Construction Stormwater Pollution Prevention Plan

PREPARED FOR:

Mr. Don Huber
SPP Manufacturing
PO Box 64160
Tacoma, WA 98465

PROJECT:

Puyallup 2nd Street Apartments
XXX 2nd Street NE
Puyallup, WA
2190606.10

PREPARED BY:

Allyson Burket
Project Engineer

REVIEWED BY:

J. Matthew Weber, PE
Principal

DATE:

December 2021
Revised August 2022
Revised February 2024

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02/07/2024

I hereby state that this Construction Stormwater Pollution Prevention Plan for the Puyallup 2nd Street Apartments project has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community for professional engineers. I understand that City of Puyallup does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

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1.0 Introduction

In 1972, Congress passed the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act (CWA), to restore and maintain the quality of the nation's waterways. The ultimate goal was to ensure rivers and streams were fishable, swimmable, and drinkable. In 1987, the Water Quality Act (WQA) added provisions to the CWA that allowed the Environmental Protection Agency to govern stormwater discharges from construction sites. The National Pollutant Discharge Elimination System (NPDES) General Permit includes provisions for development of a Stormwater Pollution Prevention Plan (SWPPP) to maximize the potential benefits of pollution prevention and sediment and erosion control measures at construction sites.

The proposed project will disturb more than 1 acre of area, and therefore is required to obtain an NPDES General Permit for Stormwater Associated with Construction Activities.

The 2019 Department of Ecology (DOE) *Stormwater Management Manual for Western Washington (SWMMWW)* requires a Construction SWPPP for projects that add or replace more than 2,000 square feet of impervious surfaces. The proposed project will exceed this threshold; therefore, a Construction SWPPP is required.

Development, implementation, and maintenance of the Construction SWPPP will provide the selected General Contractor with the framework for reducing soil erosion and minimizing pollutants in stormwater during construction of the proposed project. The Construction SWPPP will:

- Define the characteristics of the site and the type of construction that will occur.
- Describe the practices that will be implemented to control erosion and the release of pollutants in stormwater.
- Create an implementation schedule to ensure that the practices described in this Construction SWPPP are in fact implemented, and to evaluate the plan's effectiveness in reducing erosion, sediment, and pollutant levels in stormwater discharged from the site.
- Describe the final stabilization/termination design to minimize erosion and prevent stormwater impacts after construction is complete.

This Construction SWPPP:

- Identifies the Certified Erosion and Sedimentation Control Lead (CESCL) with a description of this person's duties.
- Identifies the Stormwater Pollution Prevention Team (SWPP Team) that will assist in implementation of the Construction SWPPP during construction.
- Describes the existing site conditions, including existing land use for the site, the soil types at the site, as well as the location of surface waters that are located on or next to the site.
- Identifies the body or bodies of water that will receive runoff from the construction site, including the ultimate body of water that receives the stormwater.
- Identifies the drainage areas and potential stormwater contaminants.
- Describes the stormwater management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment, and pollutants in stormwater discharge.
- Describes the facility monitoring plan and how controls will be coordinated with construction activities.
- Describes the implementation schedule and provisions for amendment of the plan.

2.0 Project Description

2.1 Site Location

The Puyallup 2nd Street Apartments project proposes to develop 0.77 acre in Puyallup, Washington. The project is located northeast of the intersection of 2nd Street NE and 5th Avenue NE on Tax Parcel 7600200051.

2.2 Construction Type

Site development activities include the following sequence of work:

1. **Grading and Drainage Facility Construction:** Work consists of site grading for the proposed apartments, parking lot, and drainage facilities.

2. **Utility Construction:** Work consists of water and sewer utilities.

3. **Surfacing and Landscaping:** Work consists of asphalt and permeable concrete paving associated with the proposed parking lot and sidewalks. Disturbed vegetation areas will be seeded or mulched. BMP T5.13 Post Construction Soil Quality and Depth will be implemented in all landscape areas deemed not to be structural in nature.

2.3 Existing Site Conditions

The existing 0.77-acre site is primarily undeveloped. A gravel road cuts through the southeast corner of the site, connecting the neighboring property to 5th Avenue NE. The remaining ground cover is grass. The project is bounded by 2nd Street NE to the west and 5th Avenue NE to the south. Existing improvements along both roads consist of curb, gutter, and paved sidewalk.

Existing storm drainage facilities in 2nd Street NE include piped conveyance to the Puyallup River. The project proposes to infiltrate all stormwater runoff from the developed site onsite.

2.4 Developed Conditions

The project proposes a 24-unit apartment building with an approximately 7,600-square foot footprint. Other improvements include driveways, site paving, landscaping, and improvements to the adjacent right-of-way. Proposed utilities include storm drainage, a sanitary sewer connection, and a water system. The project will connect to the frontage along 2nd Street NE and 5th Avenue NE.

3.0 Adjacent Areas and Drainage

The project is bounded by 2nd Street NE to the west and 5th Avenue NE to the south. The project is bounded to the north by an auto sales lot and a single-family residence, and to the east by a single-family residence and an apartment building. Run-on to the project site from offsite properties is not anticipated.

4.0 Critical Areas

The project is within an aquifer recharge area, as identified by the Pierce County Open platform. Refer to Exhibit C-4.

5.0 Soils

Soils at the site are mapped by the Natural Resources Conservation Service (NRCS) as predominantly “Puyallup Fine Sandy Loam.” Refer to Exhibit C-3 for the NRCS Soils Report.

A Geotechnical Engineering Report is provided as an appendix within the Storm Drainage Report for this project, under a separate cover.

6.0 Potential Erosion Problems

There are no known erosion problems with onsite soils. Site clearing and grading will be mitigated with standard temporary erosion and sediment control (TESC) practices to reduce potential for erosion. Moderate slopes and site soils for the project do not indicate potential erosion problems. Once final grades have been established, all exposed soils should be hydroseeded to obtain long-term stability.

7.0 Construction Stormwater Pollution Prevention Elements

The purpose of this section is to describe how each of the 13 Construction Stormwater Pollution Prevention Elements has been addressed and to identify the type and location of BMPs used to satisfy the required element. If an element is not applicable to the project, a reason is provided.

7.1 Preserve Vegetation / Mark Clearing Limits

Prior to beginning land-disturbing activities, clearing limits will be marked with high visibility plastic or metal fence (BMP C103). Significant vegetation to remain will be marked and protected by fencing. A tree clearing permit is required prior to tree removal.

7.2 Establish Construction Access

The proposed driveway located on 5th Avenue NE will act as the construction access point for this project. This entrance will be stabilized per BMP C105. If sediment accumulates on the pavement systems, it shall be removed by sweeping. After sweeping, the pavement may be washed with water. Washing alone is not permitted.

7.3 Control Flow Rates

A temporary sediment trap, BMP C240, will be constructed to control discharge for the site, sized to mitigate stormwater runoff up to the 10-year storm event. Temporary interceptor ditches, BMP C200, and check dams, BMP C207, will help control and direct flow through the site. Refer to Exhibit C-1 for sizing calculations. Silt fence, BMP C223, will be used along the site’s clearing limits to control runoff and mitigate discharge to neighboring properties.

7.4 Install Sediment Controls

Structural control measures will be used to reduce erosion and retain sediment on the construction site. The control measures are selected to fill specific site and seasonal conditions.

The TESC plan includes the following structural measures:

1. Place silt fence around portions of the site’s perimeter to prevent sediment-laden stormwater form being transported offsite.

2. Temporary interceptor swales with rock check dams to direct surface runoff to the proposed sediment-trapping facility.

3. Rock check dams as applicable in the interceptor swales to reduce flow velocities and remove sediment from the runoff. Sediment shall be removed before or when it reaches half of the dam's original height.

4. The temporary sediment pond will remove sediment from stormwater prior to discharge.

7.5 Stabilize Soils

During the period of May 1 through September 30, the Contractor will not be allowed to leave soils unprotected for more than seven days. Areas to be paved may be armored with crushed rock subbase in place of other stabilizing measures. During the period of October 1 through April 30, all disturbed soil areas will be covered or stabilized within two days, or 24 hours when a major storm event is predicted. To protect soil from the erosive forces of raindrops, flowing water, and wind, the following BMPs will be implemented:

- Topsoil stockpiles will be stabilized with plastic coverings (BMP C123).
- Dust control, BMP C140, will be provided by sprinkling the site with water.
- Permanent erosion control measures will include site paving and seeding of exposed soils.

For the erosion and sediment control (ESC) facilities to function properly, they must be maintained and sediment must be removed on a regular basis. Inspection and sediment removal shall be performed on all ESC facilities, as described in the inspection schedule located in Section 7.11 of this report.

7.6 Protect Slopes

Slopes shall be stabilized as described above. Temporary and permanent seeding, BMP C120, and plastic sheeting, BMP C123, will be used to reduce erosion of exposed soils on slopes. Runoff shall be directed away from slopes by grading and the use of interceptor swales.

7.7 Protect Drain Inlets

Existing storm drain inlets within 100 feet of proposed work areas shall be protected so that surface water runoff does not enter the conveyance system without first being filtered. A catch basin sediment barrier will be added where applicable. Inlets shall be inspected weekly, at a minimum, and daily during storm events.

7.8 Stabilize Channels and Outlets

Interceptor ditches are proposed for the project to divert stormwater away from the construction area and direct it to the sediment pond. The sediment pond outlet will be stabilized with riprap rockery pads to prevent erosion and check dams will be provided.

7.9 Control Pollutants

The contractor shall be responsible for controlling pollutants at the work site. Key elements, such as centralized areas for equipment and concrete truck washing, and temporary storage of debris and other stockpiled materials, are the responsibility of the Contractor.

All pollutants that occur onsite, including waste materials and demolition debris, shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on proposed landscape areas of the site.

Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste). Onsite fueling tanks shall include secondary containment.

Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and degreasing cleaning operations, fuel tank drain down and removal, and other activities that may result in discharge or spillage of pollutants to the ground or into stormwater runoff will not be permitted.

BMPs shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources. These sources include, but are not limited to, bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Stormwater discharges shall not cause or contribute to a violation of the water quality standard for pH in the receiving water.

Table 1 below lists several pollutants that are commonly found on construction sites that have the potential to contaminate storm runoff. These pollutants will be present mainly in areas of building and pavement construction. The Contractor and CESCL will be responsible for identifying areas where these pollutants are being used and will monitor runoff coming from these areas. Pollutant sources will be covered with plastic if contaminated runoff is observed from these areas. If contaminated runoff is found in the sediment trap or soils, the CESCL will direct the Contractor to remove the polluted water/soil and dispose of it in an approved area offsite.

Table 1 – Potential Construction Site Stormwater Pollutants

Trade Name Material	Chemical/Physical Description [(1)]	Stormwater Pollutants [(1)]
Pesticides (insecticides, fungicides, herbicide, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand
Glue, adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, Stoddard solvent, talc, calcium carbonate, arsenic
Curing compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion	Solid Particles	Soil, sediment

[(1)] Data obtained from MSDS when available

7.10 Control Dewatering

Large volumes of dewatering of construction areas or utilities are not anticipated because groundwater is not likely to be encountered at elevations of proposed utility construction.

7.11 Maintain BMPs

For the ESC facilities to function properly, they must be maintained and sediment must be removed on a regular basis. Inspection and sediment removal shall be performed on all ESC facilities, as described in the following inspection schedule.

ESC facilities shall not be allowed to fall into disrepair. All ESC facilities shall be inspected, at a minimum, according to the following schedule:

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

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

The following inspection/maintenance schedules shall be used to ensure the ESC facilities are functioning as designed:

Mulching

- Mulching shall be inspected once a week during the dry season and after every rainfall event during the wet season.
- Mulch shall be inspected to verify that the proper thickness is being maintained if applicable.
- Any areas that experience erosion shall be re-mulched and/or protected with a net or blanket. If the erosion problem is drainage related, the problem shall be fixed and the eroded area re-mulched.

Plastic Covering

- Plastic sheeting shall be inspected once a week during both the wet and dry season.
- Torn sheets must be replaced and open seams repaired.
- If the plastic begins to deteriorate due to ultraviolet radiation, it must be completely removed and replaced.
- When the plastic is no longer needed, it shall be completely removed.

Inlet Protection

- Catch basin filter inserts shall be inspected frequently, especially after storm events. If the filter becomes clogged, it should be cleaned or replaced.
- Inserts shall be replaced when tears are detected.

Silt Fence

- Any damage shall be repaired immediately.
- If concentrated flows are evident uphill of the fence, they must be intercepted and conveyed.
- Check the uphill side of the fence for signs of the fence clogging and acting as a barrier to flow, and causing channelization of flows parallel to the fence. If this occurs, replace the fence or remove the trapped sediment.
- Sediment deposits shall be removed when the deposit reaches approximately one-third the height of the silt fence, or a second silt fence shall be installed.
- If the filter fabric

Sediment Trap

- 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.

If the erosion control facilities are damaged, or if the CESCL or City determines that existing controls are inadequate, the Contractor shall install additional measures as required.

A maintenance inspection report will be made after each inspection. Copies of the report forms to be completed by the CESCL are included in Exhibit B of this CSWPPP. Completed forms will be provided to the City Inspector and will also be maintained onsite during the entire construction project. If construction activities or design modifications are made to the site plan that could impact stormwater, or if AHBL determines that the measures are not adequate to prevent erosion and the discharge of sediment from the site (based on turbidity measurements), this CSWPPP will be amended appropriately. The amended CSWPPP will have a description of the new activities that contribute to the increased pollutant loading and the planned source control activities.

7.12 Manage the Project

The following practices will be required during construction to properly manage activities:

- Comply with seasonal work limitations.
- Inspect, maintain, and repair BMPs.
- Identify a CESCL, BMP C160.
- Maintain the Construction SWPPP onsite at all times, including narrative and plans.

The success of erosion control measures is usually related to the Contractor's attention to maintenance of such measures. However, in some instances, even with proper attention being paid to erosion control, measures such as those shown on the plans are unable to prevent the discharge of turbid water. In this event, secondary measures may be required, such as construction stormwater chemical treatment (BMP C250). Also, additional cover measures may be implemented, including sodding (BMP C124) or polyacrylamide for soil erosion protection (BMP C126). Descriptions of the above-listed BMPs are provided in the 2021 Pierce County *Stormwater Management and Site Development Manual (SMSDM)* and will be provided to the Contractor, if required.

