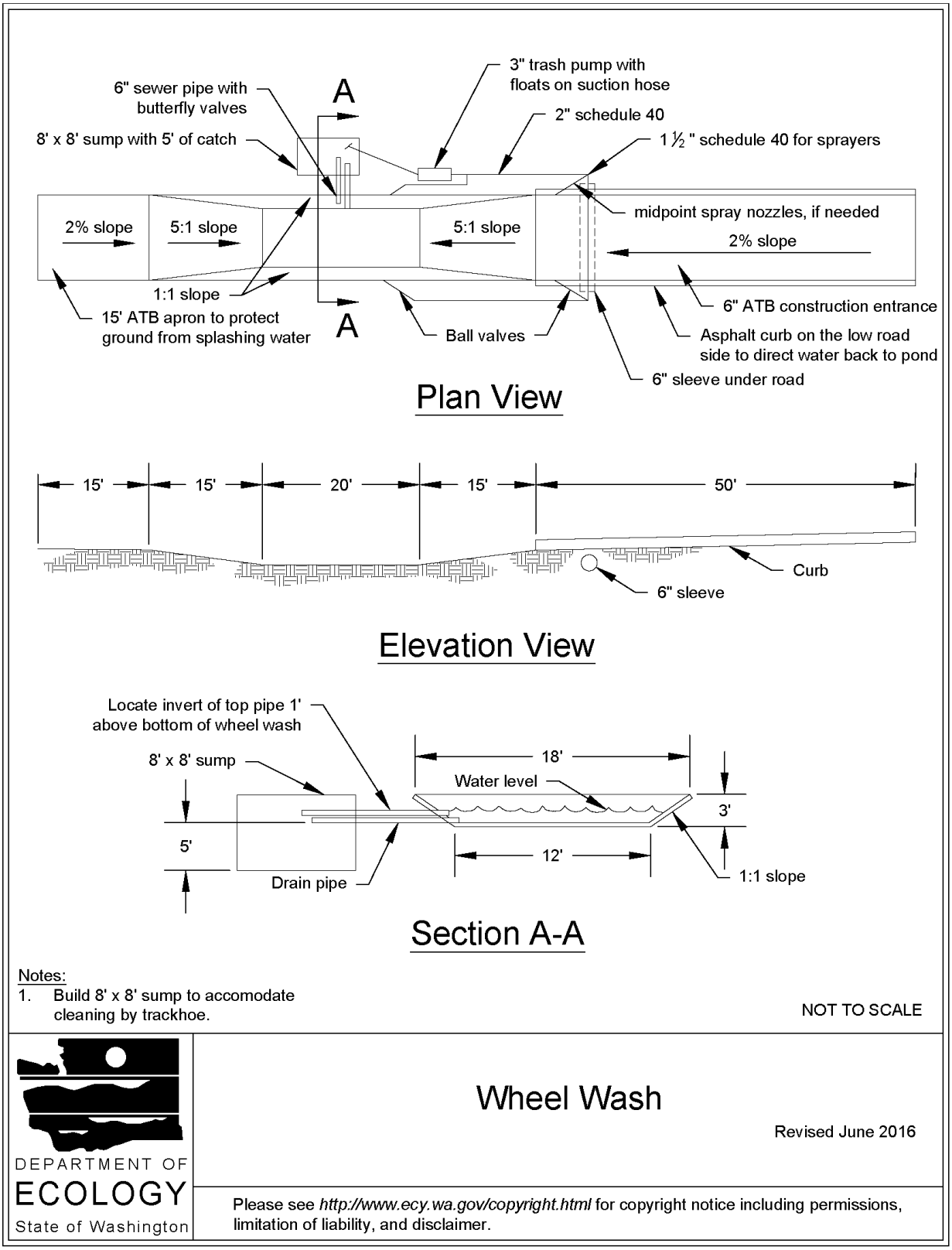
The wheel wash water should be changed a minimum of once per day. On large earthwork jobs where more than 10-20 trucks per hour are expected, the wheel wash water will need to be changed more often.

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 website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

Figure II-3.2: Wheel Wash



Notes:

1. Build 8' x 8' sump to accomodate cleaning by trackhoe.

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Wheel Wash

Revised June 2016

BMP C107: Construction Road / Parking Area Stabilization

Purpose

Stabilizing roads, parking areas, and other on-site vehicle transportation routes immediately after grading reduces erosion caused by construction traffic or stormwater runoff.

Conditions of Use

Roads and parking areas shall be stabilized wherever they are constructed, whether permanent or temporary, for use by construction traffic.

BMP C103: High-Visibility Fence shall be installed, if necessary, to limit the access of vehicles to only those roads and parking areas that are stabilized.

Design and Installation Specifications

- On areas that will receive asphalt as part of the project, install the first lift as soon as possible.
- A 6-inch depth of 2- to 4-inch crushed rock, gravel base, or crushed surfacing base course shall be applied immediately after grading or utility installation. A 4-inch course of asphalt treated base (ATB) may also be used, or the road/parking area may be paved. It may also be possible to use cement or calcium chloride for soil stabilization. If cement or cement kiln dust is used for roadbase stabilization, pH monitoring and BMP C252: Treating and Disposing of High pH Water is necessary to evaluate and minimize the effects on stormwater. If the area will not be used for permanent roads, parking areas, or structures, a 6-inch depth of hog fuel may also be used, but this is likely to require more maintenance. Whenever possible, construction roads and parking areas shall be placed on a firm, compacted subgrade.
- Temporary road gradients shall not exceed 15 percent. Roadways shall be carefully graded to drain. Drainage ditches shall be provided on each side of the roadway in the case of a crowned section, or on one side in the case of a super-elevated section. Drainage ditches shall be directed to a sediment control BMP.
- Rather than relying on ditches, it may also be possible to grade the road so that runoff sheetflows into a heavily vegetated area with a well-developed topsoil. Landscaped areas are not adequate. If this area has at least 50 feet of vegetation that water can flow through, then it is generally preferable to use the vegetation to treat runoff, rather than a sediment pond or trap. The 50 feet shall not include wetlands or their buffers. If runoff is allowed to sheetflow through adjacent vegetated areas, it is vital to design the roadways and parking areas so that no concentrated runoff is created.
- Storm drain inlets shall be protected to prevent sediment-laden water entering the drainage system (see BMP C220: Inlet Protection).

Maintenance Standards

Inspect stabilized areas regularly, especially after large storm events.

Crushed rock, gravel base, etc., shall be added as required to maintain a stable driving surface and to stabilize any areas that have eroded.

Following construction, these areas shall be restored to pre-construction condition or better to prevent future erosion.

Perform street cleaning at the end of each day or more often if necessary.

BMP C120: 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 more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself 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 C121: 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 T5.13: Post-Construction Soil Quality and Depth.

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed

before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.

- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 percent tackifier. See BMP C121: 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. Re-install native topsoil on the disturbed soil surface before application. See BMP T5.13: Post-Construction Soil Quality and Depth.
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
    - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
    - Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:
    - Installing the mulch, seed, fertilizer, and tackifier in one lift.
    - Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
    - Hold straw in place with a standard tackifier.

  Both of these approaches 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.
    - Repair of failed slope surfaces.

  This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).
- Seed may be installed by hand if:
    - Temporary and covered by straw, mulch, or topsoil.
    - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in Table II-3.4: Temporary and Permanent Seed Mixes include

recommended mixes for both temporary and permanent seeding.

- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	*Festuca rubra var. commutata* or *Poa anna*	40	98	90
Perennial rye	*Lolium perenne*	50	98	90
Redtop or colonial bentgrass	*Agrostis alba* or *Agrostis tenuis*	5	92	85
White dutch clover	*Trifolium repens*	5	98	90
Landscaping Seed Mix A recommended mix for landscaping seed.				
Perennial rye blend	*Lolium perenne*	70	98	90
Chewings and red fescue blend	*Festuca rubra var. commutata* or *Festuca rubra*	30	98	90
Low-Growing Turf Seed Mix A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	*Festuca arundinacea var.*	45	98	90
Dwarf perennial rye (Barclay)	*Lolium perenne var. barclay*	30	98	90
Red fescue	*Festuca rubra*	20	98	90
Colonial bentgrass	*Agrostis tenuis*	5	98	90
Bioswale Seed Mix A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fes-	*Festuca arundin-*	75-80	98	90

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
cue	*acea* or *Festuca elatior*			
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	92	85
Redtop bentgrass	*Agrostis alba* or *Agrostis gigantea*	5-10	90	80
Wet Area Seed Mix A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				
Tall or meadow fescue	*Festuca arundinacea* or *Festuca elatior*	60-70	98	90
Seaside/Creeping bentgrass	*Agrostis palustris*	10-15	98	85
Meadow foxtail	*Alepocurus pratensis*	10-15	90	80
Alsike clover	*Trifolium hybridum*	1-6	98	90
Redtop bentgrass	*Agrostis alba*	1-6	92	85
Meadow Seed Mix A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	*Agrostis alba* or *Agrostis oregonensis*	20	92	85
Red fescue	*Festuca rubra*	70	98	90
White dutch clover	*Trifolium repens*	10	98	90

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. Backblading or smoothing of slopes greater than 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 use soil amendments to achieve organic matter and permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application 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.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. 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 that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent 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 Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
    - 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.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes run-off.

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 website at:

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BMP C121: Mulching

Purpose

Mulching soils provides 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 that can be used. This section discusses only the most common types of mulch.

Conditions of Use

As a temporary cover measure, mulch should be used:

- For less than 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.
- 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 be made up of 100 percent:

- cottonseed meal;
- fibers made of wood, recycled cellulose, hemp, or kenaf;

- compost;
- or blends of these.

Tackifier shall be plant-based, such as guar or alpha plantago, or chemical-based such as polyacrylamide or polymers.

Generally, mulches come in 40-50 pound bags. Seed and fertilizer are added at time of application.

Recycled cellulose may contain polychlorinated biphenyl (PCBs). Ecology recommends that products should be evaluated for PCBs prior to use.

Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

Any mulch or tackifier product used shall be installed per the manufacturer's instructions.

Design and Installation Specifications

For mulch materials, application rates, and specifications, see Table II-3.6: Mulch Standards and Guidelines. Consult with the local supplier or the local conservation district for their recommendations. Increase the application rate until the ground is 95% covered (i.e. not visible under the mulch layer). Note: Thickness may be increased for disturbed areas in or near sensitive areas or other areas highly susceptible to erosion.

Where the option of "Compost" is selected, it should be a coarse compost that meets the size gradations listed in Table II-3.5: Size Gradations of Compost as Mulch Material when tested in accordance with Test Method 02.02-B found in *Test Methods for the Examination of Composting and Compost* (Thompson, 2001).

Table II-3.5: Size Gradations of Compost as Mulch Material

Sieve Size	Percent Passing
3"	100%
1"	90% - 100%
3/4"	70% - 100%
1/4"	40% - 100%

Mulch used within the ordinary high-water mark of surface 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 Permit Authority (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.

Table II-3.6: Mulch Standards and Guidelines

Mulch Material	Guideline	Description
Straw	**Quality Standards**	Air-dried; free from undesirable seed and coarse material.
	Application Rates	2"-3" thick; 5 bales per 1,000 sf or 2-3 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 as 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 It should also not be used within the ordinary high-water elevation of surface waters (due to flotation).
Hydromulch	**Quality Standards**	No growth inhibiting factors.
	Application Rates	Approx. 35-45 lbs per 1,000 sf or 1,500 - 2,000 lbs 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 longer than about 3/4 - 1 inch clog hydromulch equipment. Fibers should be kept to less than 3/4 inch.
Compost	**Quality Standards**	No visible water or dust during handling. Must be produced per WAC 173-350, Solid Waste Handling Standards, but may have up to 35% biosolids.
	Application Rates	2" thick min.; approx. 100 tons per acre (approx. 750 lbs per cubic yard)
	Remarks	More effective control can be obtained by increasing thickness to 3". 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 C125: Topsoiling / Composting or BMP T5.13: Post-Construction Soil Quality and Depth. It is more stable and practical to use in wet areas and during rainy weather conditions. Do not use near wetlands or near phosphorous impaired water bodies.
Chipped Site Vegetation	**Quality Standards**	Gradations from fines to 6 inches in length for texture, variation, and interlocking properties. Include a mix of various sizes so that the average size is between 2- and 4- inches.
	Application Rates	2" thick min.;

Table II-3.6: Mulch Standards and Guidelines (continued)

Mulch Material	Guideline	Description
	Remarks	This is a cost-effective way to dispose of debris from clearing and grubbing, and it eliminates the problems associated with burning. Generally, it should not be used on slopes above approx. 10% because of its tendency to be transported by runoff. It is not recommended within 200 feet of surface waters. If permanent seeding or planting is expected shortly after mulch, the decomposition of the chipped vegetation may tie up nutrients important to grass establishment. Note: thick application of this material over existing grass, herbaceous species, and some groundcovers could smother and kill vegetation.
Wood-Based Mulch	**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" thick min.; approx. 100 tons per acre (approx. 750 lbs. per cubic yard)
	Remarks	This material is often called "wood straw" or "hog fuel". The use of mulch ultimately improves the organic matter in the soil. Special caution is advised regarding the source and composition of wood-based mulches. 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).
Wood Strand Mulch	**Quality Standards**	A blend of loose, long, thin wood pieces derived from native conifer or deciduous trees with high length-to-width ratio.
	Application Rates	2" thick min.
	Remarks	Cost-effective protection when applied with adequate thickness. A minimum of 95-percent of the wood strand shall have lengths between 2 and 10-inches, with a width and thickness between 1/16 and 1/2-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. [Specification 9-14.4(4) from the *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT, 2016)

BMP C122: 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 ways 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). 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 netting and blankets shall be made of natural plant fibers unaltered by synthetic materials.

Erosion control nets and blankets should be used:

- 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. Nets and blankets can be used to permanently stabilize channels and may provide a cost-effective, environmentally preferable alternative to riprap.

Disadvantages of nets and blankets include:

- 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 $4,000-6,000 per acre installed.

Advantages of nets and blankets include:

- Installation without mobilizing special equipment.
- Installation by anyone with minimal training
- Installation in stages or phases as the project progresses.
- Installers can hand place seed and fertilizer as they progress down the slope.
- Installation in any weather.
- There are numerous types of nets and blankets that can be designed with various parameters in mind. Those parameters include: fiber blend, mesh strength, longevity, biodegradability, cost, and availability.

An alternative to nets and blankets in some limited conditions is BMP C202: Riprap Channel Lining. Ensure that BMP C202: Riprap Channel Lining is appropriate before using it as a substitute for nets and blankets.

Design and Installation Specifications

- See Figure II-3.3: Channel Installation (Clackamas County et al., 2008) and Figure II-3.4: 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.
- Installation of nets and blankets on slopes:
    1. Complete final grade and track walk up and down the slope.
    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 the installer walks 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, the trailing edge of the upper net/blanket should overlap the leading edge of the lower net/blanket and be stapled. 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 consult the manufacturer's information and that a site visit takes place in order to ensure that the product specified is appropriate. Information is also available in WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Division 8-01 and Division 9-14 (WSDOT, 2016).
- Use jute matting in conjunction with mulch (BMP C121: 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.