7.13 Protect Low Impact Development BMPs

Protect proposed infiltration locations form construction vehicles and equipment to the maximum extent practical.

The proposed sediment trap is designed to not impact infiltration interface of the future infiltration facility.

All Low Impact Development (LID) BMPs should be kept clean of sediment and equipment to the maximum extent practical.

8.0 Construction Sequence and Phasing

8.1 Construction Sequence

The construction sequence is described below:

1. Hold a preconstruction meeting with City of Puyallup and obtain required permits.
2. Stake or paint clearing and grading limits.
3. Provide inlet protection, as shown.
4. Construct temporary construction entrance.
5. Install silt fence and infiltration area protection.
6. Install temporary sediment trap.
7. Schedule an erosion control inspection with the City.
8. Construct permanent stormwater system and infiltration trench.
9. Provide cover measures (armoring, mulching, and hydroseeding) as required to stabilize denuded areas and prevent the transport of sediment-laden stormwater offsite.
10. The contractor shall inspect the erosion control measures a minimum of once weekly and after every storm event that produces runoff from the site. The contractor shall repair or add erosion control measures, as required.
11. Cover all areas that will be unworked for more than seven days during the dry season or two days during the wet season with straw, wood fiber mulch, compost, plastic sheeting, or equivalent.
12. After site has been permanently stabilized, remove sediment from storm pipes and catch basin sumps.
13. Coordinate with the City and engineer for final inspection.
14. Remove remaining temporary erosion control devices when area has been permanently stabilized with vegetation or surfacing, and removal is approved by the engineer and the City.

8.2 Construction Phasing

Work under this permit will be constructed in a single phase.

9.0 Construction Schedule

The majority of earth moving activities will be scheduled during the dry season. During construction, measures will be taken to prevent the transportation of sediment from the site to receiving waters. These measures include the use of:

- Stabilized Construction Entrance (BMP C105)
- Temporary and Permanent Seeding (BMP C120)
- Mulching (BMP C121)
- Plastic Covering (BMP C123)
- Dust Control (BMP C140)
- Storm Drain Inlet Protection (BMP C220)
- Silt Fence (BMP C233)

10.0 Financial/Ownership Responsibilities

The Contractor is responsible for obtaining performance and maintenance bonds in accordance with City of Puyallup requirements.

11.0 Engineering Calculations

12.0 Certified Erosion and Sediment Control Lead (CESCL)

The General Contractor shall be required to provide a CESCL prior to construction. Once this individual is identified, the City Inspector will be notified.

The Contractor will designate their CESCL here:

Name: _____

Address: _____

Phone: _____

Fax Number: _____

The CESCL is required to meet DOE certification requirements. The City Inspector will be provided with CESCL information.

The duties of the CESCL include:

- Implement the Construction SWPPP/TESC plan with the aid of the SWPP Team.
- Oversee maintenance practices identified as BMPs in the Construction SWPPP.
- Conduct or provide for inspection and monitoring activities.

- Sample stormwater for turbidity using a turbidity meter.
- Identify other potential pollutant sources and make sure they are added to the plan.
- Identify any deficiencies in the Construction SWPPP and make sure they are corrected.
- Ensure that any changes in construction plans are addressed in the Construction SWPPP.

To aid in the implementation of the Construction SWPPP, the members of the SWPP Team include the following: General Contractor, CESCL, City of Puyallup Inspector, the geotechnical engineering consultant, and AHBL.

The General Contractor will ensure that all housekeeping and monitoring procedures are implemented, while the CESCL will ensure the integrity of the structural BMPs. The SWPP Team will observe construction and erosion control practices and recommend revisions or additions to the Construction SWPPP and drawings.

This analysis is based on data and records either supplied to or obtained by AHBL, Inc. These documents are referenced within the text of the analysis. The analysis has been prepared using procedures and practices within the standard accepted practices of the industry. We conclude that this project, as proposed, will not create any new problems within the existing downstream drainage system. This project will not noticeably aggravate any existing downstream problems due to either water quality or quantity.

AHBL, Inc.

Allyson Burket
Project Engineer

AB/lsk

December 2021
Revised August 2022
Revised February 2024

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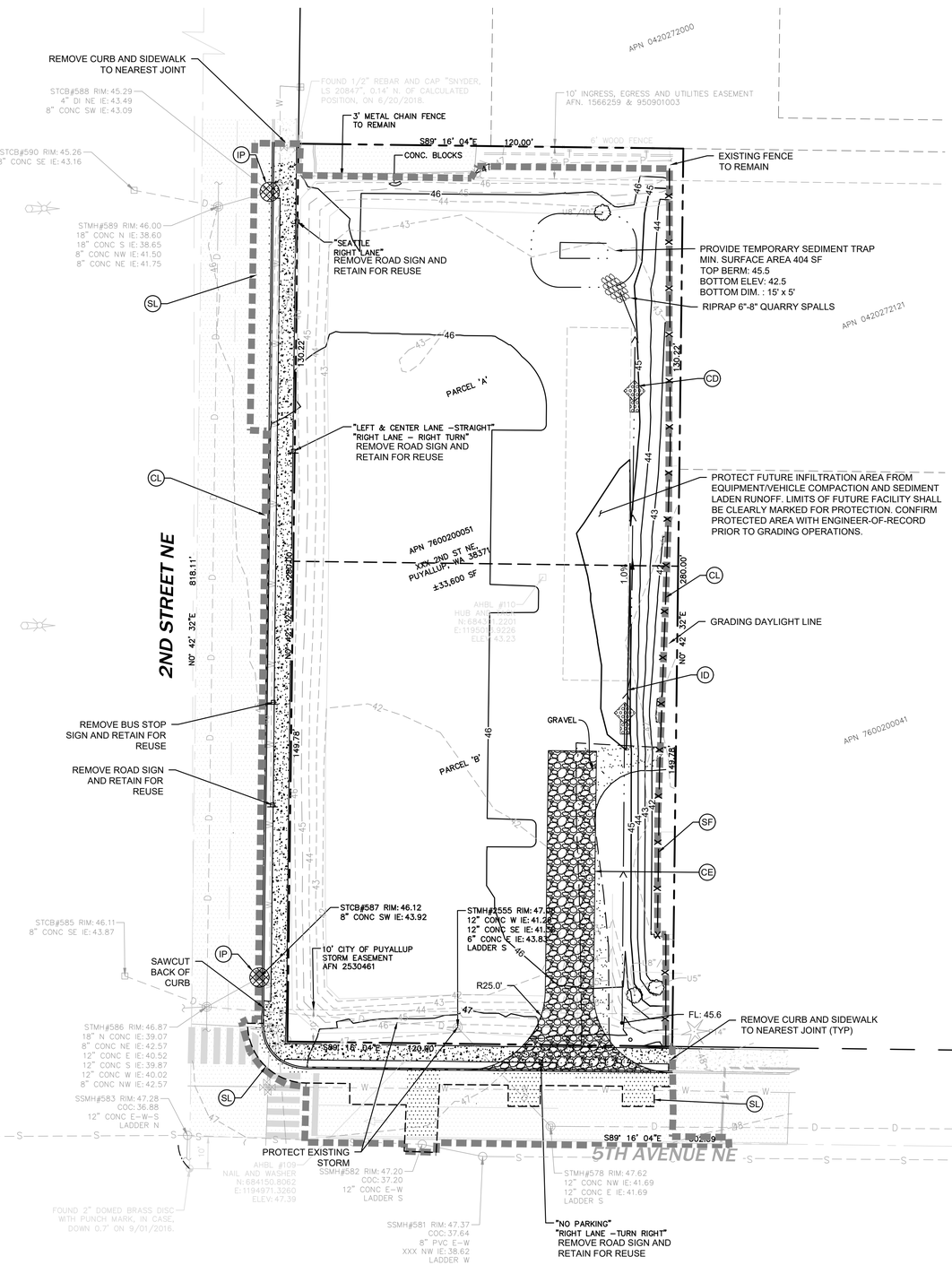
Exhibit A

TESC Plans, Notes, and Details

PUYALLUP 2ND STREET APARTMENTS

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 27, TWN. 20 N., RGE. 04 E. W.M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON.



N

GRAPHIC SCALE

0 10 20 40

1" = 20 FEET

CONSTRUCTION SEQUENCE

1. HOLD A PRECONSTRUCTION MEETING WITH THE CITY AND OBTAIN REQUIRED PERMITS.
2. STAKE OR PAINT CLEARING AND GRADING LIMITS.
3. PROVIDE INLET PROTECTION AS SHOWN.
4. CONSTRUCT TEMPORARY CONSTRUCTION ENTRANCE.
5. INSTALL SILT FENCE AND INFILTRATION AREA PROTECTION.
6. INSTALL TEMPORARY SEDIMENT TRAP.
7. SCHEDULE AN EROSION CONTROL INSPECTION WITH THE CITY.
8. CONSTRUCT PERMANENT STORMWATER SYSTEM AND INFILTRATION TRENCH.
9. PROVIDE COVER MEASURES (ARMORING, MULCHING, AND HYDROSEEDING) AS REQUIRED TO STABILIZE DENUDED AREAS AND PREVENT THE TRANSPORT OF SEDIMENT-LADEN STORMWATER OFF-SITE.
10. THE CONTRACTOR SHALL INSPECT THE EROSION CONTROL MEASURES A MINIMUM OF ONCE WEEKLY AND AFTER EVERY STORM EVENT THAT PRODUCES RUNOFF FROM THE SITE. THE CONTRACTOR SHALL REPAIR OR ADD EROSION CONTROL MEASURES AS REQUIRED.
11. COVER ALL AREAS THAT WILL BE UNWORKED FOR MORE THAN SEVEN DAYS DURING THE DRY SEASON OR TWO DAYS DURING THE WET SEASON WITH STRAW, WOOD FIBER MULCH, COMPOST, PLASTIC SHEETING OR EQUIVALENT.
12. AFTER SITE HAS BEEN PERMANENTLY STABILIZED, REMOVE SEDIMENT FROM STORM PIPES AND CATCH BASIN SUMPS.
13. COORDINATE WITH THE CITY OF PUYALLUP AND ENGINEER FOR FINAL INSPECTION.
14. REMOVE REMAINING TEMPORARY EROSION CONTROL DEVICES WHEN AREA HAS BEEN PERMANENTLY STABILIZED WITH VEGETATION OR SURFACING, AND REMOVAL IS APPROVED BY THE ENGINEER AND THE CITY OF PUYALLUP.

LEGEND

CE	CONSTRUCTION ENTRANCE	1 C1.1
	ASPHALT TO BE REMOVED	
	CONCRETE TO BE REMOVED	
SF	SILTATION FENCE	3 C1.1
CL	CLEARING/PROJECT LIMITS	
SL	SAWCUT LINE	
ID	INTERCEPTOR DITCH	2 C1.1
IP	INLET SEDIMENT PROTECTION	1 C1.1
CD	ROCK CHECK DAM	4 C1.2
	TREE TO BE REMOVED	
	TREE TO REMAIN	
	EXISTING MAJOR CONTOUR	XXX
	EXISTING MINOR CONTOUR	XXX
	PROPOSED MAJOR CONTOUR	XXX
	PROPOSED MINOR CONTOUR	XXX
	EXISTING STORM MANHOLE	
	EXISTING CATCH BASIN	

GRADING, EROSION & SEDIMENTATION CONTROL NOTES:

1. ALL WORK IN CITY RIGHT-OF-WAY REQUIRES A PERMIT FROM THE CITY OF PUYALLUP. PRIOR TO ANY WORK COMMENCING, THE GENERAL CONTRACTOR SHALL ARRANGE FOR A PRECONSTRUCTION MEETING AT CITY HALL TO BE ATTENDED BY ALL MAJOR CONTRACTORS, REPRESENTATIVES OF INVOLVED UTILITIES AND THE CITY OF PUYALLUP. CONTACT THE ENGINEERING DIVISION AT THE CITY OF PUYALLUP TO SCHEDULE THE MEETING (253-864-4165). THE CONTRACTOR IS RESPONSIBLE TO HAVE HIS SET OF PLANS AT THE MEETING.

2. AFTER COMPLETION OF ALL ITEMS SHOWN ON THESE PLANS AND BEFORE ACCEPTANCE OF THE PROJECT, THE CONTRACTOR SHALL OBTAIN A "PUNCH LIST" PREPARED BY THE CITY'S INSPECTOR DETAILING REMAINING ITEMS OF WORK TO BE COMPLETED. ALL ITEMS OF WORK SHOWN ON THESE PLANS SHALL BE COMPLETED TO THE SATISFACTION OF THE CITY PRIOR TO ACCEPTANCE OF THE WATER SYSTEM AND PROVISION OF SANITARY SEWER SERVICE.

3. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS"), WASHINGTON STATE DEPARTMENT OF TRANSPORTATION AND AMERICAN PUBLIC WORKS ASSOCIATION, WASHINGTON STATE CHAPTER, LATEST EDITION, UNLESS SUPERSEDED OR AMENDED BY THE CITY OF PUYALLUP CITY STANDARDS FOR PUBLIC WORKS ENGINEERING AND CONSTRUCTION (HEREINAFTER REFERRED TO AS THE "CITY STANDARDS").

4. A COPY OF THESE APPROVED PLANS AND APPLICABLE CITY DEVELOPER SPECIFICATIONS AND DETAILS SHALL BE ON SITE DURING CONSTRUCTION.

5. ANY REVISIONS MADE TO THESE PLANS MUST BE REVIEWED AND APPROVED BY THE DEVELOPER'S ENGINEER AND THE CITY ENGINEER PRIOR TO ANY IMPLEMENTATION IN THE FIELD. THE CITY SHALL NOT BE RESPONSIBLE FOR ANY ERRORS AND/OR OMISSIONS ON THESE PLANS.

6. THE CONTRACTOR SHALL HAVE ALL UTILITIES VERIFIED ON THE GROUND PRIOR TO ANY CONSTRUCTION. CALL (1-800-424-5555) AT LEAST 48 HOURS IN ADVANCE. THE OWNER AND HIS ENGINEER SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT EXISTS.

7. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.

8. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITTEE.

9. THE EROSION AND SEDIMENTATION CONTROL SYSTEM FACILITIES DEPICTED ON THESE PLANS ARE INTENDED TO BE MINIMUM REQUIREMENTS TO MEET ANTICIPATED SITE CONDITIONS. AS CONSTRUCTION PROGRESSES AND UNEXPECTED OR SEASONAL CONDITIONS DICTATE, FACILITIES WILL BE NECESSARY TO ENSURE COMPLETE SILTATION CONTROL ON THE SITE. DURING THE COURSE OF CONSTRUCTION, IT SHALL BE THE OBLIGATION AND RESPONSIBILITY OF THE PERMITTEE TO ADDRESS ANY NEW CONDITIONS THAT MAY BE CREATED BY HIS ACTIVITIES AND TO PROVIDE ADDITIONAL FACILITIES, OVER AND ABOVE THE MINIMUM REQUIREMENTS, AS MAY BE NEEDED TO PROTECT ADJACENT PROPERTIES, SENSITIVE AREAS, NATURAL WATER COURSES, AND/OR STORM DRAINAGE SYSTEMS.

10. APPROVAL OF THESE PLANS IS FOR GRADING, TEMPORARY DRAINAGE, EROSION AND SEDIMENTATION CONTROL ONLY. IT DOES NOT CONSTITUTE AN APPROVAL OF PERMANENT STORM DRAINAGE DESIGN, SIZE OR LOCATION OF PIPES, RESTRICTORS, CHANNELS, OR RETENTION FACILITIES.

11. ANY DISTURBED AREA WHICH HAS BEEN STRIPPED OF VEGETATION AND WHERE NO FURTHER WORK IS ANTICIPATED FOR A PERIOD OF 30 DAYS OR MORE, MUST BE IMMEDIATELY STABILIZED WITH MULCHING, GRASS PLANTING, OR OTHER APPROVED EROSION CONTROL TREATMENT APPLICABLE TO THE TIME OF YEAR IN QUESTION. GRASS SEEDING ALONE WILL BE ACCEPTABLE ONLY DURING THE MONTHS OF APRIL THROUGH SEPTEMBER INCLUSIVE. SEEDING MAY PROCEED OUTSIDE THE SPECIFIED TIME PERIOD WHENEVER IT IS IN THE INTEREST OF THE PERMITTEE BUT MUST BE AUGMENTED WITH MULCHING, NETTING, OR OTHER TREATMENT APPROVED BY THE CITY.

12. IN CASE EROSION OR SEDIMENTATION OCCURS TO ADJACENT PROPERTIES, ALL CONSTRUCTION WORK WITHIN THE DEVELOPMENT THAT WILL FURTHER AGGRAVATE THE SITUATION MUST CEASE, AND THE OWNER/CONTRACTOR WILL IMMEDIATELY COMMENCE RESTORATION METHODS. RESTORATION ACTIVITY WILL CONTINUE UNTIL SUCH TIME AS THE AFFECTED PROPERTY OWNER IS SATISFIED.

13. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

14. AT ANY TIME DURING CONSTRUCTION IT IS DETERMINED BY THE CITY THAT MUD AND DEBRIS ARE BEING TRACKED ONTO PUBLIC STREETS WITH INSUFFICIENT CLEANUP, ALL WORK SHALL CEASE ON THE PROJECT UNTIL THIS CONDITION IS CORRECTED. THE CONTRACTOR AND/OR THE OWNER SHALL IMMEDIATELY TAKE ALL STEPS NECESSARY TO PREVENT FUTURE TRACKING OF MUD AND DEBRIS INTO THE PUBLIC ROW, WHICH MAY INCLUDE THE INSTALLATION OF A WHEEL WASH FACILITY ON-SITE.

15. CONTRACTOR SHALL DESINGATE A WASHINGTON DEPARTMENT OF ECOLOGY CERTIFIED EROSION AND SEDIMENT CONTROL LEAD PERSON, AND SHALL COMPLY WITH THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THEIR PROJECT

16. SEDIMENT-LADEN RUNOFF SHALL NOT BE ALLOWED TO DISCHARGE BEYOND THE CONSTRUCTION LIMITS IN ACCORDANCE WITH THE PROJECT'S NPDES GENERAL STORMWATER PERMIT.

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.
THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.
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253.383.2422 TEL 253.383.2572 FAX www.ahbl.com WEB

Project Title:

PUYALLUP 2ND STREET APARTMENTS

Client:
SPP MANUFACTURING

P.O.BOX 64160
TACOMA, WA 98464

DON HUBER

Project No.
2190606.10

Issue Set & Date:
SITE DEVELOPMENT PERMIT SET
2/2/2024

J. MATTHEW WEBER — STATE OF WASHINGTON — 18558 — REGISTERED PROFESSIONAL ENGINEER

A
A
A
A

Revisions:

Sheet Title:

TESC AND DEMOLITION PLAN

Designed by:	Drawn by:	Checked by:
MW	MW	BB

Sheet No.

C1.0

3 of 26 Sheets

DATE: February 2, 2024 FILENAME: Q:\2019\2190606\10_CIV\CAD_Final Design\2190606-SH-TESC.dwg

PUYALLUP 2ND STREET APARTMENTS

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 27, TWN. 20 N., RGE. 04 E. W.M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON.

APPROVED

BY _____
CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

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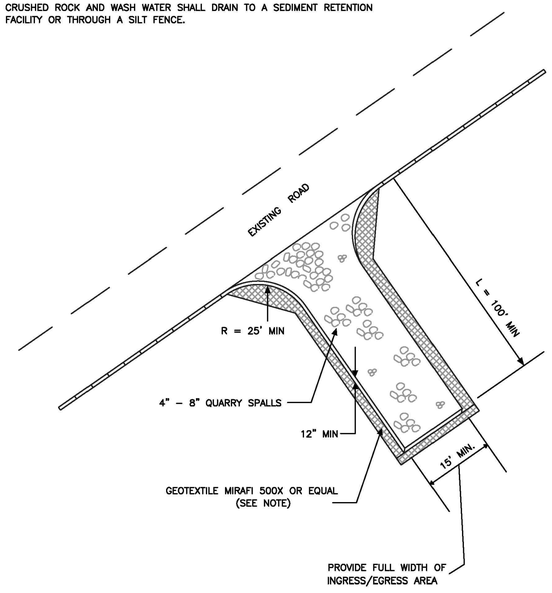
NOTE:

1. GEOTEXTILE MIRAFI 500 X OR APPROVED EQUAL SHALL BE PLACED UNDER THE ENTIRETY OF THE TEMPORARY ENTRANCE.
2. ADDITIONAL ROCK SHALL BE ADDED PERIODICALLY TO MAINTAIN PROPER FUNCTION OF THE PAD.
3. IF THE PAD DOES NOT ADEQUATELY REMOVE THE MUD FROM THE VEHICLE'S WHEELS, THE WHEELS SHALL BE HOSED OFF BEFORE THE VEHICLE ENTERS A PAVED STREET. THE WASHING SHALL BE DONE ON AN AREA COVERED WITH CRUSHED ROCK AND WASH WATER SHALL DRAIN TO A SEDIMENT RETENTION FACILITY OR THROUGH A SILT FENCE.



CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

TEMPORARY CONSTRUCTION ENTRANCE

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
JIM ERWIN-SVOBODA	LINDA LIAN	COLLEEN HARRIS	XXXX	05.01.01
FILE NAME: F:\DWG\COMMON\STDS\CITY\2009\05_GRD\05.01\05.01.01	DATE APPROVED: 07/01/2009	DATE REVISED: XX/XX/XXX	SCALE: 1:40	

1 TEMPORARY CONSTRUCTION ENTRANCE
NOT TO SCALE

1. ALL LIMITS OF CLEARING AND AREAS OF VEGETATION PRESERVATION AS PRESCRIBED ON THE PLANS SHALL BE CLEARLY FLAGGED IN THE FIELD AND OBSERVED DURING CONSTRUCTION.

2. ALL REQUIRED SEDIMENTATION AND EROSION CONTROL FACILITIES MUST BE CONSTRUCTED AND IN OPERATION PRIOR TO ANY LAND CLEARING AND/OR OTHER CONSTRUCTION TO ENSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE NATURAL DRAINAGE SYSTEM. THE CONTRACTOR SHALL SCHEDULE AN INSPECTION OF THE EROSION CONTROL FACILITIES PRIOR TO ANY LAND CLEARING AND/OR CONSTRUCTION. ALL EROSION AND SEDIMENT FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION AS DETERMINED BY THE CITY, UNTIL SUCH TIME THAT CLEARING AND/OR CONSTRUCTION IS COMPLETED AND THE POTENTIAL FOR ON–SITE EROSION HAS PASSED. THE IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE EROSION AND SEDIMENTATION CONTROL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE PERMITEE.

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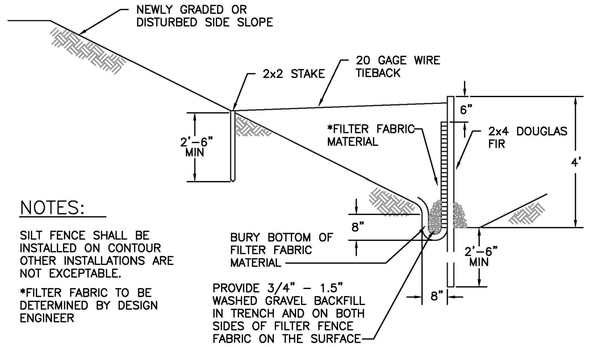
7. NO TEMPORARY OR PERMANENT STOCKPILING OF MATERIALS OR EQUIPMENT SHALL OCCUR WITHIN CRITICAL AREAS OR ASSOCIATED BUFFERS, OR THE CRITICAL ROOT ZONE FOR VEGETATION PROPOSED FOR RETENTION.

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

GRADING, EROSION, AND SEDIMENTATION CONTROL NOTES

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
JIM ERWIN-SVOBODA	LINDA LIAN	COLLEEN HARRIS	LINDA LIAN	05.02.01
FILE NAME: F:\DWG\COMMON\STDS\CITY\2009\05_GRD\05.01\05.02.01	DATE APPROVED: 07/01/2009	DATE REVISED: 11/18/2014	SCALE: 1:1	

2 GRADING AND T.E.S.C. NOTES
NOT TO SCALE

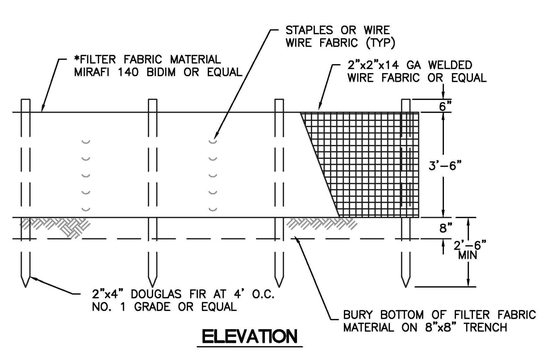


NOTES:

SILT FENCE SHALL BE INSTALLED ON CONTOUR OTHER INSTALLATIONS ARE NOT EXCEPTABLE.

*FILTER FABRIC TO BE DETERMINED BY DESIGN ENGINEER

TYPICAL CROSS SECTION



ELEVATION

CITY OF PUYALLUP
DEVELOPMENT ENGINEERING and PUBLIC WORKS DEPARTMENTS

SILTATION FENCE

DRAWN BY	CHECKED BY	APPROVED BY	REVISED BY	CITY STANDARD
LINDA LANSING	LINDA LIAN	COLLEEN HARRIS	XXXX	02.03.02
FILE NAME: F:\DWG\COMMON\STDS\CITY\2009\02_SD\02.03.02	DATE APPROVED: 09/01/1992	DATE REVISED: 06/01/2003	SCALE: NTS	

3 SILTATION FENCE
NOT TO SCALE

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Project Title:

PUYALLUP 2ND STREET APARTMENTS

Client:
SPP MANUFACTURING

P.O.BOX 64160
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DON HUBER

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SITE DEVELOPMENT PERMIT SET
2/2/2024

J. MATTHEW WEBER — STATE OF WASHINGTON — 24858 — REGISTERED PROFESSIONAL ENGINEER

Revisions:
4
3
2
1

Sheet Title:

TESC NOTES AND DETAILS

Designed by:	Drawn by:	Checked by:
MW	MW	BB

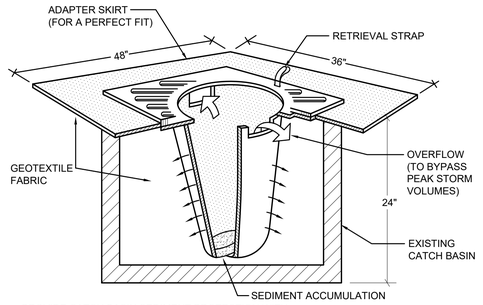
Sheet No.

C1.1

4 of 26 Sheets

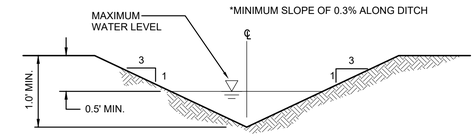
PUYALLUP 2ND STREET APARTMENTS

A PORTION OF THE NW 1/4 OF THE NW 1/4 OF SEC. 27, TWN. 20 N., RGE. 04 E. W.M.
CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON.