- 100-percent biodegradable blankets are available for use in sensitive areas. 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 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 non-degraded 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 II-3.3: Channel Installation

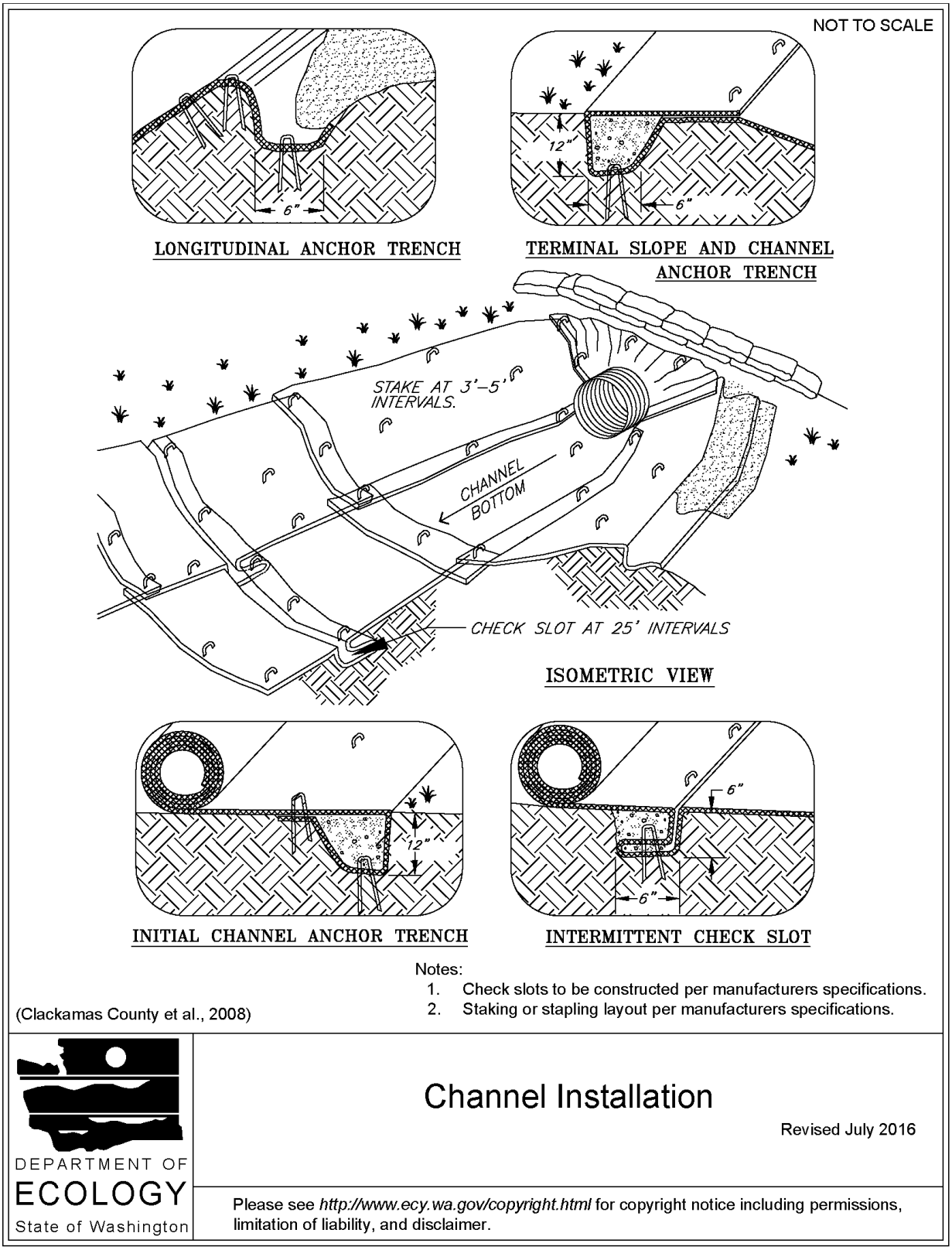
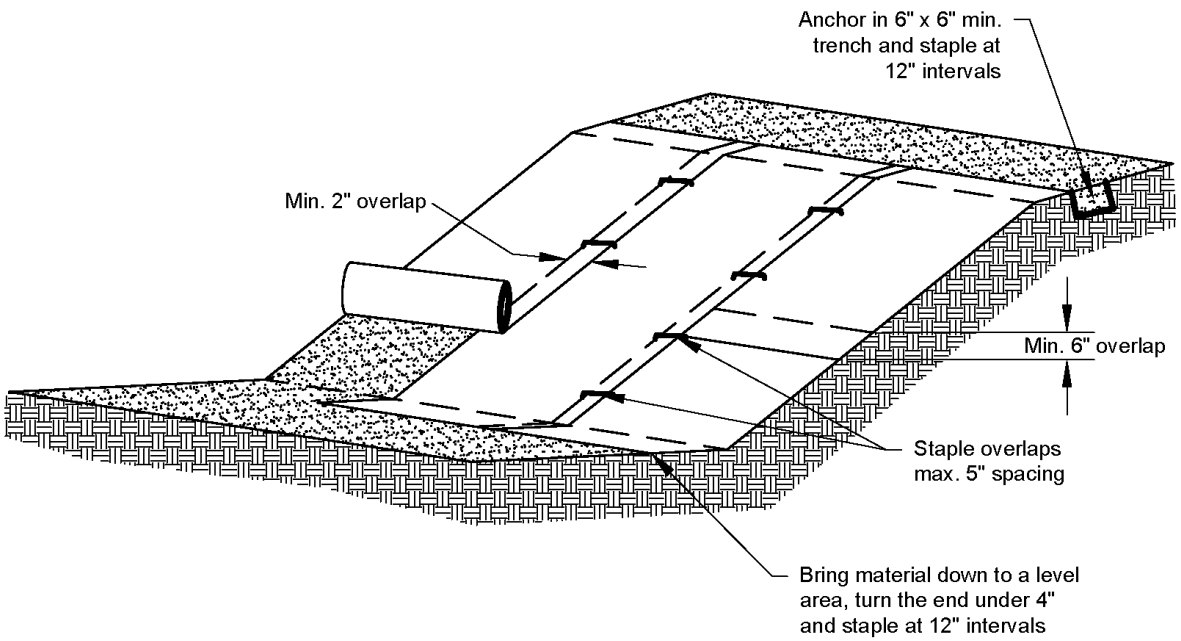


Figure II-3.4: Slope Installation



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 C123: 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 less than 30 days, except as stated below.

- 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 greater than six 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 rolled plastic covering products.
- 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:
    - 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 as follows:
    1. Run plastic up and down the slope, not across the slope.
    2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.

3. Provide a minimum of 8-inch overlap 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

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 website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C124: Sodding

Purpose

The purpose of sodding is to establish 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, of uniform thickness (approximately 1-inch thick), and shall 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 ten percent or the permeability is less than 0.6 inches per hour. See https://ecology.wa.gov/Waste-Toxics/Reducing-recycling-waste/Organic-materials/Managing-organics-compost for further information.
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 at least 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 groundcover. If it is impossible to establish a healthy groundcover due to frequent saturation, instability, or some other cause, the sod shall be removed, the area seeded with an appropriate mix, and protected with a net or blanket.

BMP C125: 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 and composting are an integral component of providing permanent cover in those areas where there is an unsuitable soil surface for plant growth. Use this BMP in conjunction with other BMPs such as BMP C120: Temporary and Permanent Seeding, BMP C121: Mulching, or BMP C124: Sodding. Implementation of this BMP may meet the post-construction requirements of BMP T5.13: Post-Construction Soil Quality and Depth.

Native soils and disturbed soils that have been organically amended not only retain much more stormwater, but also serve as effective biofilters for urban pollutants and, by supporting more vigorous plant growth, reduce the water, fertilizer and pesticides needed to support installed landscapes. Topsoil does not include any subsoils but only the 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 mycorrhiza are acclimated to the site and will provide optimum conditions for establishing grasses. Use commercially available mycorrhiza products when using off-site topsoil.

Design and Installation Specifications

Meet the following requirements for disturbed areas that will be developed as lawn or landscaped areas at the completed project site:

- Maximize the depth of the topsoil wherever possible to provide the maximum possible infiltration capacity and beneficial growth medium. Topsoil shall have:
    - A minimum depth of 8-inches. Scarify subsoils below the topsoil layer at least 4-inches with some incorporation of the upper material to avoid stratified layers, where feasible. Ripping or re-structuring the subgrade may also provide additional benefits regarding the overall infiltration and interflow dynamics of the soil system.
    - A minimum organic content of 10% dry weight in planting beds, and 5% organic matter content in turf areas. Incorporate organic amendments to a minimum 8-inch depth except where tree roots or other natural features limit the depth of incorporation.
    - A pH between 6.0 and 8.0 or matching the pH of the undisturbed soil.
    - If blended topsoil is imported, then fines should be limited to 25 percent passing through a 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 using the option of incorporating amendments to meet the organic content requirement, use compost that meets the compost specification for Bioretention (See BMP T7.30: Bioretention), with the exception that the compost may have up to 35% biosolids or manure.
- Sections 3 through 7 of *Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington* (Stenn et al., 2016), provides useful guidance for implementing whichever option is chosen. It includes guidance for pre-approved default strategies and guidance for custom strategies. Check with your local jurisdiction concerning its acceptance of this guidance.
- 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 top soil 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 promote bonding is to actually work the topsoil into the layer below for a depth of at least 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, and clay loam). Avoid areas of natural ground water recharge.

- Stripping shall be confined to the immediate construction area. A 4-inch 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.
- 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 exceed 2H:1V.
    - Between October 1 and April 30:
        - An interceptor dike with gravel outlet and silt fence shall surround all topsoil.
        - Within 2 days complete erosion control seeding, or covering stockpiles with clear plastic, or other mulching materials.
    - Between May 1 and September 30:
        - An interceptor dike with gravel outlet and silt fence shall surround all topsoil if the stockpile will remain in place for a longer period of time than active construction grading.
        - Within 7 days complete erosion control seeding, or covering stockpiles with clear plastic, or other mulching materials.
- When native topsoil is to be stockpiled and reused the following should apply to ensure that the mycorrhizal bacterial, earthworms, and other beneficial organisms will not be destroyed:
    - Re-install topsoil within 4 to 6 weeks.
    - Do not allow the saturation of topsoil with water.
    - 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.

BMP C130: 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.

Use this BMP in conjunction with other BMPs such as BMP C120: Temporary and Permanent Seeding, BMP C121: Mulching, or BMP C124: Sodding.

Conditions for Use

- All slopes steeper than 3H:1V and greater than 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

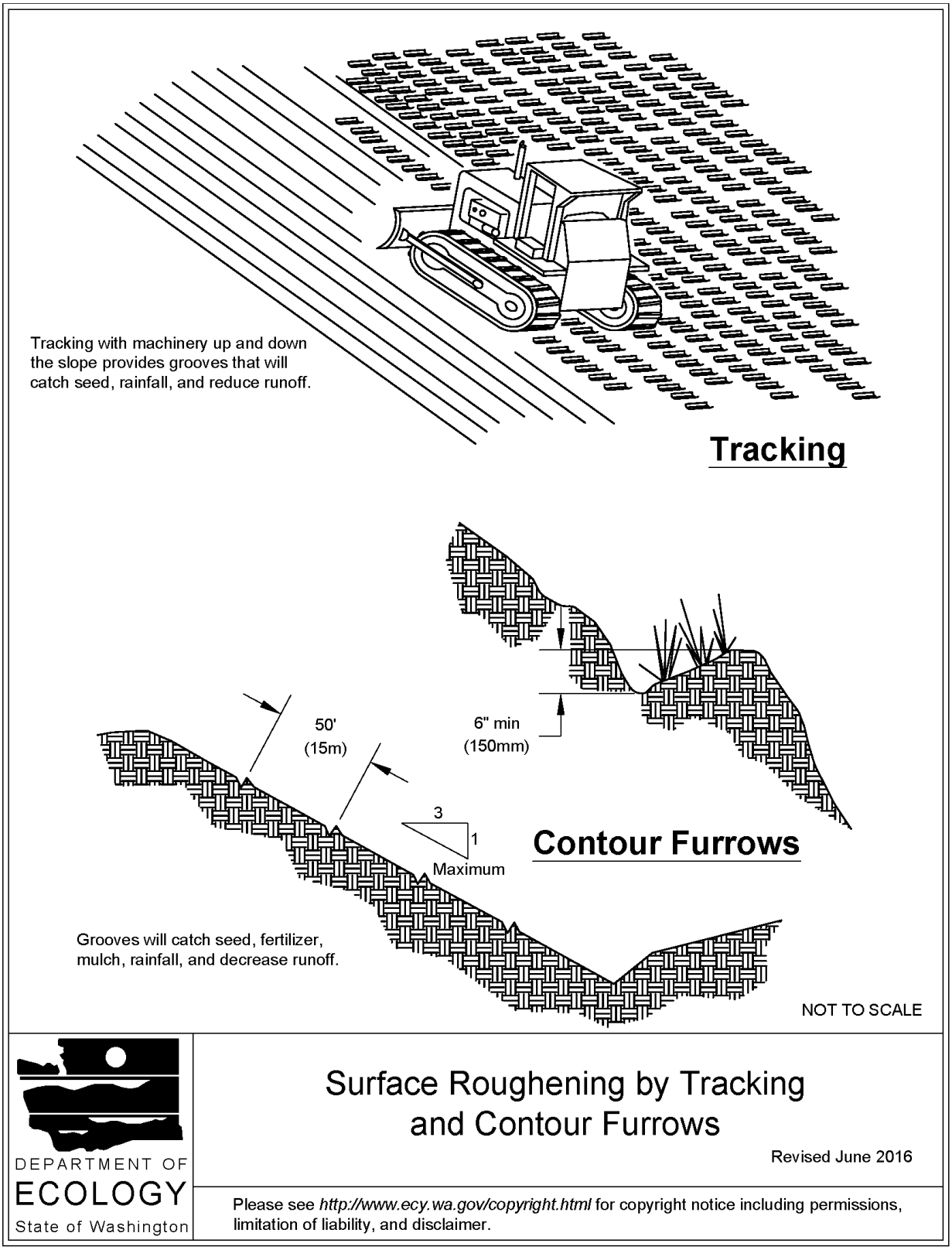
There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, contour furrows, and tracking. See Figure II-3.5: Surface Roughening by Tracking and Contour 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 3H:1V) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes steeper than 3H:1V but less than 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 re-seeded immediately.

Figure II-3.5: Surface Roughening by Tracking and Contour Furrows



BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface 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. 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, refer to BMP C105: Stabilized Construction Access and BMP C106: 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 governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM (BMP C126: Polyacrylamide (PAM) 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 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. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection, but the downstream protections still apply.

  Refer to BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection for conditions of use. PAM shall 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.

- 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:
    - Lower 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 (those smaller than .075 mm) to 10 to 20 percent.
    - 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-causing 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 C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and 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 SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of 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 project proponent could keep a stockpile of materials that are available for use 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 project type, size, complexity, and length, materials and quantities will vary. A good minimum list of items that will cover numerous situations includes:

- 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.
- Re-stock materials as needed.