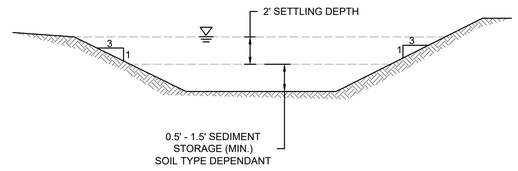


PROVIDE CATCH BASIN SEDIMENT PROTECTION WITH
STREAMGUARD BASIN INSERT #3003, FROM
BOW HEAD ENVIRONMENTAL OR EQUIVALENT.
P.O. BOX 375
PRESTON, WA 98050
PHONE: 1-800-909-3677

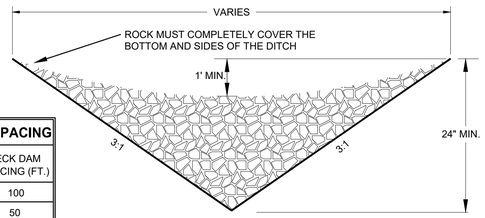
1 INLET PROTECTION
NOT TO SCALE



2 INTERCEPTOR DITCH
NOT TO SCALE

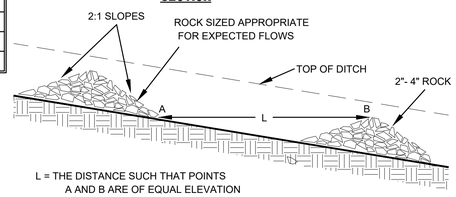


3 SEDIMENT TRAP
NOT TO SCALE



CHECK DAM SPACING	
DITCH SLOPE %	CHECK DAM SPACING (FT.)
1	100
2	50
4	25
5	20
6	15
10	10
20	5

SECTION



L = THE DISTANCE SUCH THAT POINTS
A AND B ARE OF EQUAL ELEVATION

PLAN

CHECK DAM NOTES:

1. THE MAXIMUM SPACING BETWEEN THE DAMS SHALL BE SUCH THAT THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
2. ROCK CHECK DAMS SHALL BE CONSTRUCTED OF 2- TO 4- INCH DIAMETER QUARRY SPALLS. THE QUARRY SPALLS MUST BE PLACED BY HAND OR MECHANICAL PLACEMENT (NO DUMPING OF SPALLS TO FORM DAM) TO ACHIEVE COMPLETE COVERAGE OF THE DITCH OR SWALE AND TO INSURE THAT THE CENTER OF THE DAM IS LOWER THAN THE EDGES.
3. LOG CHECK DAMS SHALL BE CONSTRUCTED OF 4- TO 6- INCH DIAMETER LOGS. THE LOGS SHALL BE EMBEDDED INTO THE SOIL AT LEAST 18 INCHES.
4. IN THE CASE OF GRASS-LINED DITCHES AND SWALES, CHECK DAMS SHALL BE REMOVED WHEN THE GRASS HAS MATURED SUFFICIENTLY TO PROTECT THE DITCH OR SWALE. THE AREA BENEATH THE CHECK DAMS SHALL BE SEEDED AND MULCHED IMMEDIATELY AFTER DAM REMOVAL.
5. CHECK DAMS SHALL BE CHECKED FOR SEDIMENT ACCUMULATION AFTER EACH SIGNIFICANT RAINFALL. SEDIMENT SHALL BE REMOVED WHEN IT REACHES ONE HALF OF THE ORIGINAL DAM HEIGHT OR BEFORE.

4 CHECK DAM
NOT TO SCALE

811 Know what's **below.** **Call** before you dig.

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APPROVED

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CITY OF PUYALLUP
DEVELOPMENT ENGINEERING

DATE _____

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DON HUBER

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2/2/2024

J. MATTHEW WEBER — STATE OF WASHINGTON — 21858 — REGISTERED PROFESSIONAL ENGINEER

Revisions:
4
3
2
1

Sheet Title:
TESC NOTES AND DETAILS

Designed by:	Drawn by:	Checked by:
MW	MW	BB

Sheet No.
C1.2
5 of 26 Sheets

Exhibit B

Inspection Logs

- Inspection and Maintenance Report Form
- Perimeter Structural Controls: Silt Fence
- Inlet Protection
- Sediment Trap

Exhibit B - Inspection Logs

On the following pages are sample inspection logs. These are only samples. Your inspection logs can be of your own design.

There must be an inspection log for each BMP. The log must indicate:

1. The date of the inspection.
2. Noted conditions.
3. If any discrepancies are noted indicate:
    a. Who is supposed to make the correction.
    b. The date by which the corrections will be completed.

Puyallup 2nd Street Apartments

Construction Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

To be completed at least once every seven calendar days and recommended within 24 hours of the end of a storm event greater than 0.5 inch.

Inspector: _____ Date: _____

Inspector's Qualifications:

Days since last rainfall: _____ Amount of last rainfall: ____ inches

Soil Stabilization Measures

Location onsite	Date of Last Disturbance	Stabilized (Yes/No)	Stabilized With	Condition

Stabilization required: *Fill out if required.*

To be performed by: _____ On or before: _____

Puyallup 2nd Street Apartments

Construction Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Perimeter Structural Controls:
Silt Fence

Date	Location	Has Silt Reached 1/3 of Fence Height?	Is Fence Properly Secured?	Is There Evidence of Washout or Overtopping?

Maintenance required for silt fence:

To be performed by: _____ On or before: _____

Puyallup 2nd Street Apartments

Construction Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Inlet Protection

Date	Depth of Sediment	Condition of Fabric

Maintenance required for inlet protection:

To be performed by: _____ On or before: _____

Puyallup 2nd Street Apartments

Construction Stormwater Pollution Prevention Plan

Inspection and Maintenance Report Form

Sediment Trap

Date	Has Sediment Reached 1-foot Depth?	Condition of Pond Embankments

Maintenance required for sediment trap:

To be performed by: _____ On or before: _____

Exhibit C

Temporary Facility Sizing

C-1 ..... TESC Calculations
C-2 ..... TESC WWHM Report
C-3 ..... NRCS Soils Report
C-4 ..... Aquifer Recharge Area Map

TEMPORARY SEDIMENT TRAP SIZING

Subbasin Name: Basin 1 ☐ Designate as Bypass for POC:

Flows To :	Surface	Interflow	Groundwater

Area in Basin ☑ Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
☑ C, Lawn, Flat	0.88		

```
Flow Frequency
Flow(cfs)   0801 15m
2 Year    =     0.0502
5 Year    =     0.0987
10 Year   =     0.1448
25 Year   =     0.2230
50 Year   =     0.2986
100 Year  =     0.3916
```

SA = 2 x Q_{10} / 0.00096
SA = 2 x (0.1448 cfs) / 0.00096
SA = 302 ft^2

AHBL
2215 North 30th Street
Suite 300
Tacoma, WA 98403
253.383.2422 TEL
253.383.2572 FAX

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	TESC
Site Name:	
Site Address:	
City:	
Report Date:	2/2/2024
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data
Predeveloped Land Use

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Lawn, Flat	0.88
Pervious Total	0.88
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.88

Element Flows To:

Surface	Interflow	Groundwater

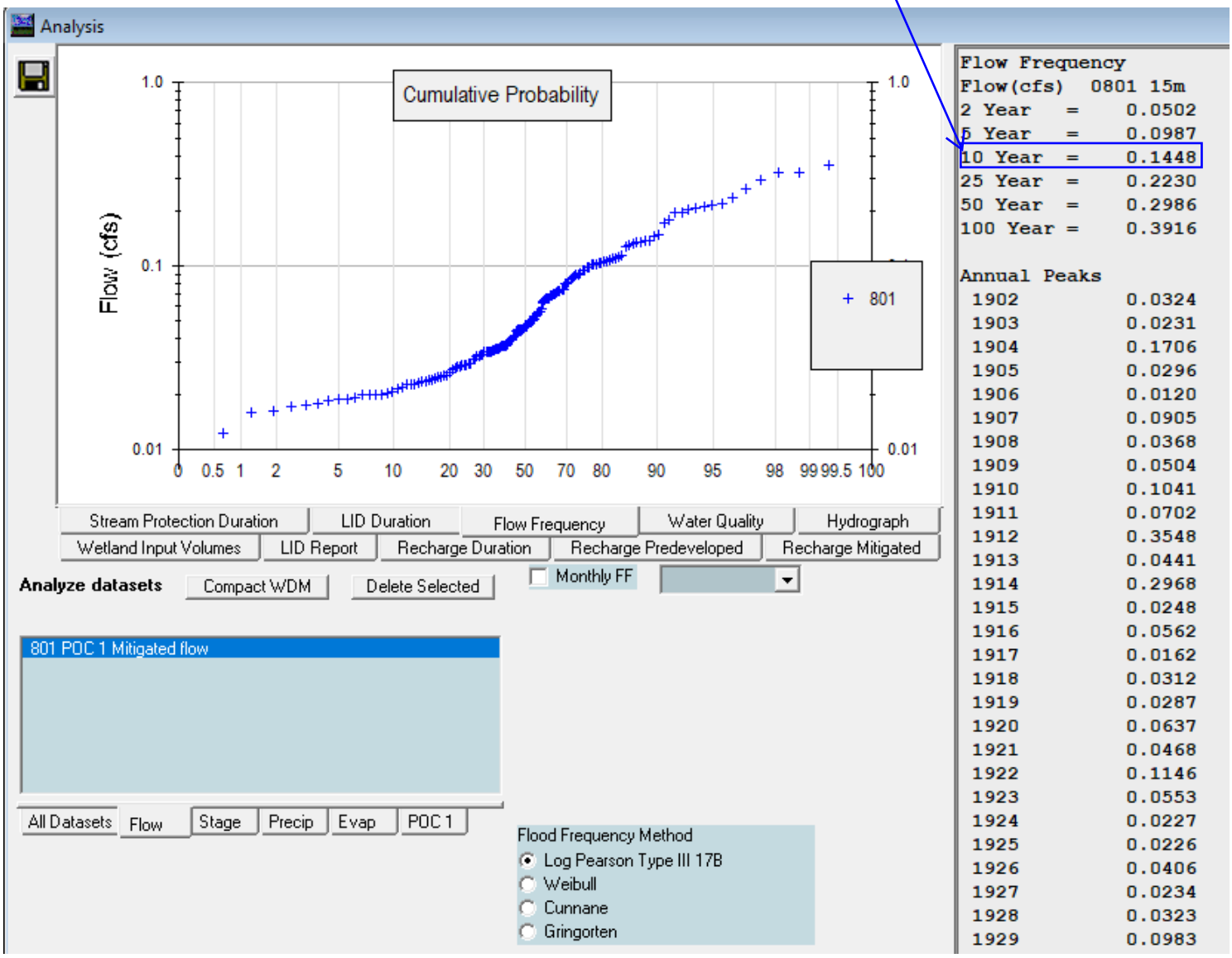
Mitigated Routing

Analysis Results

POC 1

POC #1 was not reported because POC must exist in both scenarios and both scenarios must have been run.

10 YEAR DESIGN STORM



Model Default Modifications

Total of 0 changes have been made.

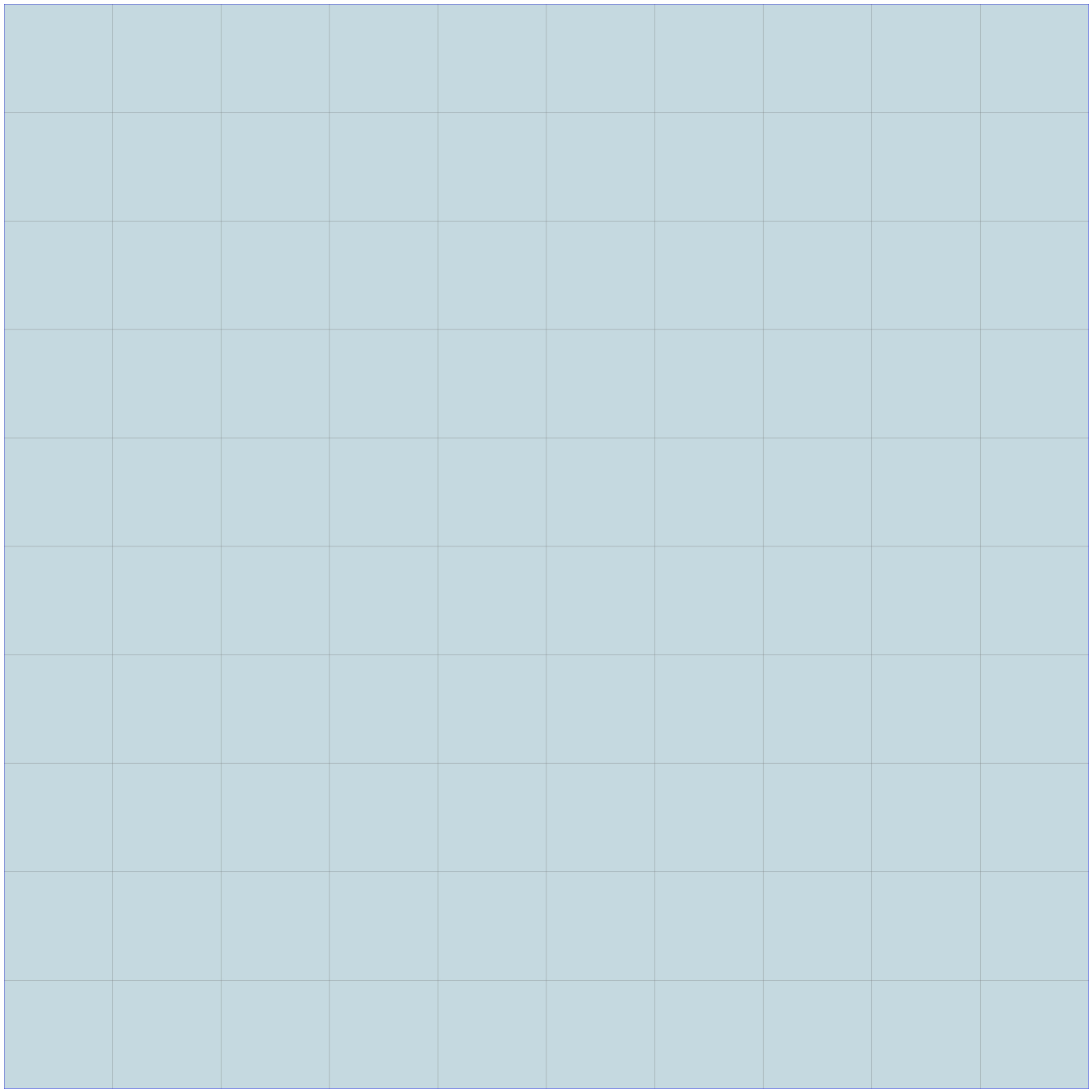
PERLND Changes

No PERLND changes have been made.