BMP C151: 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 C154: 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 C154: 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 C154: 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 C252: 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 C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the 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 process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. 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 hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. 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 pick-up 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 C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses 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

Use at 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 temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all 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 (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children's wading pool for non-reactive 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, when possible, 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.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 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.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:

- 1-Water Resistant Nylon Bag
- 3-Oil Absorbent Socks 3”x 4’
- 2-Oil Absorbent Socks 3”x 10’
- 12-Oil Absorbent Pads 17”x19”
- 1-Pair Splash Resistant Goggles
- 3-Pair Nitrile Gloves
- 10-Disposable Bags with Ties
- Instructions

Maintenance Standards

- 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 non-hazardous.
- Re-stock spill kit materials as needed.

II-3.3 Construction Runoff BMPs

BMP C200: 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 of Use

Use an interceptor dike or swale where runoff from an exposed site or disturbed slope must be conveyed to an erosion control BMP which 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 BMP (e.g. BMP C240: Sediment Trap or BMP C241: Sediment Pond (Temporary)).

Design and Installation Specifications

- 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 one acre or less.
- Design the dike and/or swale to contain flows calculated by one of the following methods:
    - Single Event Hydrograph Method: The peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the worst-case land cover condition.

      OR
    - Continuous Simulation Method: The 10-year peak flow rate, as determined by an approved continuous runoff model with a 15-minute time step for the worst-case land cover condition.

  Worst-case land cover conditions (i.e., producing the most runoff) should be used for analysis (in most cases, this would be the land cover conditions just prior to final landscaping).

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 percent ASTM D698 standard proctor.
- Stabilization: Depends on velocity and reach. Inspect regularly to ensure stability.
- Ground Slopes <5%: Seed and mulch applied within 5 days of dike construction (see BMP C121: Mulching).
- Ground Slopes 5 - 40%: Dependent on runoff velocities and dike materials. Stabilization should be done 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 facility.

- Minimize construction traffic over temporary dikes. Use temporary cross culverts for channel crossing.
- See Table II-3.8: Horizontal Spacing of Interceptor Dikes Along Ground Slope for recommended horizontal spacing between dikes.

Table II-3.8: Horizontal Spacing of Interceptor Dikes Along Ground Slope

Average Slope	Slope Percent	Flowpath Length
20H:1V or less	3-5%	300 feet
(10 to 20)H:1V	5-10%	200 feet
(4 to 10)H:1V	10-25%	100 feet
(2 to 4)H:1V	25-50%	50 feet

Interceptor Swales

Interceptor swales shall meet the following criteria:

- Bottom Width: 2 feet minimum; the cross-section bottom shall be level.
- Depth: 1-foot minimum.
- Side Slope: 2H:1V or flatter.
- Grade: Maximum 5 percent, with positive drainage to a suitable outlet (such as BMP C241: Sediment Pond (Temporary)).
- Stabilization: Seed as per BMP C120: Temporary and Permanent Seeding, or BMP C202: Riprap Channel Lining, 12 inches thick riprap pressed into the bank and extending at least 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 C202: Riprap Channel Lining

Purpose

To protect channels by providing a channel liner using riprap.

Conditions of Use

Use this BMP when natural soils or vegetated stabilized soils in a channel are not adequate to prevent channel erosion.

Use this BMP when a permanent ditch or pipe system is to be installed and a temporary measure is needed.

An alternative to riprap channel lining is BMP C122: Nets and Blankets.

The Federal Highway Administration recommends not using geotextile liners whenever the slope exceeds 10 percent or the shear stress exceeds 8 lbs/ft^2.

Design and Installation Specifications

- Since riprap is typically used where erosion potential is high, construction must be sequenced so that the riprap is put in place with the minimum possible delay.
- Disturb areas awaiting riprap only when final preparation and placement of the riprap can follow immediately behind the initial disturbance. Where riprap is used for outlet protection, the riprap should be placed before or in conjunction with the construction of the pipe or channel so that it is in place when the pipe or channel begins to operate.
- The designer, after determining the riprap size that will be stable under the flow conditions, shall consider that size to be a minimum size and then, based on riprap gradations actually available in the area, select the size or sizes that equal or exceed the minimum size. The possibility of drainage structure damage by others shall be considered in selecting a riprap size, especially if there is nearby water or a gully in which to toss the stones.
- Stone for riprap shall consist of field stone or quarry stone of approximately rectangular shape. The stone shall be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering and it shall be suitable in all respects for the purpose intended. See Section 9-13 of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* (WSDOT, 2016).
- A lining of engineering filter fabric (geotextile) shall be placed between the riprap and the underlying soil surface to prevent soil movement into or through the riprap. The geotextile should be keyed in at the top of the bank.
- Filter fabric shall not be used on slopes greater than 1.5H:1V as slippage may occur. It should be used in conjunction with a layer of coarse aggregate (granular filter blanket) when the riprap to be placed is 12 inches and larger.

Maintenance Standards

Replace riprap as needed.

BMP C203: Water Bars

Purpose

A water bar is a small ditch or ridge of material that is constructed diagonally across a road or right-of-way to divert stormwater runoff from the road surface, wheel tracks, or a shallow road ditch. See Figure II-3.12: Water Bar.

Conditions of Use

Clearing right-of-way and construction of access for power lines, pipelines, and other similar installations often require long narrow right-of-ways over sloping terrain. Disturbance and compaction promotes gully formation in these cleared strips by increasing the volume and velocity of runoff. Gully formation may be especially severe in tire tracks and ruts. To prevent gullying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using small predesigned diversions.

Give special consideration to each individual outlet area, as well as to the cumulative effect of added diversions. Use gravel to stabilize the diversion where significant vehicular traffic is anticipated.

Design and Installation Specifications

- Height: 8-inch minimum, measured from the channel bottom to the ridge top.
- Side slope of channel: 2H:1V maximum; 3H:1V or flatter when vehicles will cross.
- Top width of ridge: 6-inch minimum.
- Locate water bars to use natural drainage systems and to discharge into well vegetated stable areas.
- See Table II-3.9: Water Bar Spacing Guidelines:

Table II-3.9: Water Bar Spacing Guidelines

Slope Along Road (%)	Spacing (ft)
< 5	125
5 - 10	100
10 - 20	75
20 - 35	50
> 35	Use rock lined ditch

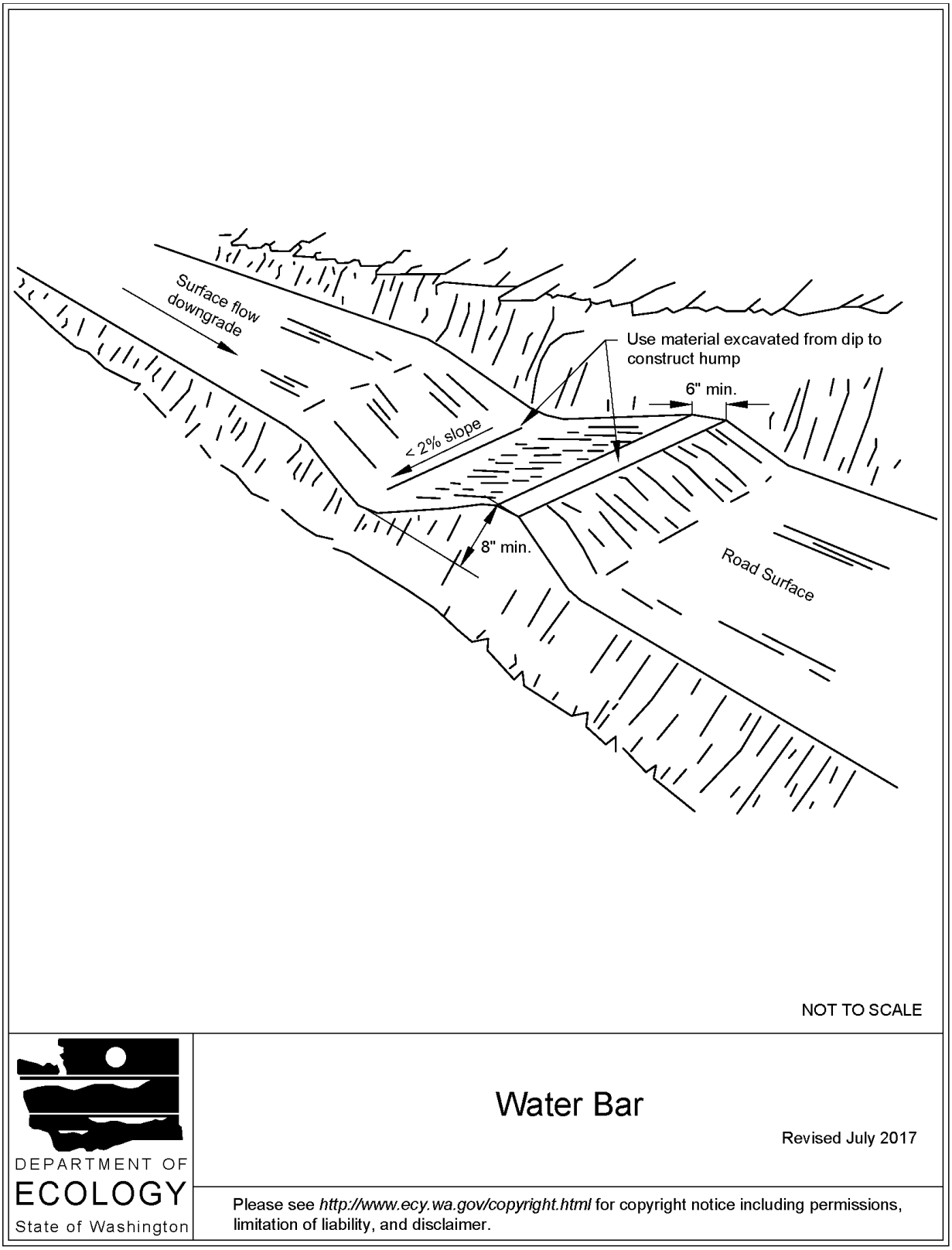
- Grade of water bar and angle: Select an angle that results in a ditch slope less than 2 percent.
- Install the water bar as soon as the clearing and grading is complete. When utilities are being installed, reconstruct the water bar as construction is complete in each section.
- Compact the water bar ridge.
- Stabilize, seed, and mulch the portions that are not subject to traffic. Gravel the areas crossed by vehicles.
- Note that BMP C208: Triangular Silt Dike (TSD) can be used to create the ridge for the water bar.

Maintenance Standards

Periodically inspect water bars after every heavy rainfall for wear and erosion damage.

- Immediately remove sediment from the flow area and repair the dike.
- Check outlet areas and make timely repairs as needed.
- When permanent road drainage is established and the area above the temporary water bar is permanently stabilized, remove the dikes and fill the channel to blend with the natural ground, and appropriately stabilize the disturbed area.

Figure II-3.12: Water Bar



BMP C207: 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 or permanent channels are not yet vegetated, channel lining is infeasible, and/or velocity checks are required.

- Check dams may not be placed in streams unless approved by the 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 re-usable, 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 check dams, 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 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 at least 12 inches lower than the outer edges at natural ground elevation.
- Keep the side slopes of the check dam at 2H:1V or flatter.
- Key the stone into the ditch banks and extend it beyond the abutments a minimum of 18 inches to avoid washouts from overflow around the dam.
- Use filter fabric foundation under a rock or sand bag check dam. If a blanket ditch liner is used, filter fabric 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 greater than 4 percent. 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 stones.
- See Figure II-3.16: 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 C202: Riprap Channel Lining.

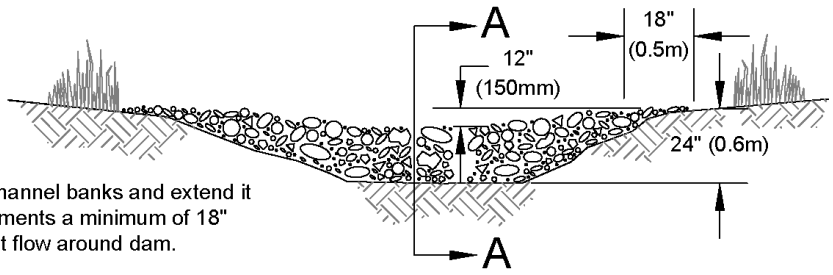
Approved as Functionally Equivalent

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 website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

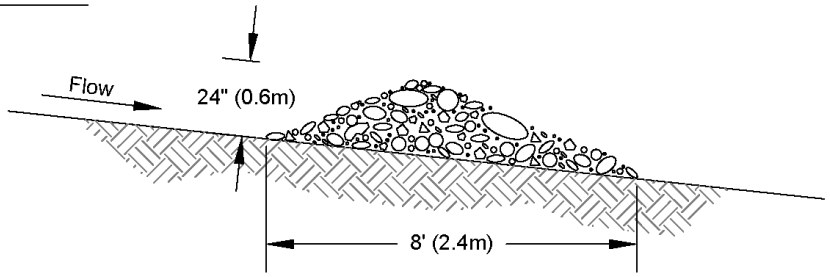
Figure II-3.16: Rock Check Dam

View Looking Upstream

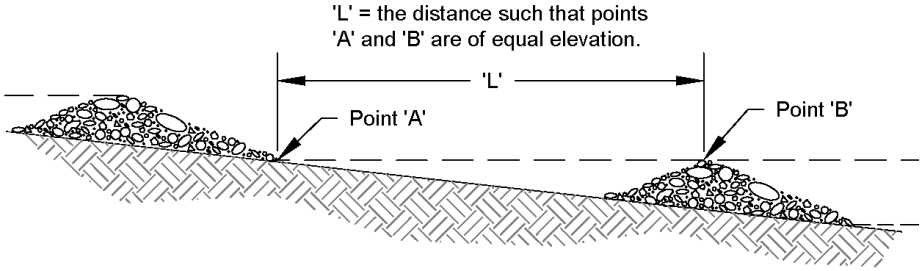


Note:
Key stone into channel banks and extend it beyond the abutments a minimum of 18" (0.5m) to prevent flow around dam.

Section A-A



Spacing Between Check Dams



NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Rock Check Dam

Revised June 2016

BMP C208: Triangular Silt Dike (TSD)

Purpose

Triangular silt dikes (TSDs) may be used as check dams, for perimeter protection, for temporary soil stockpile protection, for drop inlet protection, or as a temporary interceptor dike.

Conditions of Use

- TSDs may be used on soil or pavement with adhesive or staples.
- TSDs have been used to build temporary:
    - BMP C241: Sediment Pond (Temporary);
    - BMP C200: Interceptor Dike and Swale;
    - BMP C154: Concrete Washout Area;
    - BMP C203: Water Bars;
    - BMP C206: Level Spreader;
    - BMP C220: Inlet Protection;
    - BMP C207: Check Dams
    - curbing; and
    - berms.