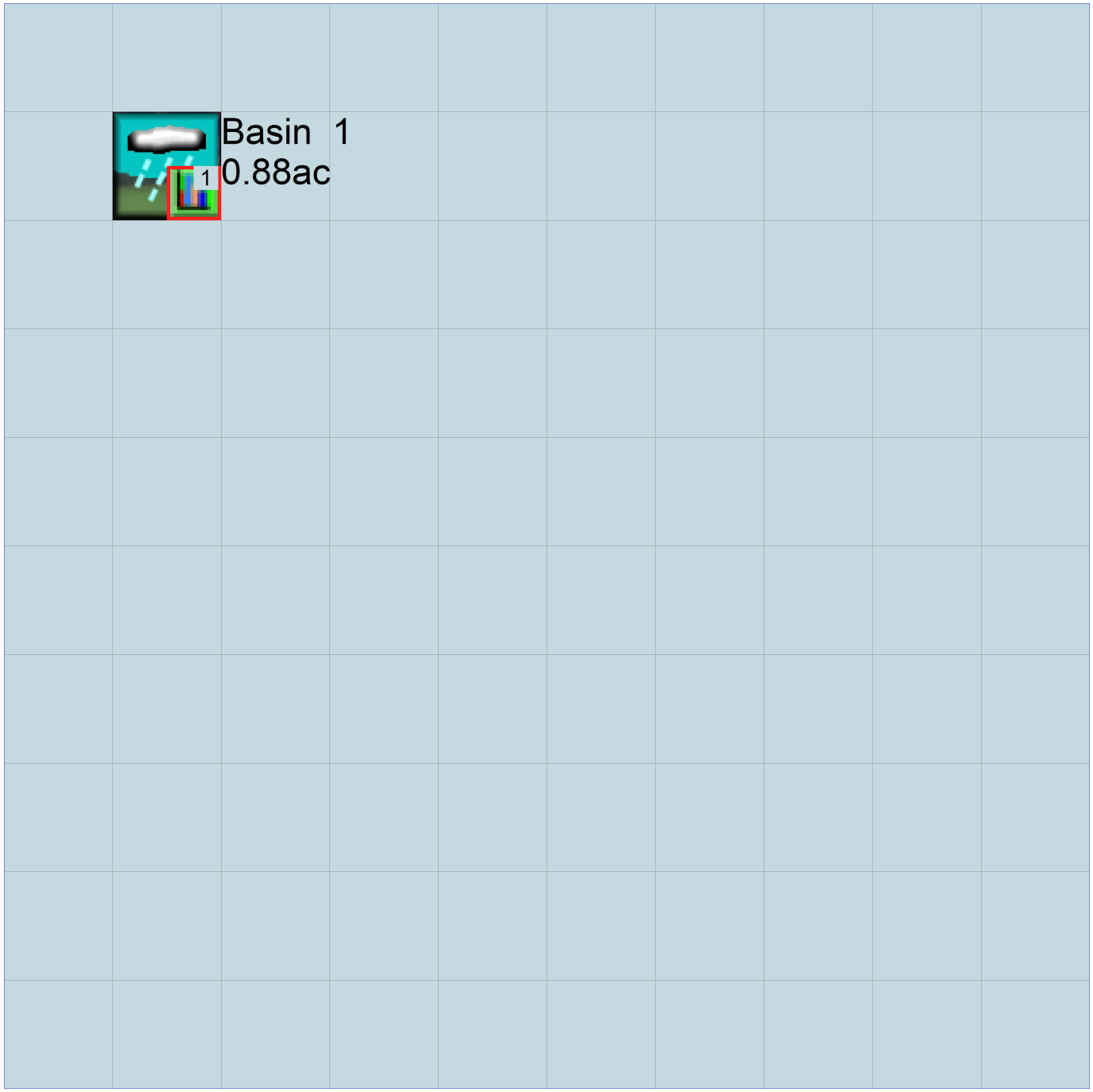
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   TESC.wdm
MESSU       25   MitTESC.MES
            27   MitTESC.L61
            28   MitTESC.L62
            30   POCTESC1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
   16     C, Lawn, Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   16         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   16         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   16         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16           0.1      0.25      0.25         6       0.5      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   16             0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                       0.88     COPY   501     12
PERLND  16                       0.88     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *      *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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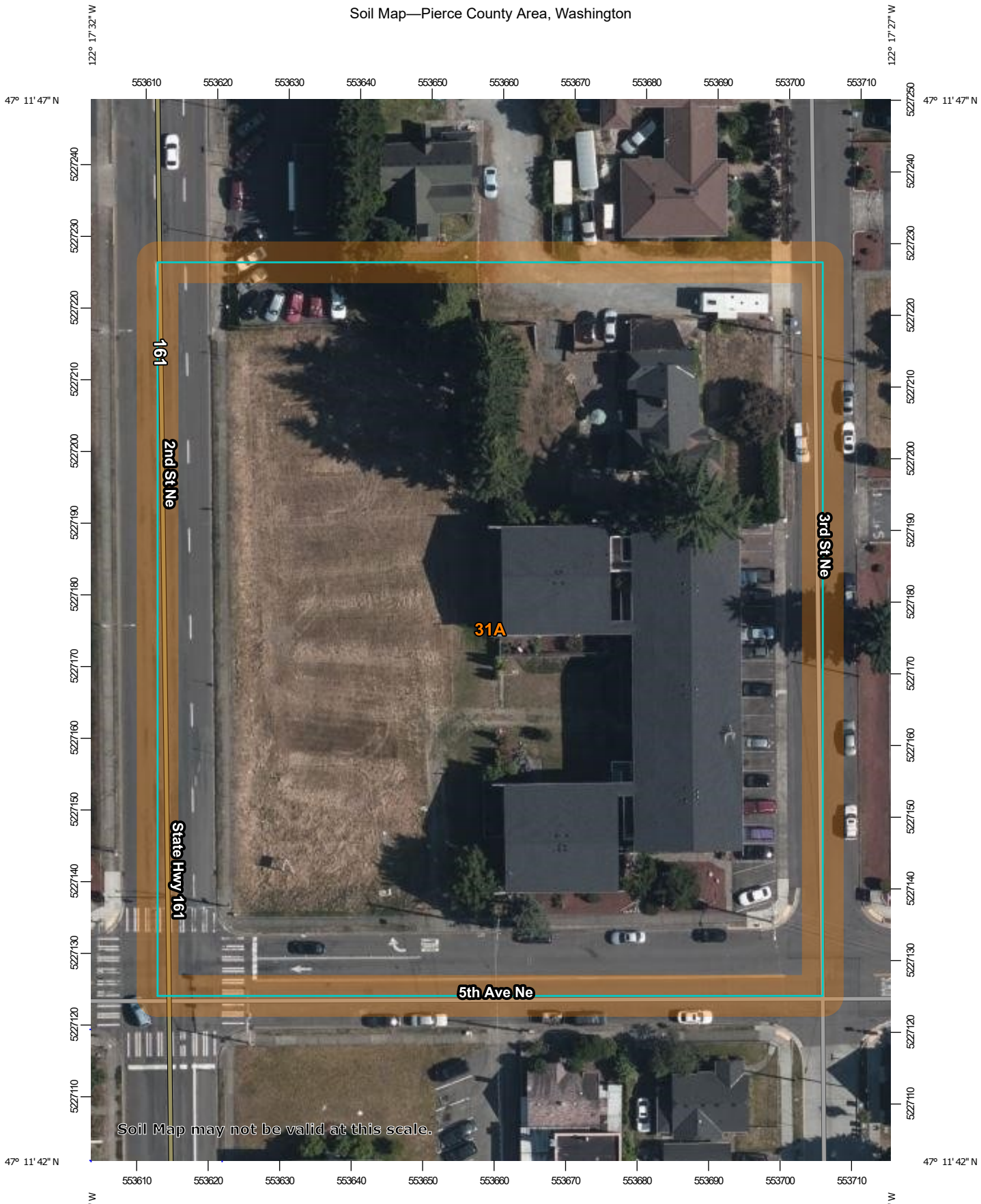


Map Scale: 1:721 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 15, Sep 16, 2019

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
31A	Puyallup fine sandy loam	2.4	100.0%
Totals for Area of Interest		**2.4**	**100.0%**

C-4

PROJECT SITE

Note:
Aquifer Recharge Areas Include land located within any of the following:
1. The Clover/Chambers Creek Upper Aquifer Basin
2. The boundaries of the two highest DRASTIC zones (rated 180 or higher).
3. The Wellhead Protection Area defined by ten year time of travel

Sources:
Map of Clover/Chambers Creek Upper Aquifer Basin Bnd.,
Tacoma-Pierce County Health Department, Waste & Water
Section Bulletin No. 1
Map of Ground Water Pollution Potential (DRASTIC Index),
National Well Association
Well Head Protection Area Source Reference on file in the
Tacoma-Pierce County Health Department

Pierce County Code Title 18E regulates activities within Aquifer Recharge Areas.

The map features are approximate and are intended only to provide an indication of said feature.
Additional areas that have not been mapped may be present.
This is not a survey. Orthophotos and other data may not align.
The County assumes no liability for variations ascertained by actual survey.
ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'.
The County makes no warranty of fitness for a particular purpose.

Aquifer Recharge Area

Legend
- County Boundaries
- Comprehensive Urban Growth Area Boundary
- Urban Growth Area Boundary
- Federal Boundary
- Aquifer - Recharge Areas
- Water body
- Rivers
- Puget Sound

Roads
- Interstate Highway
- Highway Ramp
- Limited Access State Highway
- Other State Highway
- Major Road
- Arterial

Pierce County
0 1.5 3 4.5 6
Miles

Updated January 2013

Exhibit D

Best Management Practices (BMPs)

damage from burying and smothering.

- 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.

BMP C103: High Visibility Fence

Purpose

Fencing is intended to:

1. Restrict clearing to approved limits.
2. Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
3. Limit construction traffic to designated construction entrances, exits, or internal roads.
4. 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 (p.367) 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 Entrance / Exit

Purpose

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

Conditions of Use

Construction entrances shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential construction provide stabilized construction entrances for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size/configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized entrances not shown in the initial Construction 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-4.1.1 Stabilized Construction Entrance (p.273) for details. Note: the 100’ minimum length of the entrance shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100’).

Construct stabilized construction entrances 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 entrance stabilization because these products raise pH levels in stormwater and concrete discharge to surface waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the following standards:

Grab Tensile Strength (ASTM D4751)	200 psi min.
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 paved; this can be used as a stabilized entrance. Also consider the installation of excess concrete as a stabilized entrance. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see BMP C103: High Visibility Fence (p.269)) shall be installed as necessary to restrict traffic to the construction entrance.
- Whenever possible, the entrance shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction entrances should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction entrance must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

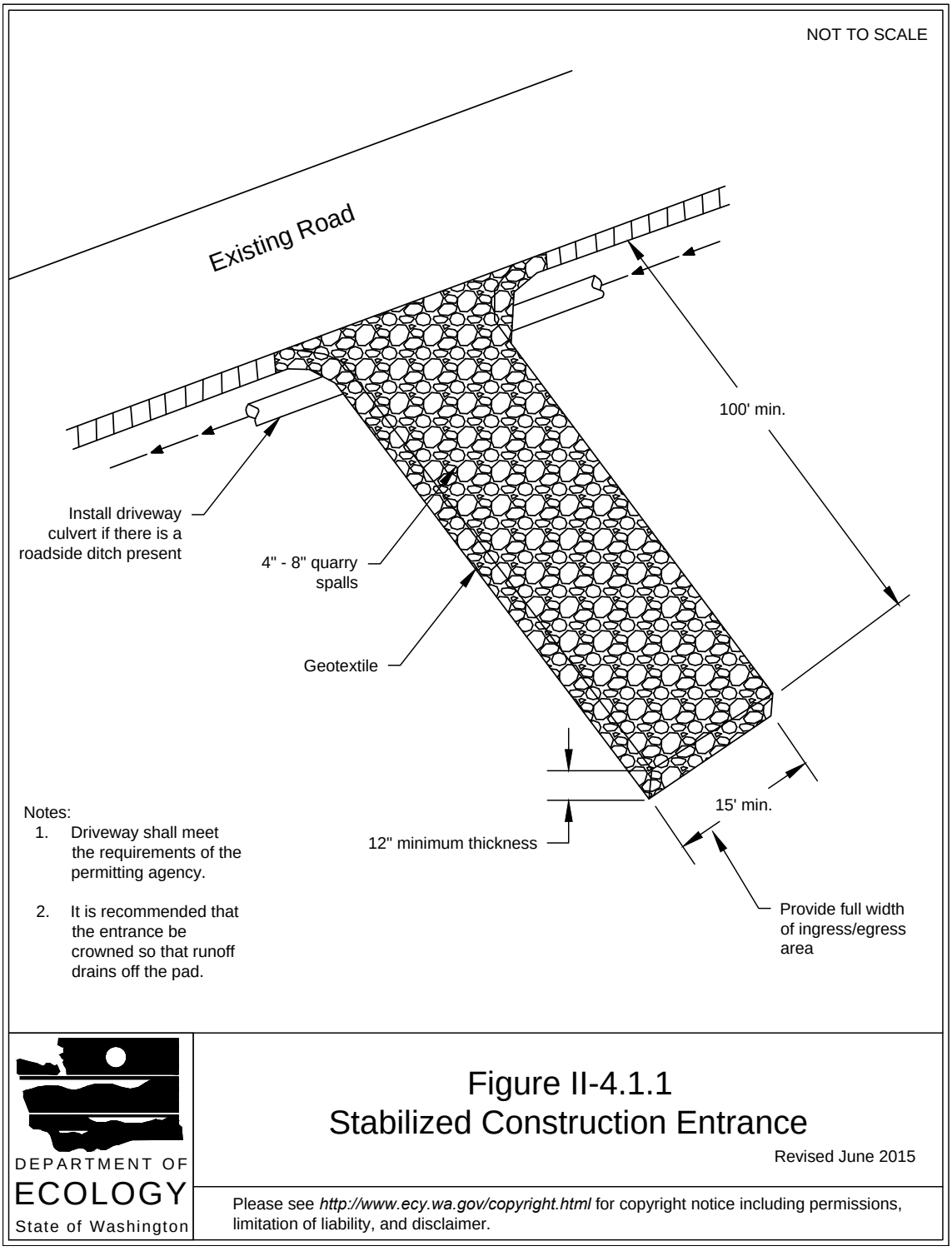
Maintenance Standards

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

- If the entrance is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the entrance, or the installation of a 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 entrance(s), fencing (see BMP C103) 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-4.1.1 Stabilized Construction Entrance



- Storm drain inlets shall be protected to prevent sediment-laden water entering the storm drain system (see BMP C220: Storm Drain Inlet Protection (p.357)).