Design and Installation Specifications

- TSDs are made of urethane foam sewn into a woven geosynthetic fabric.
- TSDs are triangular, 10 inches to 14 inches high in the center, with a 20-inch to 28-inch base. A 2 foot apron extends beyond both sides of the triangle along its standard section of 7 feet. A sleeve at one end allows attachment of additional sections as needed.
- Install with ends curved up to prevent water from flowing around the ends.
- The fabric flaps and check dam units are attached to the ground with wire staples. Wire staples should be No. 11 gauge wire and should be 200 mm to 300 mm in length.
- When multiple units are installed, the sleeve of fabric at the end of the unit shall overlap the abutting unit and be stapled.
- When used as check dams:
    - TSDs should be located and installed as soon as construction will allow.
    - TSDs should be placed perpendicular to the flow of water.
    - The leading edge of the TSD must be secured with rocks, sandbags, or a small key slot

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 greater than 4 percent. 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 sediment 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 C220: 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 II-3.10: Storm Drain Inlet Protection lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: 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 may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/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 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	N/A	N/A	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 of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 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.

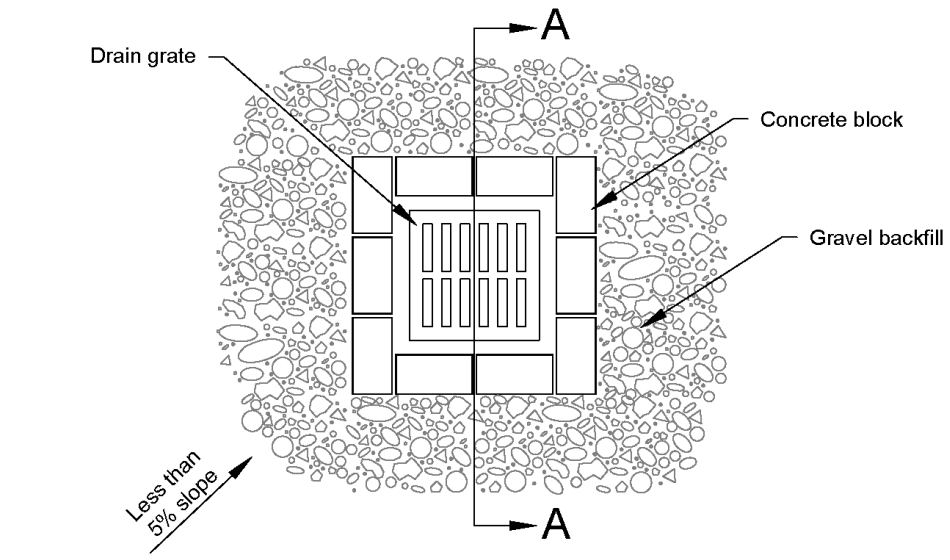
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

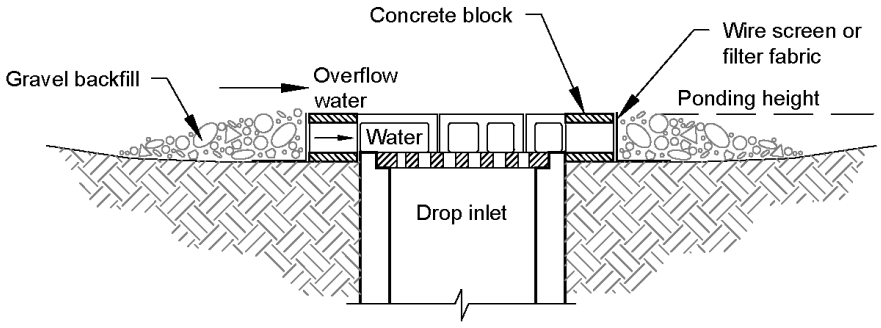
A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See Figure II-3.17: Block and Gravel Filter. Design and installation specifications for block gravel filters include:

- Provide a height of 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 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 ½-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 stone area between the gravel berm and the inlet.
    - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
    - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Plan View



Section A-A

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

Revised June 2016

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 ½-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 at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 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 type of 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:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog 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:

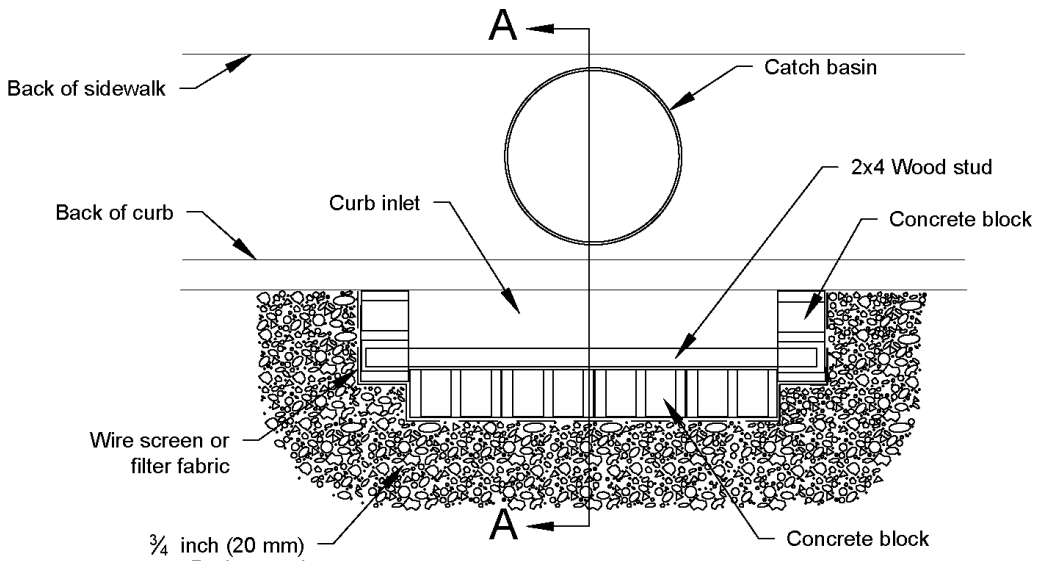
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

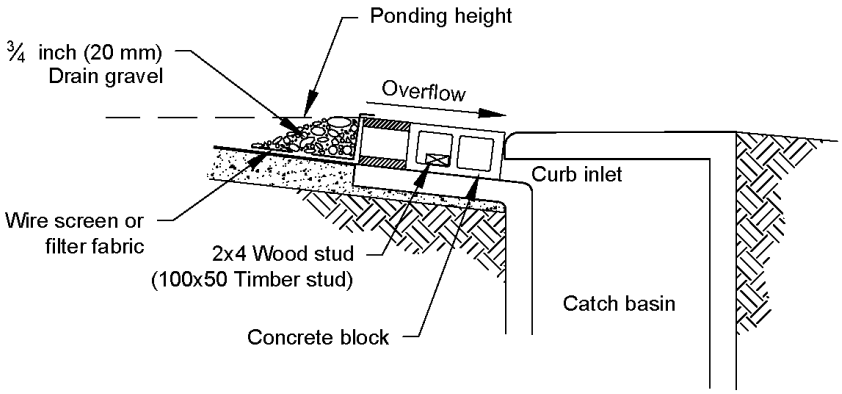
Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-3.18: Block and Gravel Curb Inlet Protection. Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-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.

Figure II-3.18: 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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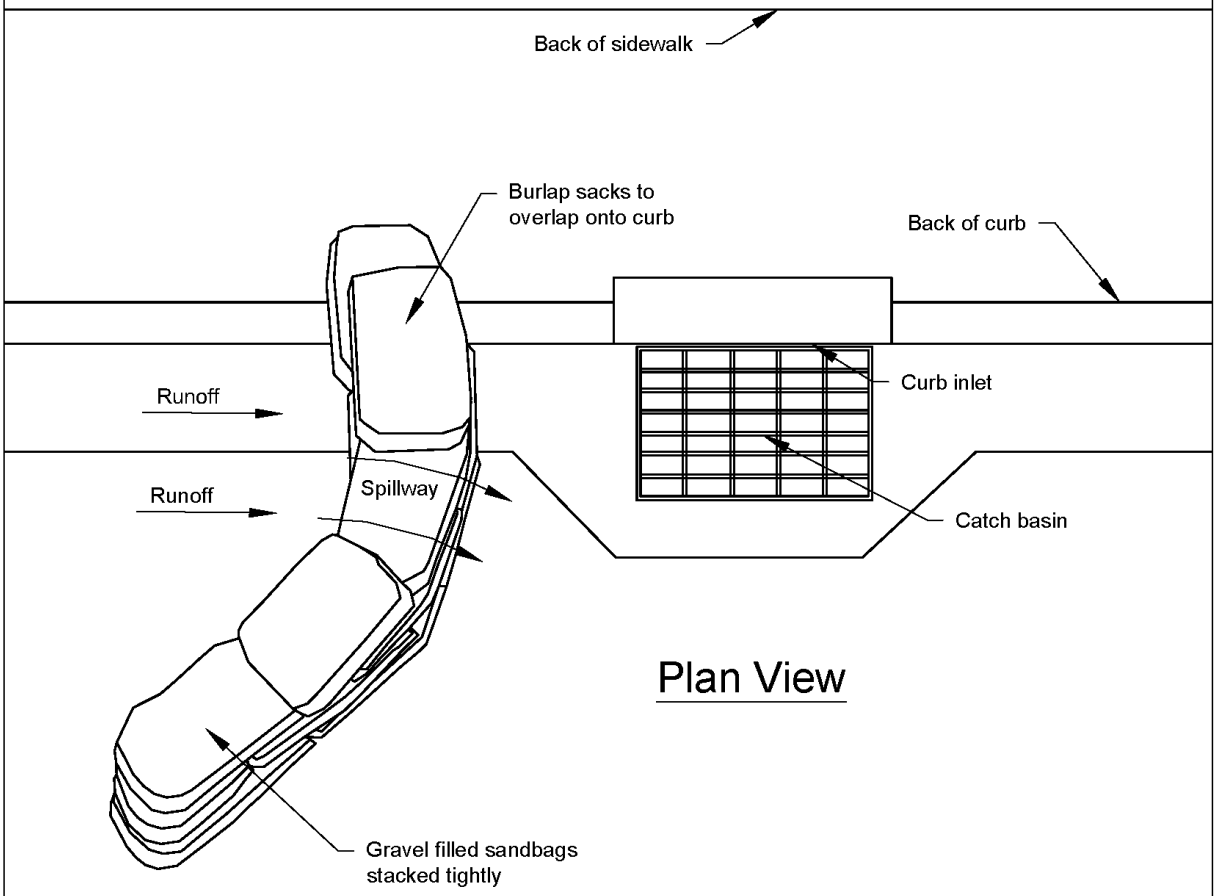
Curb and Gutter Sediment Barrier

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 II-3.19: Curb and Gutter Barrier. Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 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.

Figure II-3.19: 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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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 would be 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.

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 website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C232: Gravel Filter Berm

Purpose

A gravel filter berm retains sediment by filtering runoff through a berm of gravel or crushed rock.

Conditions of Use

Use a gravel filter berm where a temporary measure is needed to retain sediment from construction sites.

Do not place gravel filter berms in traffic areas; gravel filter berms are not intended to be driven over.

Place gravel filter berms perpendicular to the flow of runoff, such that the runoff will filter through the berm prior to leaving the site.

Design and Installation Specifications

- Berm material shall be ¾ to 3 inches in size, washed well-grade gravel or crushed rock with less than 5 percent fines. Do not use crushed concrete.
- Spacing of berms:
    - Every 300 feet on slopes less than 5 percent
    - Every 200 feet on slopes between 5 percent and 10 percent
    - Every 100 feet on slopes greater than 10 percent
- Berm dimensions:
    - 1 foot high with 3H:1V side slopes
    - 8 linear feet per 1 cfs runoff based on the 10-year, 24-hour design storm
- See Figure II-3.21: Gravel Filter Berm for a photo of a gravel filter berm application.

Maintenance Standards

Regular inspection is required. Sediment shall be removed and filter material replaced as needed.

Figure II-3.21: Gravel Filter Berm

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Gravel Filter Berm

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BMP C233: Silt Fence

Purpose

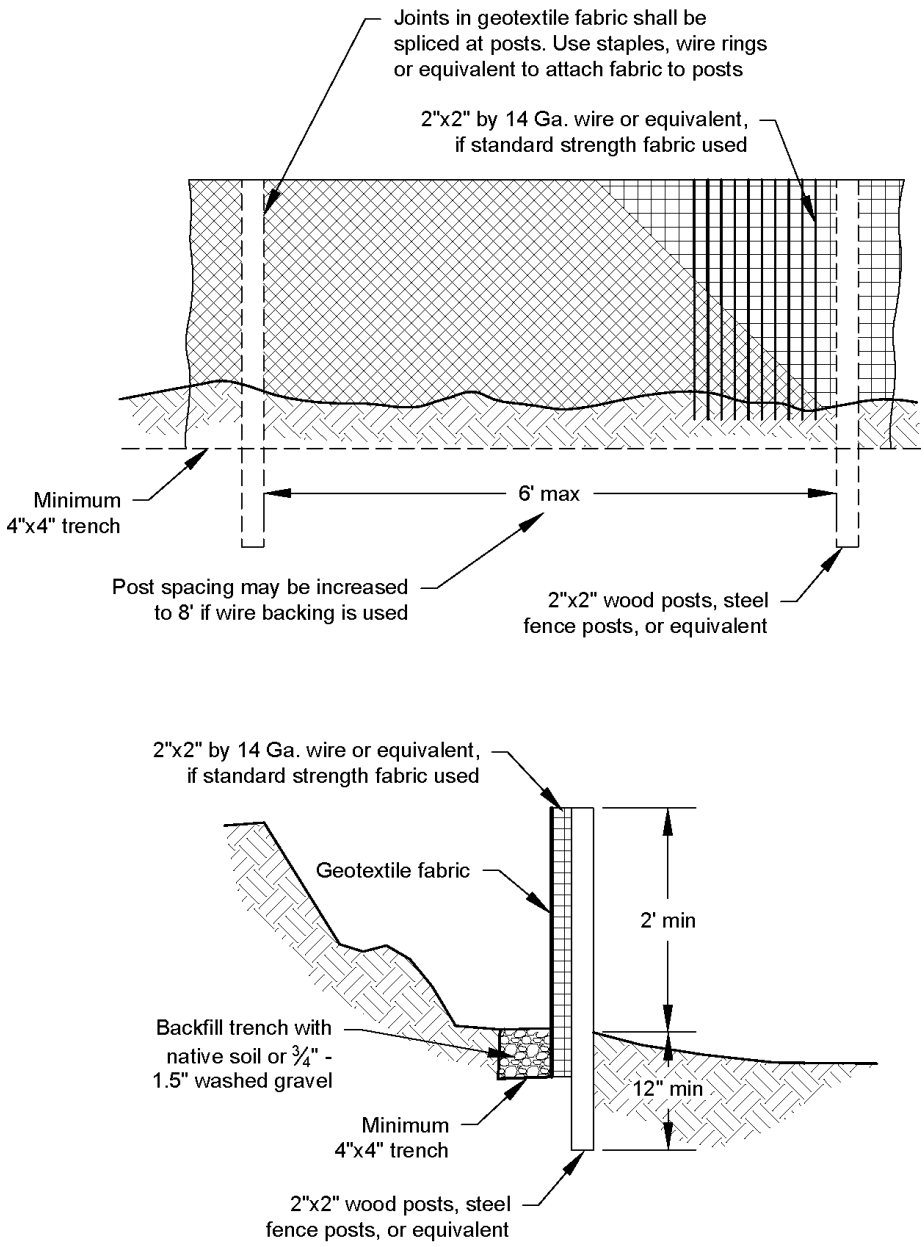
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

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.

Figure II-3.22: Silt Fence



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Silt Fence

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Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below 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 II-3.11: Geotextile Fabric Standards for Silt Fence):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec^{-1} minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 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 six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent 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.
- Refer to Figure II-3.22: Silt Fence for standard silt fence details. 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 areas of clearing, grading, or drainage prior to starting those activities.

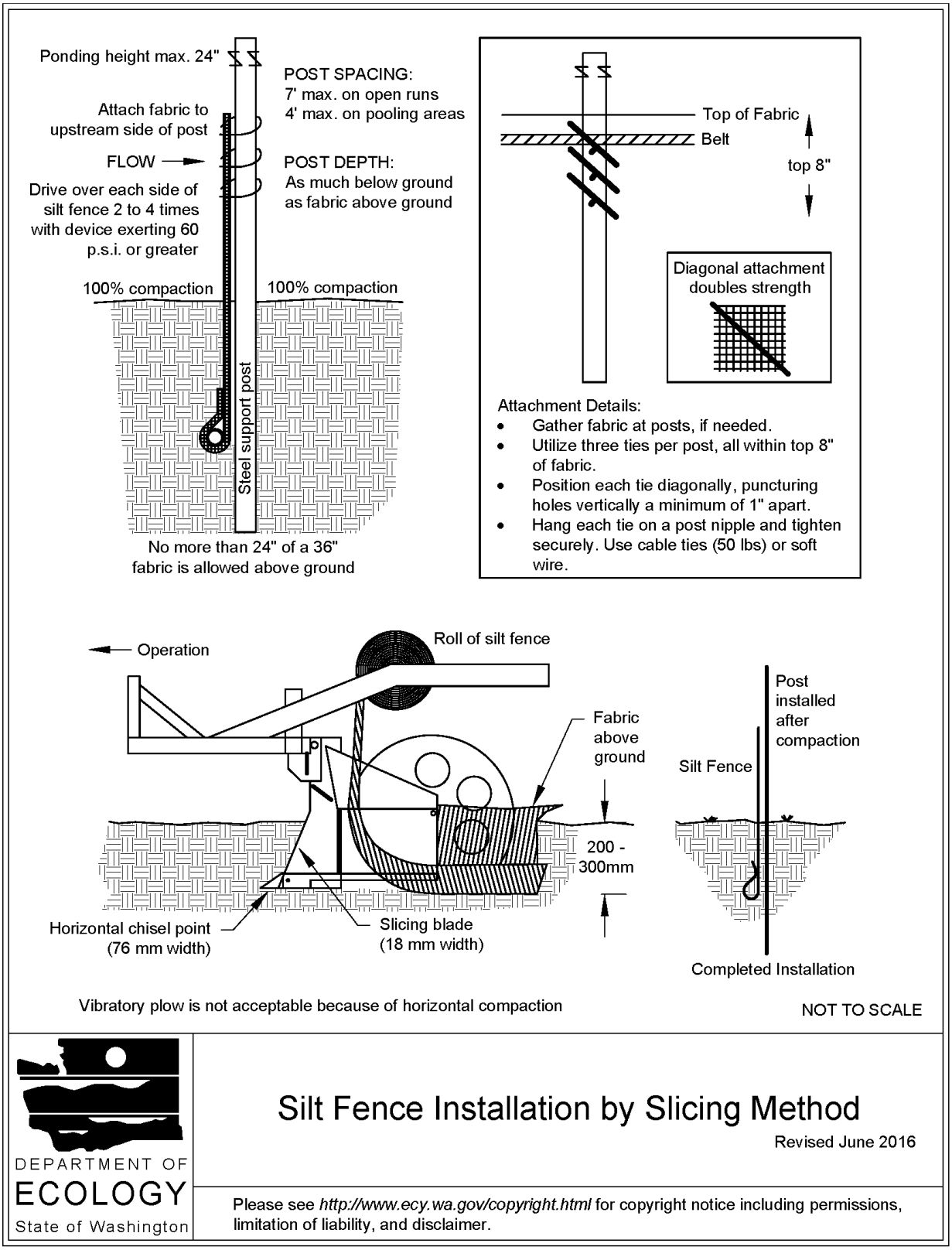
3. The silt fence shall have a 2-feet min. and a 2½-feet max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided 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 up-slope 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 up-slope side of the posts with the geotextile fabric up-slope 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 equivalent to or greater than 180 lbs. 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 min. 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 back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12–inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper 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 either:
    - 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 A 120 steel pipe with a minimum diameter of 1-inch.
    - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
    - Other steel posts having equivalent strength and bending resistance 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 not be steeper than 3H:1V.
    - Check dams shall be approximately 1-foot deep at the back of the fence. Check dams 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. Check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-3.23: 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 at least 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 at least 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 3 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 at least 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 silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- 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 sediment 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 C235: Wattles

Purpose

Wattles are temporary erosion and sediment control barriers consisting of straw, compost, or other material that is wrapped in netting made of natural plant fiber 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

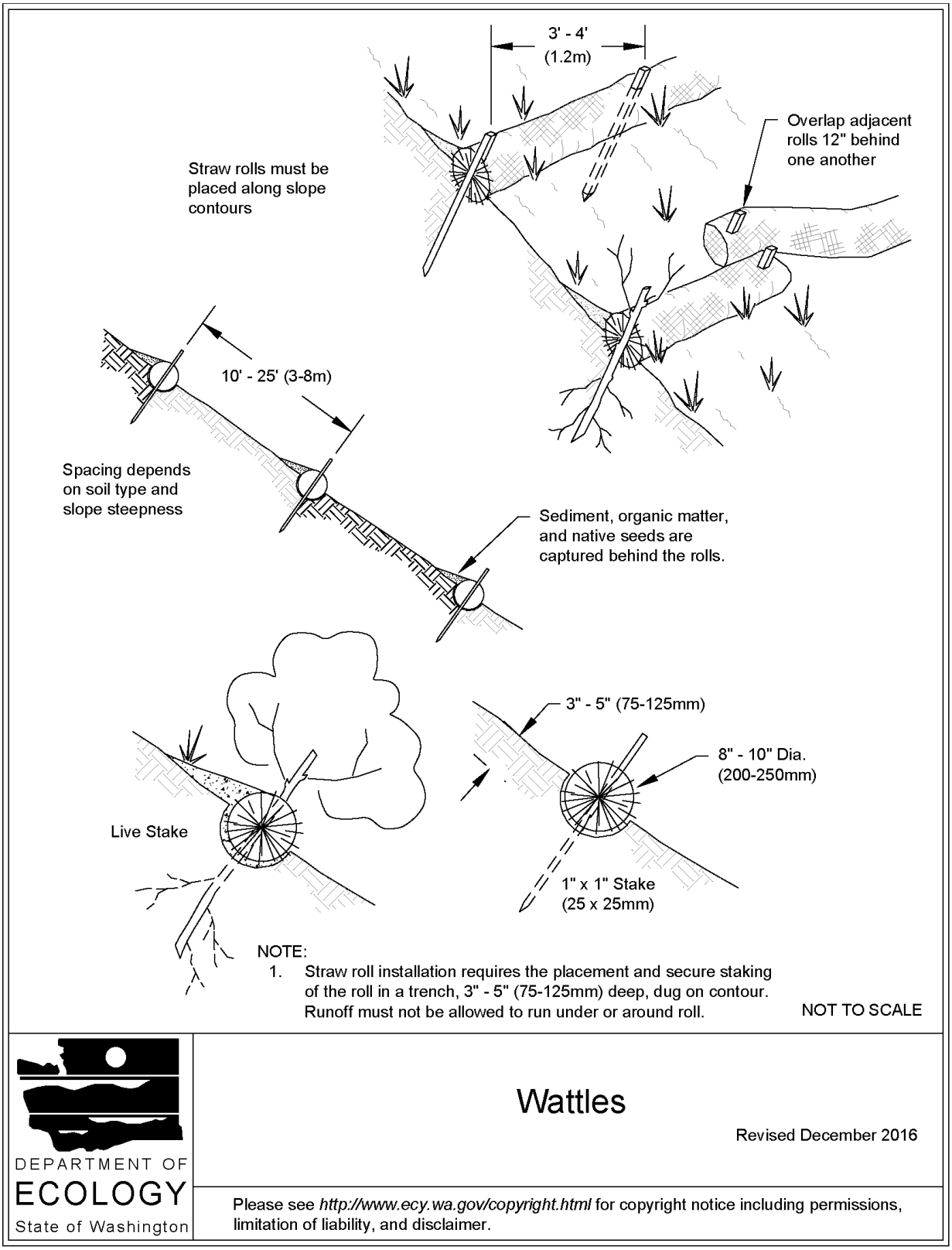
- Wattles shall consist of cylinders of plant material such as weed-free straw, coir, wood chips, excelsior, or wood fiber or shavings encased within netting made of natural plant fibers unaltered by synthetic materials.
- Use wattles:
    - In disturbed areas that require immediate erosion protection.
    - 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 II-3.24: 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 1/2 to 2/3 of 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 intervals of 10- to 25-feet 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 approximately 0.75 x 0.75 x 24 inches min. 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.

Figure II-3.24: Wattles



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

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 website at:

https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies

BMP C240: Sediment Trap

Purpose

A sediment trap is a small temporary ponding area with a gravel outlet used to collect and store sediment from sites during construction. Sediment traps, along with other perimeter controls, shall be installed before any land disturbance takes place in the drainage area.

Conditions of Use

- Sediment traps are intended for use on sites where the tributary drainage area is less than 3 acres, with no unusual drainage features, and a projected build-out time of six months or less. The sediment trap is a temporary measure (with a design life of approximately 6 months) and shall be maintained until the tributary area is permanently protected against erosion by vegetation and/or structures.
- Sediment traps are only effective in removing sediment down to about the medium silt size fraction. Runoff with sediment of finer grades (fine silt and clay) will pass through untreated, emphasizing the need to control erosion to the maximum extent first.
- Projects that are constructing permanent Flow Control BMPs, or Runoff Treatment BMPs that use ponding for treatment, may use the rough-graded or final-graded permanent BMP footprint for the temporary sediment trap. When permanent BMP footprints are used as temporary sediment traps, the surface area requirement of the sediment trap must be met. If the surface area requirement of the sediment trap is larger than the surface area of the permanent BMP, then the sediment trap shall be enlarged beyond the permanent BMP footprint to comply with the surface area requirement.

- A floating pond skimmer may be used for the sediment trap outlet if approved by the Local Permitting Authority.
- Sediment traps may not be feasible on utility projects due to the limited work space or the short-term nature of the work. Portable tanks may be used in place of sediment traps for utility projects.

Design and Installation Specifications

- See Figure II-3.26: Cross Section of Sediment Trap and Figure II-3.27: Sediment Trap Outlet for details.
- To determine the sediment trap geometry, first calculate the design surface area (SA) of the trap, measured at the invert of the weir. Use the following equation:

$$SA = FS(Q_2/V_s)$$

where

Q_2 =

  - Option 1 - Single Event Hydrograph Method:

    Q_2 = Peak volumetric flow rate calculated using a 10-minute time step from a Type 1A, 2-year, 24-hour frequency storm for the developed condition. The 10-year peak volumetric flow rate shall be used if the project size, expected timing and duration of construction, or downstream conditions warrant a higher level of protection.

  - Option 2 - For construction sites that are less than 1 acre, the Rational Method may be used to determine Q_2.

V_s = The settling velocity of the soil particle of interest. The 0.02 mm (medium silt) particle with an assumed density of 2.65 g/cm3 has been selected as the particle of interest and has a settling velocity (Vs) of 0.00096 ft/sec.

FS = A safety factor of 2 to account for non-ideal settling.

Therefore, the equation for computing sediment trap surface area becomes:

$$SA = 2 \times Q_2/0.00096$$

or

2080 square feet per cfs of inflow

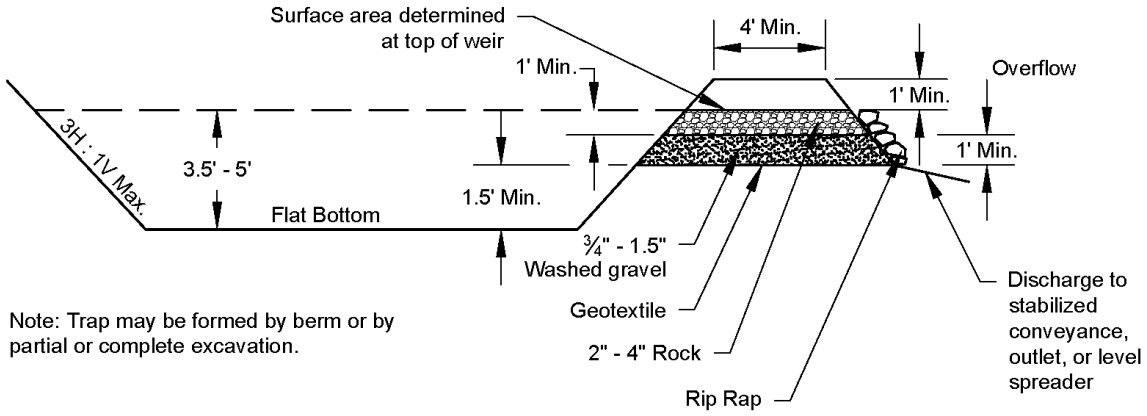
- Sediment trap depth shall be 3.5 feet minimum from the bottom of the trap to the top of the overflow weir.
- To aid in determining sediment depth, all sediment traps shall have a staff gauge with a prominent mark 1-foot above the bottom of the trap.

- Design the discharge from the sediment trap by using the guidance for discharge from temporary sediment ponds in BMP C241: Sediment Pond (Temporary).

Maintenance Standards

- Sediment shall be removed from the trap when it reaches 1-foot in depth.
- Any damage to the trap embankments or slopes shall be repaired.

Figure II-3.26: Cross Section of Sediment Trap



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Cross Section of Sediment Trap

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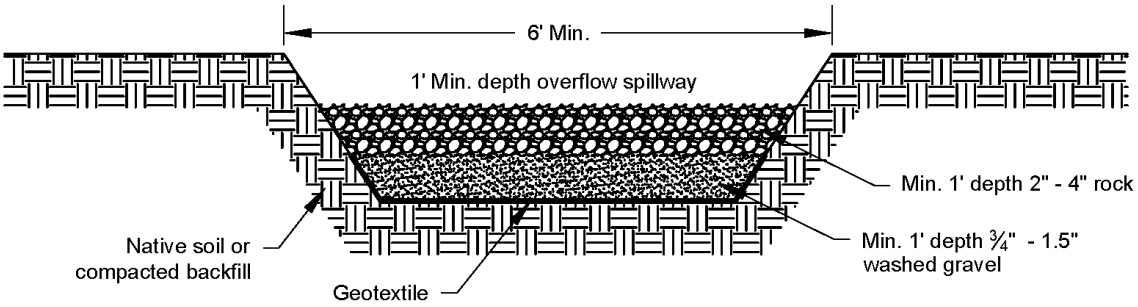
Figure II-3.27: Sediment Trap Outlet



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Sediment Trap Outlet

Revised June 2016

BMP C241: Sediment Pond (Temporary)

Purpose

Sediment ponds are temporary ponds used during construction to remove sediment from runoff originating from disturbed areas of the project site. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Consequently, they usually reduce turbidity only slightly.