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 with straw 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 (p.284) 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 per-

manent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion.

Design and Installation Specifications

Seed retention/detention ponds as required.

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 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 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 (p.284) 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.
- 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:

  1. Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
  2. Phase 2- Install the rest of the mulch and tackifier over the first lift.

  Or, enhance vegetation by:

  1. Installing the mulch, seed, fertilizer, and tackifier in one lift.
  2. Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
  3. 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 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 the tables below include recommended mixes for both temporary and permanent seeding.
  - Apply these mixes, with the exception of the wetland mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used.
  - Consult the local suppliers or the local conservation district for their recommendations because 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.
  - Other mixes may be appropriate, depending on the soil type and hydrology of the area.
- Table II-4.1.2 Temporary Erosion Control Seed Mix (p.280) lists the standard mix for areas requiring a temporary vegetative cover.

Table II-4.1.2 Temporary Erosion Control Seed Mix

	% Weight	% Purity	% Germination
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

- Table II-4.1.3 Landscaping Seed Mix (p.281) lists a recommended mix for landscaping seed.

Table II-4.1.3 Landscaping Seed Mix

	% Weight	% Purity	% Germination
Perennial rye blend *Lolium perenne*	70	98	90
Chewings and red fescue blend *Festuca rubra var. commutata* or *Festuca rubra*	30	98	90

- Table II-4.1.4 Low-Growing Turf Seed Mix (p.281) lists a turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.

Table II-4.1.4 Low-Growing Turf Seed Mix

	% Weight	% Purity	% Germination
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

- Table II-4.1.5 Bioswale Seed Mix* (p.281) lists a mix for bioswales and other intermittently wet areas.

Table II-4.1.5 Bioswale Seed Mix*

	% Weight	% Purity	% Germination
Tall or meadow fescue *Festuca arundinacea* or *Festuca elatior*	75-80	98	90
Seaside/Creeping bentgrass *Agrostis palustris*	10-15	92	85
Redtop bentgrass *Agrostis alba* or *Agrostis gigantea*	5-10	90	80
* Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix			

- Table II-4.1.6 Wet Area Seed Mix* (p.282) lists a low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Apply

this mixture at a rate of 60 pounds per acre. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.

Table II-4.1.6 Wet Area Seed Mix*

	% Weight	% Purity	% Germination
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
* Modified Briargreen, Inc. Hydroseeding Guide Wetlands Seed Mix			

- Table II-4.1.7 Meadow Seed Mix (p.282) lists 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.

Table II-4.1.7 Meadow Seed Mix

	% Weight	% Purity	% Germination
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 of mulch with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Installed products per manufacturer's instructions. 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.

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 design engineer 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 at the following web sites:

    1. WSDOT (Section 3.2.4):

       http://www.wsdot.wa.gov/NR/rdonlyres/3B41E087-FA86-4717-932D-D7A8556CCD57/0/ErosionTrainingManual.pdf

    2. Texas Transportation Institute:

       http://www.txdot.gov/business/doing_business/product_evaluation/erosion_control.htm

- Use jute matting in conjunction with mulch (BMP C121: Mulching (p.284)). 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 they break 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-4.1.3 Channel Installation

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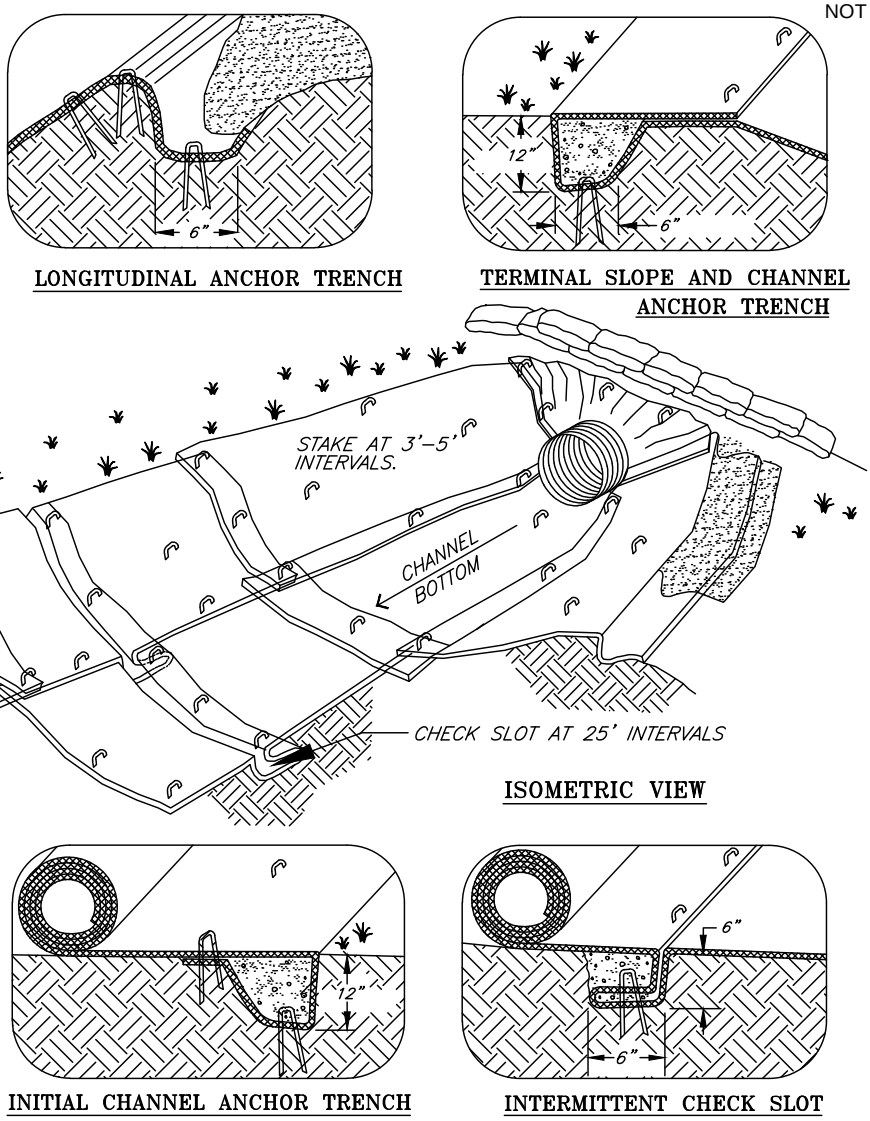

Source: Clackamas County 2009 Erosion Prevention Planning and Design Manual

Notes:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.

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Figure II-4.1.3
Channel Installation

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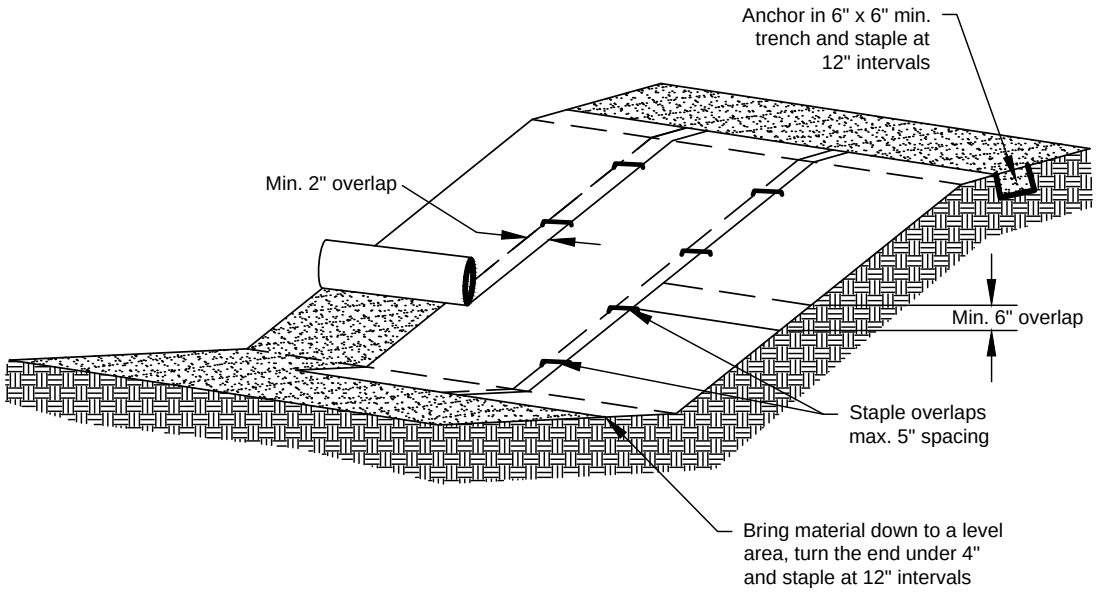
Figure II-4.1.4 Slope Installation



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.

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Figure II-4.1.4
Slope Installation

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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. Note: The relatively rapid breakdown of most polyethylene sheeting makes it unsuitable for long-term (greater than six months) applications.
- 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.
- While plastic is inexpensive to purchase, the added cost of installation, maintenance, removal, and disposal make this an expensive material, up to $1.50-2.00 per square yard.
- 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 covey 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:
    1. Temporary ditch liner.
    2. Pond liner in temporary sediment pond.
    3. Liner for bermed temporary fuel storage area if plastic is not reactive to the type of fuel being stored.
    4. Emergency slope protection during heavy rains.
    5. 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 slope, not across slope.
    2. Plastic may be installed perpendicular to a slope if the slope length is less than 10 feet.
    3. Minimum of 8-inch overlap at 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 Equivalent

Ecology has approved products as able to meet the requirements of BMP C123: Plastic Covering. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

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

- In areas (including roadways) subject to surface and air movement of dust where on-site and 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 surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to BMP C105: Stabilized Construction Entrance / Exit (p.270).
- 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 (p.300)) added to water at a rate of 0.5 lbs. 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 actually reduce the quantity of water needed for dust control. Use of PAM could be a cost-effective dust control method.

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.
- Restrict use of paved roadways by tracked vehicles and heavy trucks to prevent damage to road surface and base.
- 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.
- Pave unpaved permanent roads and other trafficked areas.
- Use vacuum street sweepers.
- Remove mud and other dirt promptly so it does not dry and then turn into dust.
- Limit dust-causing work on windy days.
- 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.

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 summer rains. Having these materials on-site reduces the time needed to implement 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 are stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or developer could keep a stockpile of materials that are available 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:

Material
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 used 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 surface 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 projects include, but are not limited to, the following:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Design and Installation Specifications

- Assure that washout of concrete trucks, chutes, pumps, and internals is performed at an approved off-site location or in designated concrete washout areas. Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams. Refer to BMP C154: Concrete Washout Area (p.317) 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.
- Wash off hand tools including, but not limited to, screeds, shovels, rakes, floats, and trowels into formed areas only.
- Wash equipment difficult to move, such as concrete pavers in areas that do not directly drain to natural or constructed stormwater conveyances.
- Do not allow washdown from areas, such as concrete aggregate driveways, to drain directly to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no formed areas

are available. Dispose of contained concrete in a manner that does not violate ground water or surface water quality standards.

- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to BMP C252: High pH Neutralization Using CO2 (p.409) and BMP C253: pH Control for High pH Water (p.412) for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit for pH monitoring requirements if the project involves one of the following activities:
  - Significant concrete work (greater than 1,000 cubic yards poured concrete or recycled concrete used over the life of a project).
  - The use of engineered 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 surface 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, the following:

- 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 process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose 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 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

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.

- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- 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

BMP C154: Concrete Washout Area

Purpose

Prevent or reduce the discharge of pollutants to stormwater from concrete waste by conducting washout off-site, or performing on-site washout in a designated area to prevent pollutants from entering surface waters or ground water.

Conditions of Use

Concrete washout area best management practices are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete trucks, pumpers, or other concrete coated equipment are washed on-site.
- Note: If less than 10 concrete trucks or pumpers need to be washed out on-site, the washwater may be disposed of in a formed area awaiting concrete or an upland disposal site where it will not contaminate surface or ground water. The upland disposal site shall be at least 50 feet from sensitive areas such as storm drains, open ditches, or water bodies, including wetlands.

Design and Installation Specifications

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Perform washout of concrete trucks at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete trucks onto the ground, or into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over above-grade structures because they are less prone to spills and leaks.
- Self-installed above-grade structures should only be used if excavation is not practical.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for contractor's superintendent or Certified Erosion and Sediment Control

Lead (CESCL) to oversee and enforce concrete waste management procedures.

- A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and sub-contractor agreements.

Location and Placement

- Locate washout area at least 50 feet from sensitive areas such as storm drains, open ditches, or water bodies, including wetlands.
- Allow convenient access for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access washout, prevent track-out with a pad of rock or quarry spalls (see BMP C105: Stabilized Construction Entrance / Exit (p.270)). These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.
- The number of facilities you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, washouts should be placed in multiple locations for ease of use by concrete truck drivers.

On-site Temporary Concrete Washout Facility, Transit Truck Washout Procedures:

- Temporary concrete washout facilities shall be located a minimum of 50 ft from sensitive areas including storm drain inlets, open drainage facilities, and watercourses. See Figure II-4.1.7a Concrete Washout Area (p.322), Figure II-4.1.7b Concrete Washout Area (p.323), and Figure II-4.1.8 Prefabricated Concrete Washout Container w/Ramp (p.324).
- Concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Washout of concrete trucks shall be performed in designated areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of off-site.
- Once concrete wastes are washed into the designated area and allowed to

harden, the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.