Conditions of Use

- Use a sediment pond where the contributing drainage area to the pond is 3 acres or more. Ponds must be used in conjunction with other Construction Stormwater BMPs to reduce the amount of sediment flowing into the pond.
- Do not install sediment ponds on sites where failure of the BMP would result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment ponds are attractive to children and can be dangerous. Compliance with local ordinances regarding health and safety must be addressed. If fencing of the pond is required, show the type of fence and its location on the drawings in the Construction SWPPP.
- Sediment ponds that can impound 10 acre-ft (435,600 cu-ft, or 3.26 million gallons) or more, or have an embankment of more than 6 feet, are subject to the Washington Dam Safety Regulations (Chapter 173-175 WAC). See BMP D.1: Detention Ponds for more information regarding dam safety considerations for detention ponds.
- Projects that are constructing permanent Flow Control BMPs or Runoff Treatment BMPs that use ponding for treatment may use the rough-graded or final-graded permanent BMP footprint for the temporary sediment pond. When permanent BMP footprints are used as temporary sediment ponds, the surface area requirement of the temporary sediment pond must be met. If the surface area requirement of the sediment pond is larger than the surface area of the permanent BMP, then the sediment pond shall be enlarged beyond the permanent BMP footprint to comply with the surface area requirement.

  The permanent control structure must be temporarily replaced with a control structure that only allows water to leave the temporary sediment pond from the surface or by pumping. Alternatively, the permanent control structure may used if it is temporarily modified by plugging any outlet holes below the riser. The permanent control structure must be installed as part of the permanent BMP after the site is fully stabilized.

Design and Installation Specifications

General

- See Figure II-3.28: Sediment Pond Plan View, Figure II-3.29: Sediment Pond Cross Section, and Figure II-3.30: Sediment Pond Riser Detail for details.
- Use of permanent infiltration BMP footprints for temporary sediment ponds during

construction tends to clog the soils and reduce their capacity to infiltrate. If permanent infiltration BMP footprints are used, the sides and bottom of the temporary sediment pond must only be rough excavated to a minimum of 2 feet above final grade of the permanent infiltration BMP. Final grading of the permanent infiltration BMP shall occur only when all contributing drainage areas are fully stabilized. Any proposed permanent pretreatment BMP prior to the infiltration BMP should be fully constructed and used with the temporary sediment pond to help prevent clogging of the soils. See Element 13: Protect Low Impact Development BMPs for more information about protecting permanent infiltration BMPs.

- The pond shall be divided into two roughly equal volume cells by a permeable divider that will reduce turbulence while allowing movement of water between the cells. The divider shall be at least one-half the height of the riser, and at least one foot below the top of the riser. Wire-backed, 2- to 3-foot high, high strength geotextile fabric supported by treated 4"x4"s can be used as a divider. Alternatively, staked straw bales wrapped with geotextile fabric may be used. If the pond is more than 6 feet deep, a different divider design must be proposed. A riprap embankment is one acceptable method of separation for deeper ponds. Other designs that satisfy the intent of this provision are allowed as long as the divider is permeable, structurally sound, and designed to prevent erosion under and around the divider.
- The most common structural failure of sediment ponds is caused by piping. Piping refers to two phenomena: (1) water seeping through fine-grained soil, eroding the soil grain by grain and forming pipes or tunnels; and, (2) water under pressure flowing upward through a granular soil with a head of sufficient magnitude to cause soil grains to lose contact and capability for support.

  The most critical construction practices to prevent piping are:

  - Tight connections between the riser and outlet pipe, and other pipe connections.
  - Adequate anchoring of the riser.
  - Proper soil compaction of the embankment and riser footing.
  - Proper construction of anti-seep devices.

Sediment Pond Geometry

To determine the sediment pond geometry, first calculate the design surface area (SA) of the pond, measured at the top of the riser pipe. Use the following equation:

$$SA = 2 \times Q_2 / 0.00096$$

or

2080 square feet per cfs of inflow

See BMP C240: Sediment Trap for more information on the above equation.

The basic geometry of the pond can now be determined using the following design criteria:

- Required surface area SA (from the equation above) at the top of the riser.
- Minimum 3.5-foot depth from the top of the riser to the bottom of the pond.

- Maximum 3H:1V interior side slopes and maximum 2H:1V exterior slopes. The interior slopes can be increased to a maximum of 2H:1V if fencing is provided at or above the maximum water surface.
- One foot of freeboard between the top of the riser and the crest of the emergency spillway.
- Flat bottom.
- Minimum 1-foot deep spillway.
- Length-to-width ratio between 3:1 and 6:1.

Sediment Pond Discharge

The outlet for the pond consists of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 100-year storm. If, due to site conditions and basin geometry, a separate emergency spillway is not feasible, the principal spillway must pass the entire peak runoff expected from the 100-year storm. However, an attempt to provide a separate emergency spillway should always be made. Base the runoff calculations on the site conditions during construction. The flow through the dewatering orifice cannot be utilized when calculating the 100-year storm elevation because of its potential to become clogged; therefore, available spillway storage must begin at the principal spillway riser crest.

The principal spillway designed by the procedures described below will result in some reduction in the peak rate of runoff. However, the design will not control the discharge flow rates to the extent required to comply with I-3.4.7 MR7: Flow Control. The size of the contributing basin, the expected life of the construction project, the anticipated downstream effects, and the anticipated weather conditions during construction should be considered to determine the need for additional discharge control.

Principal Spillway: Determine the required diameter for the principal spillway (riser pipe). The diameter shall be the minimum necessary to pass the peak volumetric flow rate using a 15-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Use Figure II-3.31: Riser Inflow Curves to determine the riser diameter.

To aid in determining sediment depth, one-foot intervals shall be prominently marked on the riser.

Emergency Overflow Spillway: Size the emergency overflow spillway for the peak volumetric flow rate using a 10-minute time step from a Type 1A, 100-year, 24-hour frequency storm for the developed condition. See BMP D.1: Detention Ponds for additional guidance for Emergency Overflow Spillway design

Dewatering Orifice: Size of the dewatering orifice(s) (minimum 1-inch diameter) using a modified version of the discharge equation for a vertical orifice and a basic equation for the area of a circular orifice. Determine the required area of the orifice with the following equation:

$$A_o = \frac{A_S(2h)^{0.5}}{0.6 \times 3600 T g^{0.5}}$$

where

A_o = orifice area (square feet)

A_S = pond surface area (square feet)

h = head of water above orifice (height of riser in feet)

T = dewatering time (24 hours)

g = acceleration of gravity (32.2 feet/second^2)

Convert the orifice area (in square feet) to the orifice diameter D (in inches):

$$D = 24 \times \sqrt{\frac{A_o}{\pi}} = 13.54 \times \sqrt{A_o}$$

The vertical, perforated tubing connected to the dewatering orifice must be at least 2 inches larger in diameter than the orifice to improve flow characteristics. The size and number of perforations in the tubing should be large enough so that the tubing does not restrict flow. The orifice should control the flow rate.

Figure II-3.28: Sediment Pond Plan View

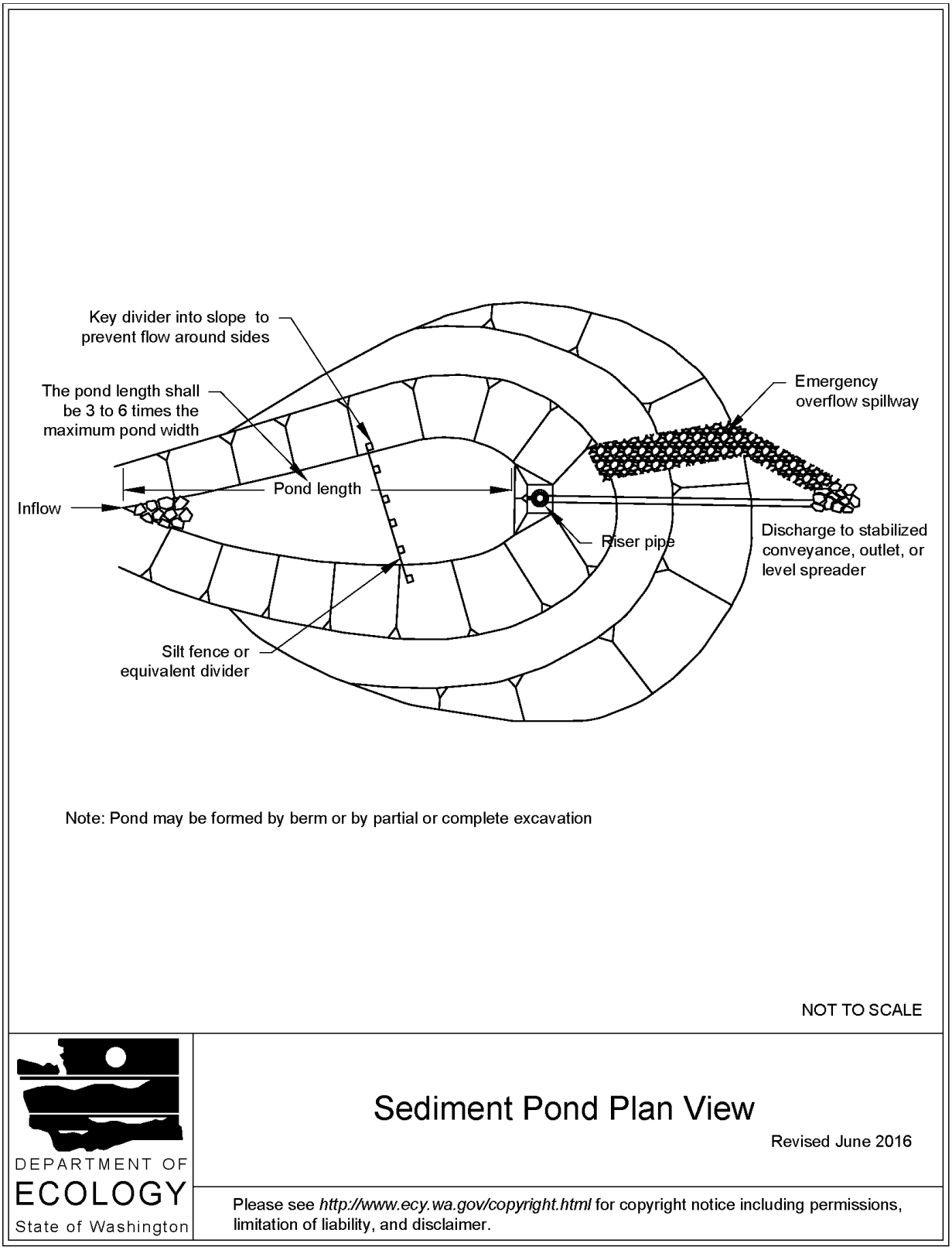
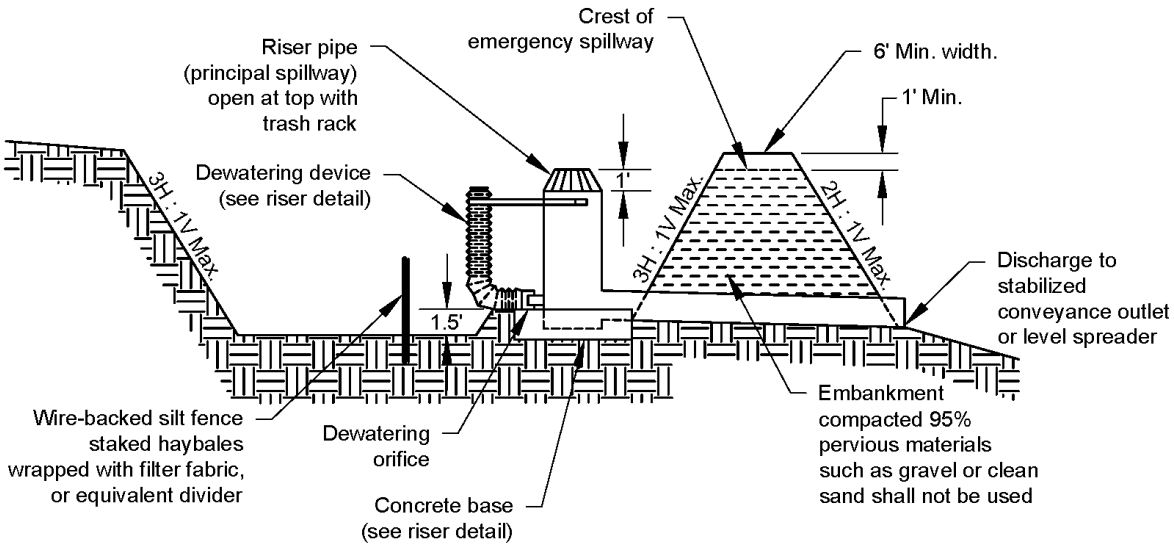


Figure II-3.29: Sediment Pond Cross Section



NOT TO SCALE

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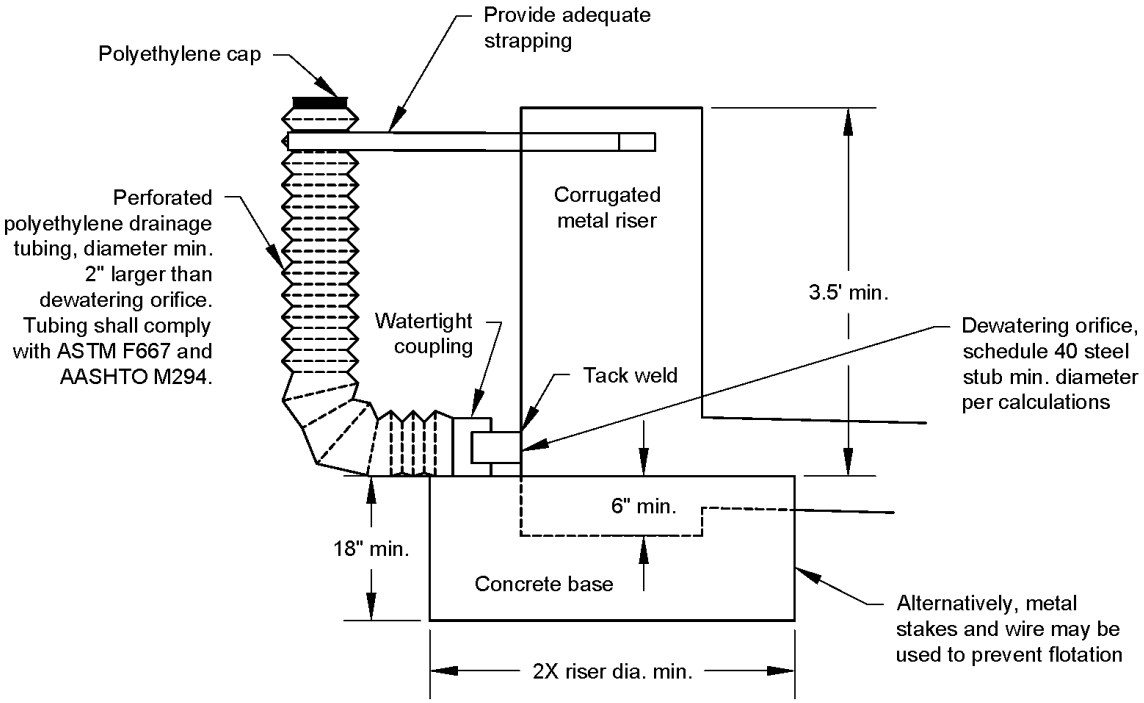
State of Washington