- Temporary Above-Grade Concrete Washout Facility
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Temporary Below-Grade Concrete Washout Facility
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details below, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
  - Lath and flagging should be commercial type.
  - Plastic lining material shall be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
  - Liner seams shall be installed in accordance with manufacturers' recommendations.
  - Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

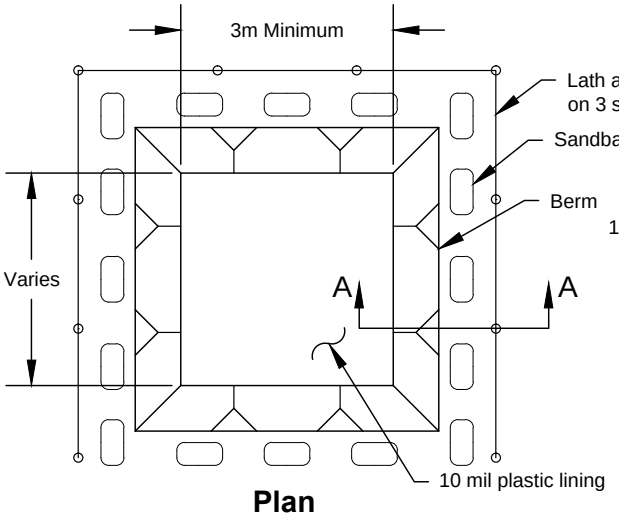
- Inspect and verify that concrete washout BMPs are in place prior to the commencement of concrete work.
- During periods of concrete work, inspect daily to verify continued performance.
  - Check overall condition and performance.
  - Check remaining capacity (% full).
  - If using self-installed washout facilities, verify plastic liners are intact and sidewalls are not damaged.
  - If using prefabricated containers, check for leaks.

- Washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- If the washout is nearing capacity, vacuum and dispose of the waste material in an approved manner.
    - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
    - Do not use sanitary sewer without local approval.
    - Place a secure, non-collapsing, non-water collecting cover over the concrete washout facility prior to predicted wet weather to prevent accumulation and overflow of precipitation.
    - Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from the self-installed concrete washout, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

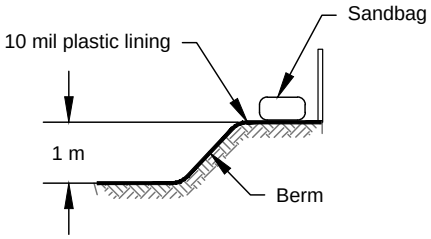
Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct temporary concrete washout facilities shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled, repaired, and stabilized to prevent erosion.

Figure II-4.1.7a Concrete Washout Area



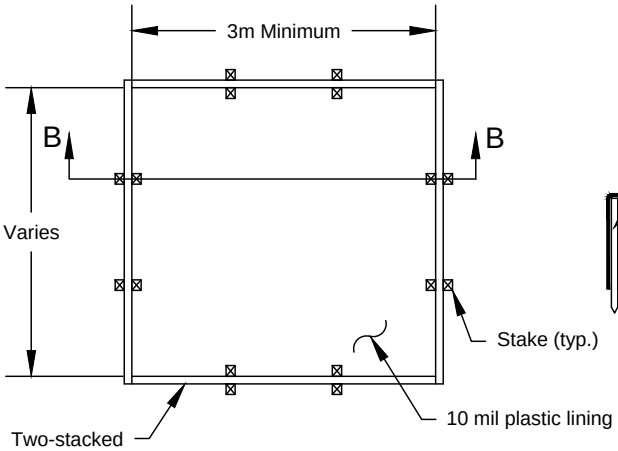
Plan



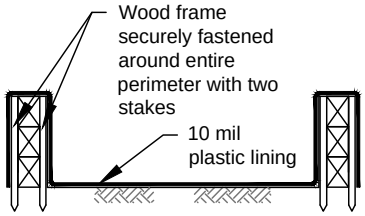
Section A-A

Type "Below Grade"

Notes:
1. Actual layout determined in the field.
2. A concrete washout sign shall be installed within 10 m of the temporary concrete washout facility.



Plan



Section B-B

Type "Above Grade" with Wood Planks

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Figure II-4.1.7a
Concrete Washout Area

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Figure II-4.1.7b Concrete Washout Area

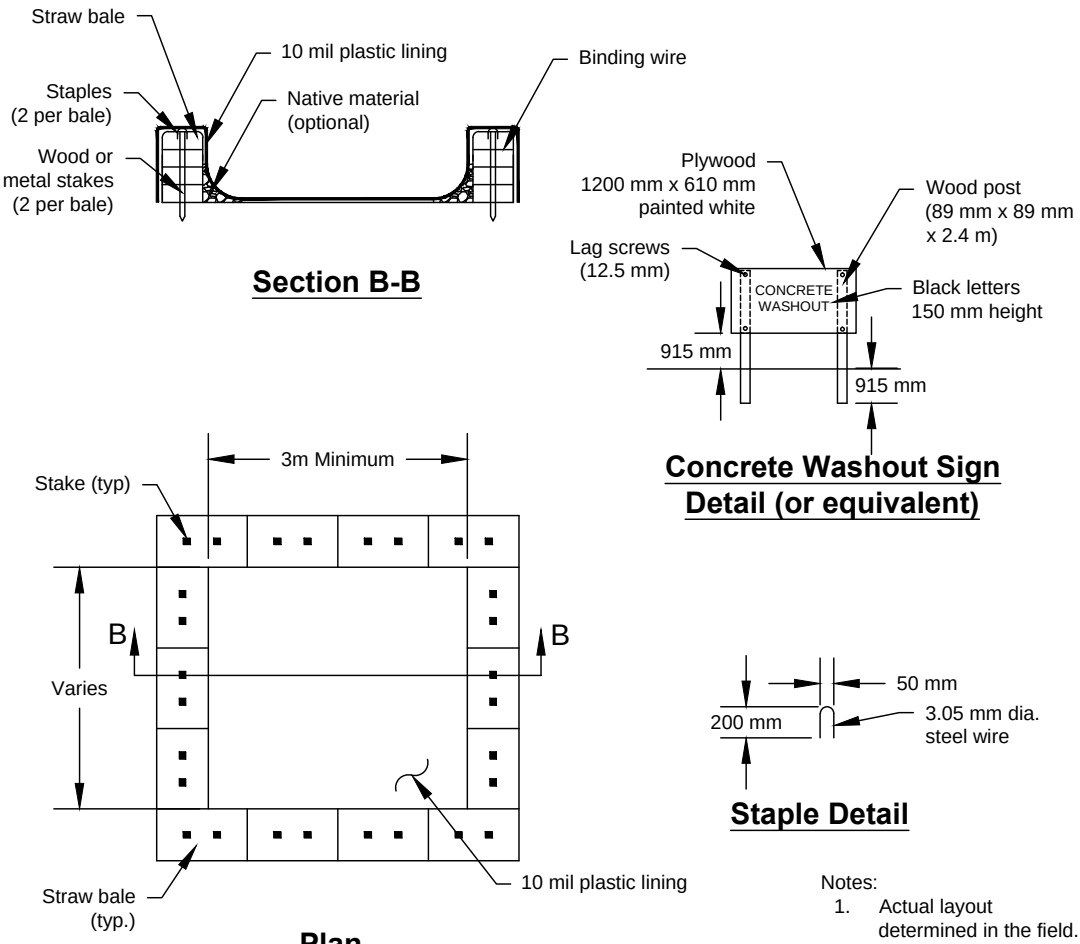

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Figure II-4.1.7b
Concrete Washout Area

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Figure II-4.1.8 Prefabricated Concrete Washout Container w/Ramp

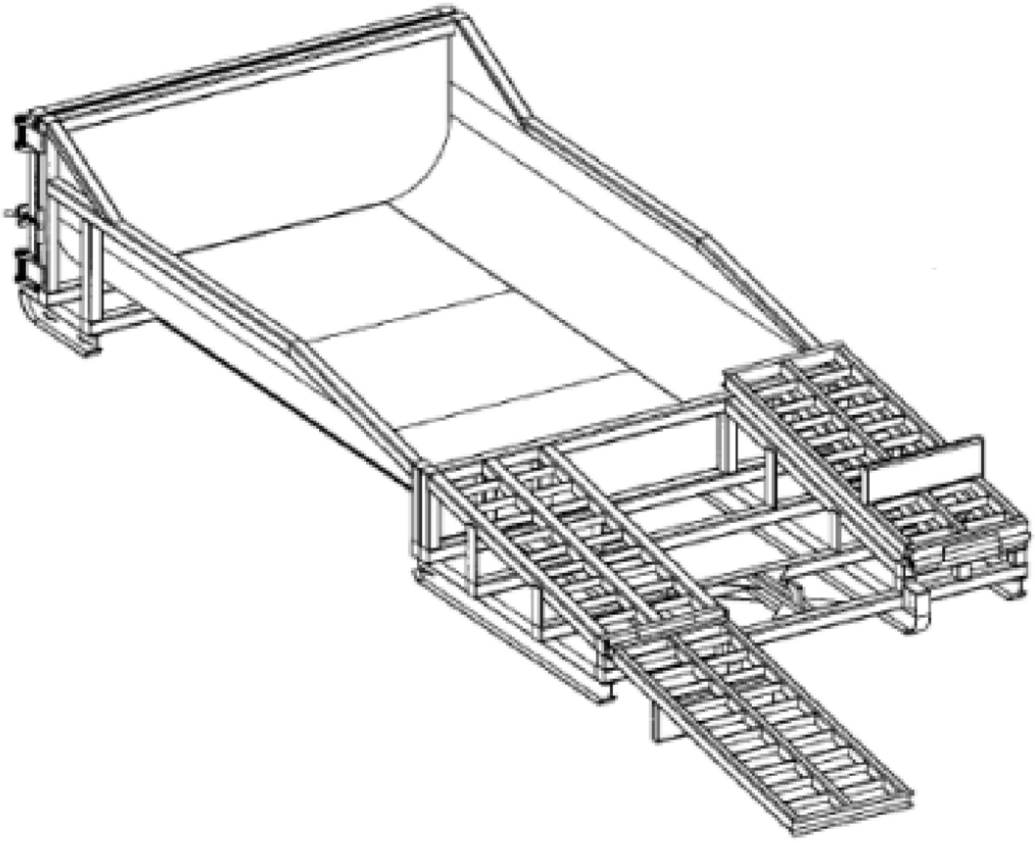

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Figure II-4.1.8
Prefabricated Concrete Washout Container w/Ramp

Revised June 2015

BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be the Certified Erosion and Sediment Control Lead (CESCL) who is responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections; sampling is not required on sites that disturb less than an acre.

- The CESCL shall:
    - Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology (see details below).

      Ecology will maintain a list of ESC training and certification providers at: http://www.ecy.wa.gov/programs/wq/stormwater/cescl.html

      OR
    - Be a Certified Professional in Erosion and Sediment Control (CPESC); for additional information go to: http://www.envirocertintl.org/cpesc/

Specifications

- Certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or developer and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL.
- A CESCL may provide inspection and compliance services for multiple construction projects in the same geographic region.

Duties and responsibilities of the CESCL shall include, but are not limited to the following:

- Maintaining permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
- Directing BMP installation, inspection, maintenance, modification, and removal.
- Updating all project drawings and the Construction SWPPP with changes made.
- Completing any sampling requirements including reporting results using WebDMR.
- Keeping daily logs, and inspection reports. Inspection reports should include:
    - Inspection date/time.
    - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
    - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
        1. Locations of BMPs inspected.
        2. Locations of BMPs that need maintenance.
        3. Locations of BMPs that failed to operate as designed or intended.
        4. Locations of where additional or different BMPs are required.
    - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
    - Any water quality monitoring performed during inspection.
    - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
- Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.

BMP C162: Scheduling

Purpose

Sequencing a construction project reduces the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

Conditions of Use

The construction sequence schedule is an orderly listing of all major land-disturbing activities together with the necessary erosion and sedimentation control measures

planned for the project. This type of schedule guides the contractor on work to be done before other work is started so that serious erosion and sedimentation problems can be avoided.

Following a specified work schedule that coordinates the timing of land-disturbing activities and the installation of control measures is perhaps the most cost-effective way of controlling erosion during construction. The removal of surface ground cover leaves a site vulnerable to accelerated erosion. Construction procedures that limit land clearing provide timely installation of erosion and sedimentation controls, and restore protective cover quickly can significantly reduce the erosion potential of a site.

Design Considerations

- Minimize construction during rainy periods.
- Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding in order to revegetate cut and fill slopes as the work progresses.

II-4.2 Runoff Conveyance and Treatment BMPs

This section contains the standards and specifications for Runoff Conveyance and Treatment BMPs. Table II-4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element (p.327), below, shows the relationship of the BMPs in II-4.2 Runoff Conveyance and Treatment BMPs to the Construction Stormwater Pollution Prevention Plan (SWPPP) Elements described in II-3.3.3 Step 3 - Construction SWPPP Development and Implementation (p.236).

Table II-4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element

BMP or Element Name	Element #3 Control Flow Rates	Element #4 Install Sediment Controls	Element #6 Protect Slopes	Element #7 Protect Drain Inlets	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #10 Control De-Watering	Element #13 Protect Low Impact Development
BMP C200: Interceptor Dike and Swale (p.331)			✓					✓

Table II-4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element (continued)

BMP or Element Name	Element #3 Control Flow Rates	Element #4 Install Sediment Controls	Element #6 Protect Slopes	Element #7 Protect Drain Inlets	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #10 Control De-Watering	Element #13 Protect Low Impact Development
BMP C201: Grass-Lined Channels (p.333)			✓					✓
BMP C202: Channel Lining (p.338)					✓			
BMP C203: Water Bars (p.339)	✓		✓				✓	
BMP C204: Pipe Slope Drains (p.342)			✓					
BMP C205: Subsurface Drains (p.346)			✓					
BMP C206: Level Spreader (p.348)			✓				✓	
BMP C207: Check Dams (p.352)	✓		✓		✓			✓
BMP C208: Triangular Silt Dike (TSD) (Geo-			✓					✓

Table II-4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element (continued)

BMP or Element Name	Element #3 Control Flow Rates	Element #4 Install Sediment Controls	Element #6 Protect Slopes	Element #7 Protect Drain Inlets	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #10 Control De-Watering	Element #13 Protect Low Impact Development
textile-Encased Check Dam) (p.355)								
BMP C209: Outlet Protection (p.356)	✓				✓			
BMP C220: Storm Drain Inlet Protection (p.357)				✓				
BMP C231: Brush Barrier (p.365)		✓						✓
BMP C232: Gravel Filter Berm (p.367)		✓						
BMP C233: Silt Fence (p.367)		✓						✓
BMP C234: Vegetated Strip (p.375)		✓						✓
BMP C235: Wattles (p.376)	✓	✓						
BMP C236:							✓	

Table II-4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element (continued)

BMP or Element Name	Element #3 Control Flow Rates	Element #4 Install Sediment Controls	Element #6 Protect Slopes	Element #7 Protect Drain Inlets	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #10 Control De-Watering	Element #13 Protect Low Impact Development
Vegetative Filtration (p.379)								
BMP C240: Sediment Trap (p.383)	✓	✓						
BMP C241: Temporary Sediment Pond (p.388)	✓	✓						
BMP C250: Construction Stormwater Chemical Treatment (p.396)		✓				✓		
BMP C251: Construction Stormwater Filtration (p.404)		✓				✓		
BMP C252: High pH Neutralization Using CO2 (p.409)						✓		
BMP C253: pH Control						✓		

Table II-4.2.1 Runoff Conveyance and Treatment BMPs by SWPPP Element (continued)

BMP or Element Name	Element #3 Control Flow Rates	Element #4 Install Sediment Controls	Element #6 Protect Slopes	Element #7 Protect Drain Inlets	Element #8 Stabilize Channels and Outlets	Element #9 Control Pollutants	Element #10 Control De-Watering	Element #13 Protect Low Impact Development
for High pH Water (p.412)								

BMP C200: Interceptor Dike and Swale

Purpose

Provide a ridge of compacted soil, or a ridge with an upslope 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

Where the runoff from an exposed site or disturbed slope must be conveyed to an erosion control facility which can safely convey the stormwater.