Sediment Pond Cross Section

Revised June 2016

Figure II-3.30: Sediment Pond Riser Detail



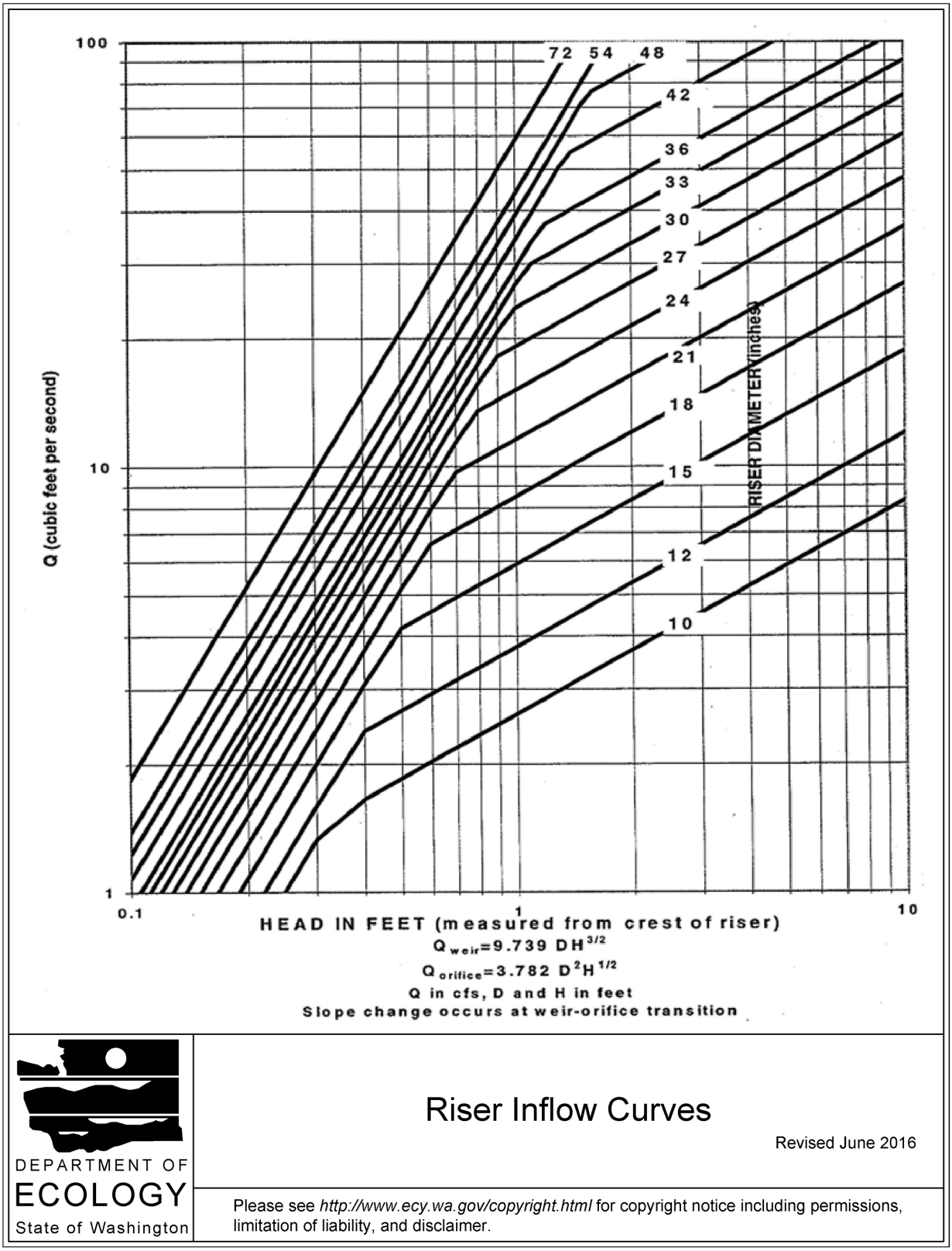
NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Sediment Pond Riser Detail

Revised June 2016

Figure II-3.31: Riser Inflow Curves



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State of Washington

Riser Inflow Curves

Revised June 2016

Maintenance Standards

- Remove sediment from the pond when it reaches 1 foot in depth.
- Repair any damage to the pond embankments or slopes.

BMP C251: Construction Stormwater Filtration

Purpose

Filtration removes sediment from runoff originating from disturbed areas of the site.

Conditions of Use

Traditional Construction Stormwater BMPs used to control soil erosion and sediment loss from construction sites may not be adequate to ensure compliance with the water quality standard for turbidity in the receiving water. Filtration may be used in conjunction with gravity settling to remove sediment as small as fine silt (0.5 µm). The reduction in turbidity will be dependent on the particle size distribution of the sediment in the stormwater. In some circumstances, sedimentation and filtration may achieve compliance with the water quality standard for turbidity.

The use of construction stormwater filtration does not require approval from Ecology as long as treatment chemicals are not used. Filtration in conjunction with BMP C250: Construction Stormwater Chemical Treatment requires testing under the Chemical Technology Assessment Protocol – Ecology (CTAPE) before it can be initiated. Approval from Ecology must be obtained at each site where chemical use is proposed prior to use. See https://-fortress.wa.gov/ecy/publications/SummaryPages/ecy070258.html for a copy of the Request for Chemical Treatment form.

Design and Installation Specifications

Two types of filtration systems may be applied to construction stormwater treatment: rapid and slow.

Rapid filtration systems are the typical system used for water and wastewater treatment. They can achieve relatively high hydraulic flow rates, on the order of 2 to 20 gpm/sf, because they have automatic backwash systems to remove accumulated solids.

Slow filtration systems have very low hydraulic rates, on the order of 0.02 gpm/sf, because they do not have backwash systems. Slow filtration systems have generally been used as post construction BMPs to treat stormwater (see V-6 Filtration BMPs). Slow filtration is mechanically simple in comparison to rapid filtration, but requires a much larger filter area.

Filter Types and Efficiencies

Sand media filters are available with automatic backwashing features that can filter to 50 µm particle size. Screen or bag filters can filter down to 5 µm. Fiber wound filters can remove particles down to 0.5 µm. Filters should be sequenced from the largest to the smallest pore opening. Sediment removal efficiency will be related to particle size distribution in the stormwater.

Treatment Process and Description

Stormwater is collected at interception point(s) on the site and diverted to an untreated stormwater sediment pond or tank for removal of large sediment, and storage of the stormwater before it is treated by the filtration system. In a rapid filtration system, the untreated stormwater is pumped from the pond or tank through the filtration media. Slow filtration systems are designed using gravity to convey water from the pond or tank to and through the filtration media.

Sizing

Filtration treatment systems must be designed to control the velocity and peak volumetric flow rate that is discharged from the system and consequently the project site. See Element 3: Control Flow Rates for further details on this requirement.

The untreated stormwater storage pond or tank should be sized to hold 1.5 times the volume of runoff generated from the site during the 10-year, 24-hour storm event, minus the filtration treatment system flowrate for an 8-hour period. For a chitosan-enhanced sand filtration system, the filtration treatment system flowrate should be sized using a hydraulic loading rate between 6-8 gpm/ft^2. 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 III-2.3 Single Event Hydrograph Method. Worst-case land cover conditions (i.e., producing the most runoff) should be used for analyses (in most cases, this would be the land cover conditions just prior to final landscaping).

If the filtration treatment system design does not allow you to discharge at the rates as 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 untreated stormwater storage pond difficult, the permanent Flow Control BMP may be divided to serve as the untreated stormwater storage pond and the post-treatment temporary flow control pond. A berm or barrier must be used in this case so the untreated water does not mix with the treated water. Both untreated stormwater storage requirements, and adequate post-treatment flow control must be achieved. The designer must document in the Construction 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 pre-set 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 untreated stormwater 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.
- Sediment shall be removed from the storage and/or treatment ponds as necessary. Typically, sediment removal is required once or twice during a wet season and at the decommissioning of the ponds.
- Disposal of filtration equipment must comply with applicable local, state, and federal regulations.

IV-1 Source Control BMPs Applicable to All Sites

S410 BMPs for Correcting Illicit Discharges to Storm Drains

Description of Pollutant Sources: Illicit discharges are unpermitted sanitary or process wastewater discharges to a storm sewer or to surface water, rather than to a sanitary sewer, industrial process wastewater, or other appropriate treatment. They can also include swimming pool water, filter backwash, cleaning solutions/washwaters, cooling water, etc. Experience has shown that illicit discharges are common, particularly in older buildings.

Pollutant Control Approach: Identify and eliminate unpermitted discharges or obtain an NPDES permit, where necessary, particularly at industrial and commercial facilities.

Applicable Operational BMPs:

- For all real properties, responsible parties must examine their plumbing systems to identify any potential illicit discharges. Review site plans, engineering drawings, or other sources of information for the plumbing systems on the property.
- If an illicit discharge is suspected, trace the source using an appropriate method such as visual reconnaissance, smoke test, flow test, dye test with a nontoxic dye, or closed circuit television (CCTV) inspection. These tests are to be performed by qualified personnel such as a plumbing contractor. Note: Contact Ecology prior to performing a dye test which may result in a discharge to a receiving water.
- If illicit connections are found, permanently plug or disconnect the connections.
- Eliminate prohibited discharges to storm sewer, ground water, or surface water.
- Convey unpermitted discharges to a sanitary sewer if allowed by the local sewer authority, or to other approved treatment.
- Obtain all necessary permits for altering or repairing side sewers and plumbing fixtures. Restrictions on certain types of discharges, particularly industrial process waters, may require pretreatment of discharges before they enter the sanitary sewer. It is the responsibility of the property owner or business operator to obtain the necessary permits and to replace the connection.
- Obtain appropriate state and local permits for these discharges.

Recommended Additional Operational BMPs:

At commercial and industrial facilities, conduct a survey of wastewater discharge connections to storm drains and to surface water as follows:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate storm drains from buildings and paved surfaces. Note where these discharge.
- During non-stormwater conditions, inspect each storm drain for non-stormwater discharges. Record the locations of all non-stormwater discharges. Include all permitted discharges.
- If useful, prepare a map of each area. Show on the map the known location of storm sewers, sanitary sewers, and permitted and unpermitted discharges. Aerial photos may be useful. Check records such as piping schematics to identify known side sewer connections and show these on the map. Consider using smoke, dye, or chemical analysis tests to detect connections between two conveyance systems (e.g., process water and stormwater). If desirable, conduct TV inspections of the storm drains and record the footage on videotape.
- Compare the observed locations of connections with the information on the map and revise the map accordingly. Note suspect connections that are inconsistent with the field survey.
- Identify all connections to storm sewers or to surface water and take the actions specified above as applicable BMPs.

S453 BMPs for Formation of a Pollution Prevention Team

The pollution prevention team should be responsible for implementing and maintaining all BMPs and treatment for the site. This team should be able to address any corrective actions needed on site to mitigate potential stormwater contamination. The team members should:

- Consist of those people who are familiar with the facility and its operations.
- Possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at your facility, and who can evaluate the effectiveness of control measures.
- Assign pollution prevention team staff to be on duty on a daily basis to cover applicable permittee facilities when those facilities are in operation.
- Have the primary responsibility for developing and overseeing facility activities necessary to comply with stormwater requirements.
- Have access to all applicable permit, monitoring, SWPPP, and other records.
- Be trained in the operation, maintenance and inspections of all BMPs and reporting procedures.
- Establish responsibilities for inspections, operation, maintenance, and emergencies.
- Regularly meet to review overall facility operations and BMP effectiveness.

S454 BMPs for Preventive Maintenance / Good Housekeeping

Preventative maintenance and good housekeeping practices reduce the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the drainage system and sewer system.

Applicable BMPs:

- Prevent the discharge of unpermitted liquid or solid wastes, process wastewater, and sewage to ground or surface water, or to storm drains that discharge to surface water, or to the ground. Conduct all oily parts cleaning, steam cleaning, or pressure washing of equipment or containers inside a building, or on an impervious contained area, such as a concrete pad. Direct contaminated stormwater from such an area to a sanitary sewer where allowed by local sewer authority, or to other approved treatment.
- Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on an exposed soil, vegetation, or paved area.
- If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging storm drains, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to sanitary sewer or for vactor truck transport to a waste water treatment plant for disposal).
- Do not hose down pollutants from any area to the ground, storm drains, conveyance ditches, or receiving water. Convey pollutants before discharge to a treatment system approved by the local jurisdiction.
- Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Use mechanical sweepers, and manual sweeping as necessary to access areas that a vacuum sweeper can't reach to ensure that all surface contaminants are routinely removed.
- Do not pave over contaminated soil unless it has been determined that ground water has not been and will not be contaminated by the soil. Call Ecology for assistance.
- Construct impervious areas that are compatible with the materials handled. Portland cement concrete, asphalt, or equivalent material may be considered.
- Use drip pans to collect leaks and spills from industrial/commercial equipment such as cranes at ship/boat building and repair facilities, log stackers, industrial parts, trucks and other vehicles stored outside.
- At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.
- For the storage of liquids use containers, such as steel and plastic drums, that are rigid and

durable, corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- For the temporary storage of solid wastes contaminated with liquids or other potential polluted materials use dumpsters, garbage cans, drums, and comparable containers, which are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. If covered with a screen, the container must be stored under a roof or other form of adequate cover.
- Where exposed to stormwater, use containers, piping, tubing, pumps, fittings, and valves that are appropriate for their intended use and for the contained liquid.
- Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater. Refer to Ecology Requirements for Generators of Dangerous Wastes in I-2.15 Other Requirements for references to assist in handling potentially dangerous waste.
- Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other drainage areas, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
- Do not connect floor drains in potential pollutant source areas to storm drains, surface water, or to the ground.

Recommended BMPs:

- Where feasible, store potential stormwater pollutant materials inside a building or under a cover and/or containment.
- Minimize use of toxic cleaning solvents, such as chlorinated solvents, and other toxic chemicals.
- Use environmentally safe raw materials, products, additives, etc. such as substitutes for zinc used in rubber production.
- Recycle waste materials such as solvents, coolants, oils, degreasers, and batteries to the maximum extent feasible. Contact Ecology's *Hazardous Waste & Toxics Reduction Program* at https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Hazardous-Waste-Toxics-Reduction for recommendations on recycling or disposal of vehicle waste liquids and other waste materials.
- Empty drip pans immediately after a spill or leak is collected in an uncovered area.
- Stencil warning signs at stormwater catch basins and drains, e.g., “Dump no waste – Drains to waterbody”.
- Use solid absorbents, e.g., clay and peat absorbents and rags for cleanup of liquid spills/leaks, where practicable.
- Promptly repair/replace/reseal damaged paved areas at industrial facilities.

- Recycle materials, such as oils, solvents, and wood waste, to the maximum extent practicable.

Note: Evidence of stormwater contamination by oils and grease can include the presence of visible sheen, color, or turbidity in the runoff, or present or historical operational problems at the facility. Operators can use simple pH tests, for example with litmus or pH paper. These tests can screen for high or low pH levels (anything outside a 6.5-8.5 range) due to contamination in stormwater.

S455 BMPs for Spill Prevention and Cleanup

Description of Pollutant Sources: Spills and leaks can damage public infrastructure, interfere with sewage treatment, and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

Applicable BMPs:

Spill Prevention

- Clearly label or mark all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

Spill Plan

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be posted at multiple locations. Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals used at the facility.
- Designate spill response employees to be on-site during business activities. Provide a current list of the names and telephone numbers (home and office) of designated spill response employees who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals, inlets/catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of all spill kits in

the spill plan.

- List the names and telephone numbers of public agencies to contact in the event of a spill.

Spill Cleanup Kits

- Store all cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the types and quantities of materials stored or otherwise used at the facility, and refilled when the materials are used. Spill kits must be located within 25 feet of all fueling/fuel transfer areas, including on-board mobile fuel trucks.

  Note: Ecology recommends that the kit(s) include salvage drums or containers, such as high density polyethylene, polypropylene or polyethylene sheet-lined steel; polyethylene or equivalent disposal bags; an emergency response guidebook; safety gloves/clothes/equipment; shovels or other soil removal equipment; and oil containment booms and absorbent pads; all stored in an impervious container.

Spill Cleanup and Proper Disposal of Waste

- Stop, contain, and clean up all spills immediately upon discovery.
- Implement the spill plan immediately.
- Contact the designated spill response employees.
- Block off and seal nearby inlets/catch basins to prevent materials from entering the drainage system or combined sewer.
- Use the appropriate material to clean up the spill.
- Do not use emulsifiers or dispersants such as liquid detergents or degreasers unless disposed of proplerly. Emulsifiers and dispersants are not allowed to be used on surface water, or in a place where they may enter storm drains, surface waters, treatments systems, or sanitary sewers.
- Immediately notify Ecology and the local jurisdiction if a spill has reached or may reach a sanitary or storm sewer, ground water, or surface water. Notification must comply with state and federal spill reporting requirements.
- Do not wash absorbent material into interior floor drains or inlets/catch basins.
- Place used spill control materials in appropriate containers and dispose of according to regulations.

S456 BMPs for Employee Training

Train all employees that work in pollutant source areas about the following topics:

- Identifying Pollution Prevention Team Members.
- Identifying pollutant sources.

- Understanding pollutant control measures.
- Spill prevention and response.
- Emergency response procedures.
- Handling practices that are environmentally acceptable. Particularly those related to vehicle/equipment liquids such as fuels, and vehicle/equipment cleaning.

Additional specialized training may be needed for staff who will be responsible for handling hazardous materials.

S457 BMPS for Inspections

Qualified personnel shall conduct inspections monthly. Make and maintain a record of each inspection on-site. The following requirements apply to inspections:

- Be conducted by someone familiar with the facility's site, operations, and BMPs.
- Verify the accuracy of the pollutant source descriptions in the SWPPP.
- Assess all BMPs that have been implemented for effectiveness and needed maintenance and locate areas where additional BMPs are needed.
- Reflect current conditions on the site.
- Include written observations of the presence of floating materials, suspended solids, oil and grease, discoloration, turbidity and odor in the stormwater discharges; in outside vehicle maintenance/repair; and liquid handling, and storage areas. In areas where acid or alkaline materials are handled or stored use a simple litmus or pH paper to identify those types of stormwater contaminants where needed.
- Eliminate or obtain a permit for unpermitted non-stormwater discharges to storm drains or receiving waters, such as process wastewater and vehicle/equipment washwater.
- Identify actions to address inspection deficiencies.

S458 BMPs for Record Keeping

See the applicable permit for specific record-keeping requirements and retention schedules for the following reports. At a minimum, retain the following reports for five years:

- Inspection reports which should include:
    - Time and date of the inspection
    - Locations inspected
    - Statement on status of compliance with the permit
    - Summary report of any remediation activities required
    - Name, title, and signature of person conducting the inspection

- Reports on spills of oil or hazardous substances in greater than Reportable Quantities (Code of Federal Regulations Title 40 Parts 302.4 and 117). Report spills of the following: antifreeze, oil, gasoline, or diesel fuel, that cause:
    - A violation of the State of Washington's Water Quality Standards.
    - A film or sheen upon or discoloration of the waters of the State or adjoining shorelines.
    - A sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

  To report a spill or to determine if a spill is a substance of a Reportable Quantity, call the Ecology regional office and ask for an oil spill operations or a dangerous waste specialist:

    - Northwest Region (425)649-7000
    - Southwest Region (360)407-6300
    - Eastern Region (509)329-3400
    - Central Region (509) 575-2490

  In addition, call the Washington Emergency Management Division at 1-800-258-5990 or 1-800-OILS-911 AND the National Response Center at 1-800-424-8802.

  Also, refer to *Focus on Emergency Spill Response* (Ecology, 2009).

The following is additional recommended record keeping:

Maintain records of all related pollutant control and pollutant generating activities such as training, materials purchased, material use and disposal, maintenance performed, etc.

V-11 Miscellaneous LID BMPs

V-11.1 Introduction to Miscellaneous LID BMPs

BMPs in this chapter have been grouped because they have the following in common:

- They employ Low Impact Development (LID) Principles
- They cannot be used to meet I-3.4.6 MR6: Runoff Treatment
- They cannot, by themselves, be used to meet the Flow Control Performance Standard or the LID Performance Standard.
    - Some of the BMPs in this chapter do allow for some amount of Flow Control credit. See the guidance for each individual BMP for details.
- The design methods for each BMP in this chapter are unique. They do not have strong enough design similarities to other BMPs in this volume to place them in the other BMP categories identified in this volume.

BMP T5.13: Post-Construction Soil Quality and Depth

Purpose and Definition

Naturally occurring (undisturbed) soil and vegetation provide important stormwater functions including: water infiltration; nutrient, sediment, and pollutant adsorption; sediment and pollutant biofiltration; water interflow storage and transmission; and pollutant decomposition. These functions are largely lost when development strips away native soil and vegetation and replaces it with minimal topsoil and sod. Not only are these important stormwater functions lost, but such landscapes themselves become pollution generating pervious surfaces due to increased use of pesticides, fertilizers and other landscaping and household/industrial chemicals, the concentration of pet wastes, and pollutants that accompany roadside litter.

Establishing soil quality and depth regains greater stormwater functions in the post development landscape, provides increased treatment of pollutants and sediments that result from development and habitation, and minimizes the need for some landscaping chemicals, thus reducing pollution through prevention.

Applications and Limitations

Establishing a minimum soil quality and depth is not the same as preservation of naturally occurring soil and vegetation. However, establishing a minimum soil quality and depth will provide improved on-site management of stormwater flow and water quality.

Soil organic matter can be attained through numerous materials such as compost, composted woody material, biosolids, and forest product residuals. It is important that the materials used to

meet this BMP be appropriate and beneficial to the plant cover to be established. Likewise, it is important that imported topsoils improve soil conditions and do not have an excessive percent of clay fines.

This BMP can be considered infeasible on till soil slopes greater than 33 percent.

Design Guidelines

Soil Retention

Retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable. 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, to be reapplied to other portions of the site where feasible.

Soil Quality

All areas subject to clearing and grading that have not been covered by impervious surface, incorporated into a drainage facility or engineered as structural fill or slope shall, at project completion, demonstrate the following:

1. A topsoil layer with a minimum organic matter content of 10% dry weight in planting beds, and 5% organic matter content in turf areas, and a pH from 6.0 to 8.0 or matching the pH of the undisturbed soil. The topsoil layer shall have a minimum depth of eight inches except where tree roots limit the depth of incorporation of amendments needed to meet the criteria. Subsoils below the topsoil layer should be scarified at least 4 inches with some incorporation of the upper material to avoid stratified layers, where feasible.
2. Mulch planting beds with 2 inches of organic material.
3. Use compost and other materials that meet the following organic content requirements:
    a. The organic content for “pre-approved” amendment rates can be met only using compost meeting the compost specification for BMP T7.30: Bioretention, with the exception that the compost may have up to 35% biosolids or manure.

       The compost must also have an organic matter content of 40% to 65%, and a carbon to nitrogen ratio below 25:1.

       The carbon to nitrogen ratio may be as high as 35:1 for plantings composed entirely of plants native to the Puget Sound Lowlands region.

    b. Calculated amendment rates may be met through use of composted material meeting (a.) above; or other organic materials amended to meet the carbon to nitrogen ratio requirements, and not exceeding the contaminant limits identified in Table 220-B, Testing Parameters, in WAC 173-350-220.

The resulting soil should be conducive to the type of vegetation to be established.

Implementation Options

The soil quality design guidelines listed above can be met by using one of the methods listed below:

1. Leave undisturbed native vegetation and soil, and protect from compaction during construction.
2. Amend existing site topsoil or subsoil either at default "pre-approved" rates, or at custom calculated rates based on tests of the soil and amendment.
3. Stockpile existing topsoil during grading, and replace it prior to planting. Stockpiled topsoil must also be amended if needed to meet the organic matter or depth requirements, either at a default "pre-approved" rate or at a custom calculated rate.
4. Import topsoil mix of sufficient organic content and depth to meet the requirements.

More than one method may be used on different portions of the same site. Soil that already meets the depth and organic matter quality standards, and is not compacted, does not need to be amended.

Planning/Permitting/Inspection/Verification Guidelines & Procedures

Local governments are encouraged to adopt guidelines and procedures similar to those recommended in *Building Soil: Guidelines and Resources for Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington* (Stenn et al., 2016).

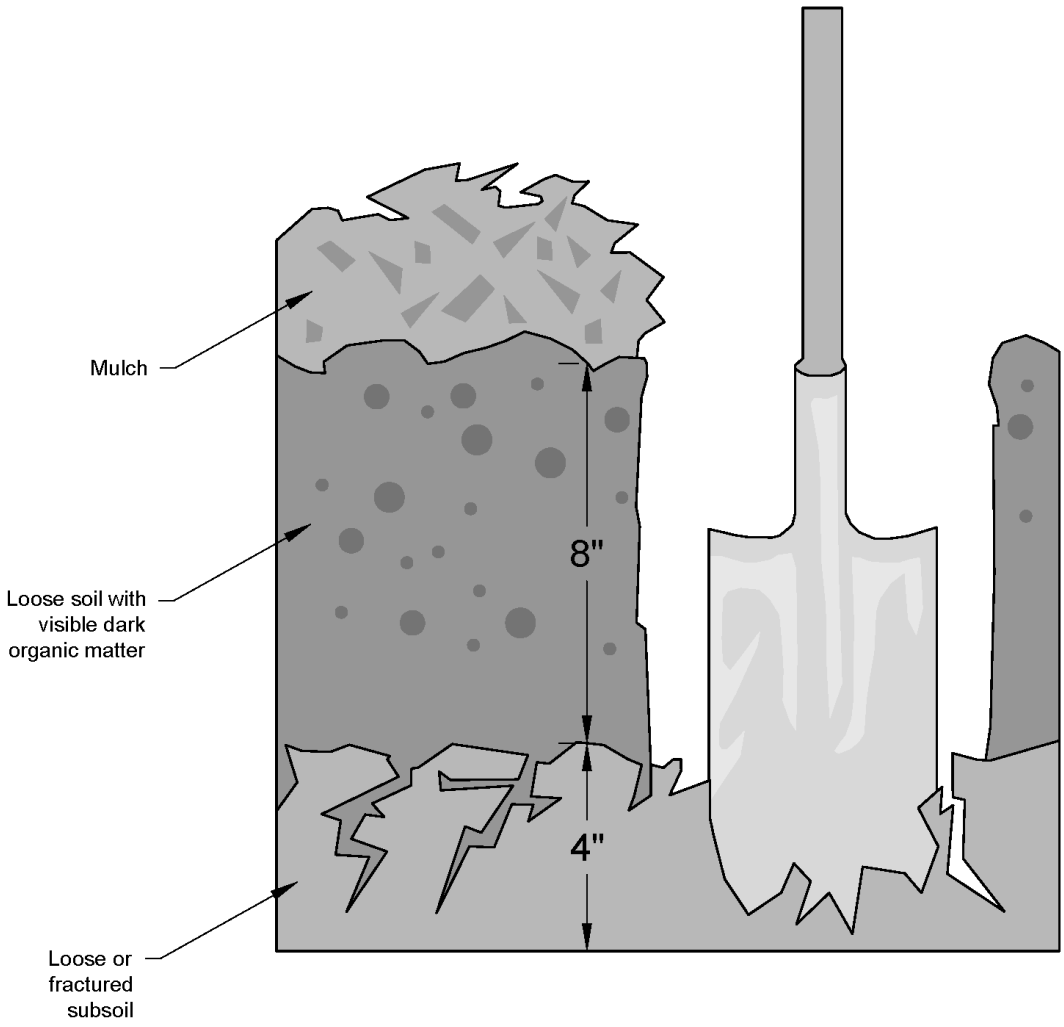
Maintenance

- 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 vegetation and mulch the amended soil area 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.

Runoff Model Representation

All areas meeting the soil quality and depth design criteria may be entered into approved runoff models as "Pasture" rather than "Lawn/Landscaping".

Figure V-11.1: Planting Bed Cross-Section



Reprinted from *Guidelines and Resources For Implementing Soil Quality and Depth BMP T5.13 in WDOE Stormwater Management Manual for Western Washington*, 2010, Washington Organic Recycling Council

NOT TO SCALE

DEPARTMENT OF ECOLOGY
State of Washington

Planting Bed Cross-Section

Revised June 2016

Appendix C: Site Inspection Form

Construction Stormwater Site Inspection Form

Project Name _____ Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*
Print Name: _____

Approximate rainfall amount since the last inspection (in inches): _____

Approximate rainfall amount in the last 24 hours (in inches): _____

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (*check all that apply*):

Pre Construction/installation of erosion/sediment controls	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes ___ No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen Yes ___ No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*) Yes ___ No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?* Yes ___ No ___
5. If yes to #4 was it reported to Ecology? Yes ___ No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes ___ No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

_____

_____

_____

_____

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: Date: _____

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
Turbidity	tube, meter, laboratory				
pH	Paper, kit, meter				

Construction Stormwater Site Inspection Form

D. Check the observed status of all items. Provide "Action Required "details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						
	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

Construction Stormwater Site Inspection Form

F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

Sign the following certification:

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) _____ (Signature) _____ Date: _____

Title/Qualification of Inspector: _____