- Locate upslope of a construction site to prevent runoff from entering 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 water to a sediment basin.

Design and Installation Specifications

- Dike and/or swale and channel must be stabilized with temporary or permanent vegetation or other channel protection during construction.
- Channel requires a positive grade for drainage; steeper grades require channel protection and check dams.
- Review construction for areas where overtopping may occur.
- Can be used at top of new fill before vegetation is established.

- May be used as a permanent diversion channel to carry the runoff.
- Sub-basin tributary area should be one acre or less.
- Design capacity for the peak volumetric flow rate calculated using a 10-minute time step from a 10-year, 24-hour storm, assuming a Type 1A rainfall distribution, for temporary facilities. Alternatively, use 1.6 times the 10-year, 1-hour flow indicated by an approved continuous runoff model. For facilities that will also serve on a permanent basis, consult the local government's drainage requirements.

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.
- Horizontal Spacing of Interceptor Dikes:

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

- Stabilization: depends on velocity and reach
- Slopes <5%: Seed and mulch applied within 5 days of dike construction (see BMP C121: Mulching (p.284)).
- 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.

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 a sediment pond).
- Stabilization: Seed as per BMP C120: Temporary and Permanent Seeding (p.278), or BMP C202: Channel Lining (p.338), 12 inches thick riprap pressed into the bank and extending at least 8 inches vertical from the bottom.

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 C201: Grass-Lined Channels

Purpose

To provide a channel with a vegetative lining for conveyance of runoff. See Figure II-4.2.1 Typical Grass-Lined Channels (p.336) for typical grass-lined channels.

Conditions of Use

This practice applies to construction sites where concentrated runoff needs to be contained to prevent erosion or flooding.

- When a vegetative lining can provide sufficient stability for the channel cross section and at lower velocities of water (normally dependent on grade). This means that the channel slopes are generally less than 5 percent and space is available for a relatively large cross section.
- Typical uses include roadside ditches, channels at property boundaries, outlets for diversions, and other channels and drainage ditches in low areas.
- Channels that will be vegetated should be installed before major earthwork and hydroseeded with a bonded fiber matrix (BFM). The vegetation should be well established (i.e., 75 percent cover) before water is allowed to flow in the ditch. With channels that will have high flows, erosion control blankets should be installed over the hydroseed. If vegetation cannot be established from seed before water is allowed in the ditch, sod should be installed in the bottom of the ditch in lieu of hydromulch and blankets.

BMP C207: Check Dams

Purpose

Construction of small dams across a swale or ditch reduces the velocity of concentrated flow and dissipates energy at the check dam.

Conditions of Use

Where temporary channels 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.
- 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 (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.
- Check dams may also be constructed of either rock or pea-gravel filled bags. Numerous new products are also available for this purpose. They tend to be reusable, quick and easy to install, effective, and cost efficient.
- Place check dams perpendicular to the flow of water.
- The dam should form a triangle when viewed from the side. This prevents undercutting as water flows over the face of the 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 in association with sumps work more effectively at slowing flow and retaining sediment than just a check dam alone. A deep sump should be provided immediately upstream of the check dam.
- In some cases, if carefully located and designed, check dams can remain as permanent installations with very minor regrading. They may be left as either spillways, in which case accumulated sediment would be graded and seeded, or as

check dams to prevent further sediment from leaving the site.

- The maximum spacing between the dams shall be such that the 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 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. Figure II-4.2.7 Rock Check Dam (p.354) depicts a typical rock check dam.

Maintenance Standards

Check dams shall be monitored for performance and sediment accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one half the sump depth.

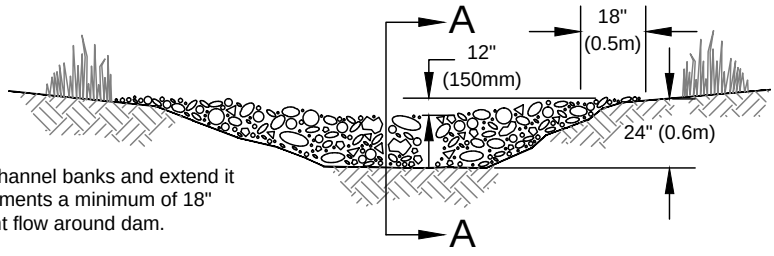
- Anticipate submergence and deposition above the check dam and erosion from high flows around the edges of the dam.
- If significant erosion occurs between dams, install a protective riprap liner in that portion of the channel.

Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C207: Check Dams. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov-/programs/wq/stormwater/newtech/equivalent.html

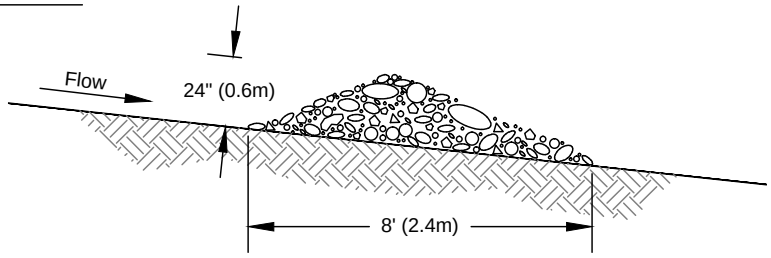
Figure II-4.2.7 Rock Check Dam

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

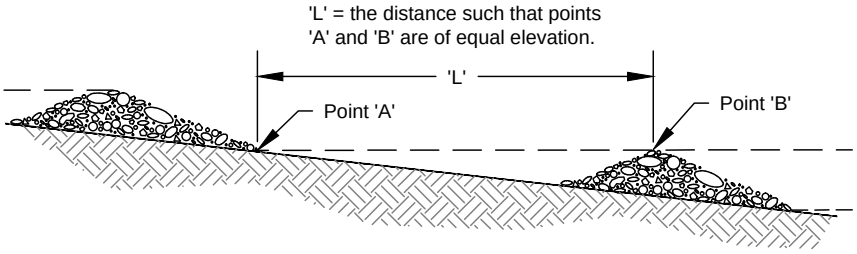


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Figure II-4.2.7
Rock Check Dam

Revised July 2015

BMP C208: Triangular Silt Dike (TSD) (Geotextile-Encased Check Dam)

Purpose

Triangular silt dikes 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

- May be used on soil or pavement with adhesive or staples.
- TSDs have been used to build temporary:
    1. sediment ponds;
    2. diversion ditches;
    3. concrete wash out facilities;
    4. curbing;
    5. water bars;
    6. level spreaders; and,
    7. berms.

Design and Installation Specifications

Made of urethane foam sewn into a woven geosynthetic fabric.

It is 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.
- Check dams should be located and installed as soon as construction will allow.
- Check dams should be placed perpendicular to the flow of water.
- When used as check dams, the leading edge must be secured with rocks, sand-bags, 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

- Triangular silt dams shall be inspected for performance and sediment accumulation during and after each runoff producing rainfall. Sediment shall be removed when it reaches one half the height of the dam.
- Anticipate submergence and deposition above the triangular silt dam and erosion from high flows around the edges of the dam. Immediately repair any damage or any undercutting of the dam.

BMP C209: Outlet Protection

Purpose

Outlet protection prevents scour at conveyance outlets and minimizes the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

Conditions of Use

Outlet protection is required at the outlets of all ponds, pipes, ditches, or other conveyances, and where runoff is conveyed to a natural or manmade drainage feature such as a stream, wetland, lake, or ditch.

Design and Installation Specifications

The receiving channel at the outlet of a culvert shall be protected from erosion by rock lining a minimum of 6 feet downstream and extending up the channel sides a minimum of 1–foot above the maximum tailwater elevation or 1-foot above the crown, whichever is higher. For large pipes (more than 18 inches in diameter), the outlet protection lining of the channel is lengthened to four times the diameter of the culvert.

- Standard wingwalls, and tapered outlets and paved channels should also be considered when appropriate for permanent culvert outlet protection. (See WSDOT Hydraulic Manual, available through WSDOT Engineering Publications).
- Organic or synthetic erosion blankets, with or without vegetation, are usually more effective than rock, cheaper, and easier to install. Materials can be chosen using manufacturer product specifications. ASTM test results are available for most products and the designer can choose the correct material for the expected flow.
- With low flows, vegetation (including sod) can be effective.
- The following guidelines shall be used for riprap outlet protection:

1. If the discharge velocity at the outlet is less than 5 fps (pipe slope less than 1 percent), use 2-inch to 8-inch riprap. Minimum thickness is 1-foot.
2. For 5 to 10 fps discharge velocity at the outlet (pipe slope less than 3 percent), use 24-inch to 48-inch riprap. Minimum thickness is 2 feet.
3. For outlets at the base of steep slope pipes (pipe slope greater than 10 percent), an engineered energy dissipater shall be used.

- Filter fabric or erosion control blankets should always be used under riprap to prevent scour and channel erosion.
- New pipe outfalls can provide an opportunity for low-cost fish habitat improvements. For example, an alcove of low-velocity water can be created by constructing the pipe outfall and associated energy dissipater back from the stream edge and digging a channel, over-widened to the upstream side, from the outfall. Overwintering juvenile and migrating adult salmonids may use the alcove as shelter during high flows. Bank stabilization, bioengineering, and habitat features may be required for disturbed areas. This work may require a HPA. See Volume V (p.765) for more information on outfall system design.

Maintenance Standards

- Inspect and repair as needed.
- Add rock as needed to maintain the intended function.
- Clean energy dissipater if sediment builds up.

BMP C220: Storm Drain Inlet Protection

Purpose

Storm drain inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use storm drain inlet protection at inlets that are operational before permanent stabilization of the disturbed drainage area. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless conveying runoff entering catch basins to a sediment pond or trap.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters in new home construction 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 pre-

vent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

Table II-4.2.2 Storm Drain Inlet Protection (p.358) lists several options for inlet protection. All of the methods for storm drain inlet protection tend to plug and require a high frequency of maintenance. Limit drainage areas to one acre or less. Possibly provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-4.2.2 Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding will occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area Requirement: 30'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		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			18 month expected life.

Design and Installation Specifications

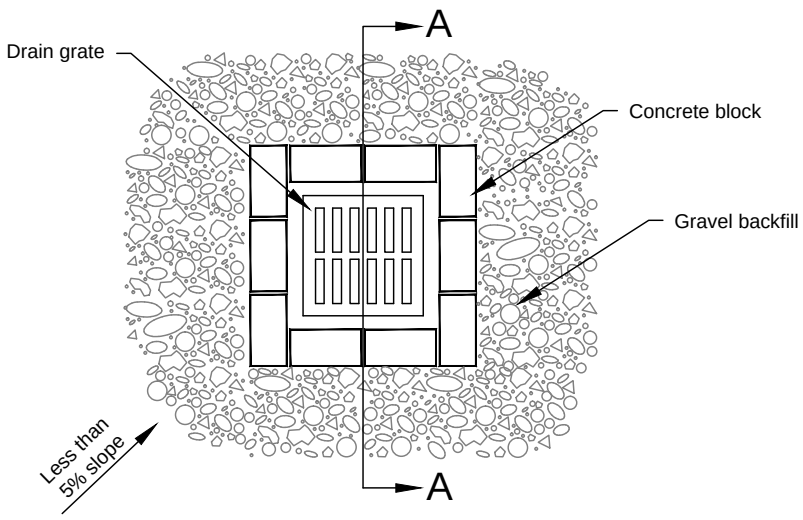
Excavated Drop Inlet Protection - An excavated impoundment around the storm drain. Sediment settles out of the stormwater prior to entering the storm drain.

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation no steeper than 2H:1V.
- Minimum volume of excavation 35 cubic yards.
- Shape basin to fit site with longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water problems.
- 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.

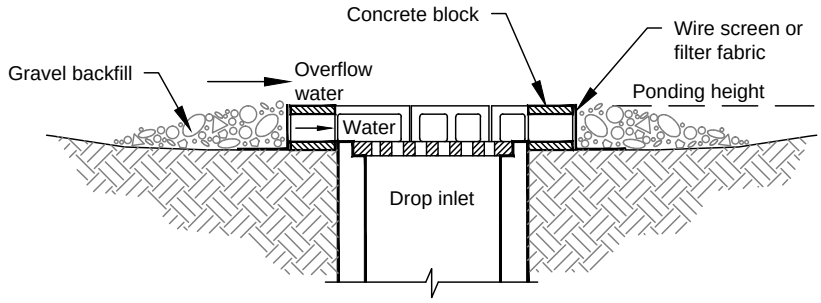
Block and Gravel Filter - A barrier formed around the storm drain inlet with standard concrete blocks and gravel. See Figure II-4.2.8 Block and Gravel Filter (p.360).

- Provide a height of 1 to 2 feet above inlet.
- Recess the first row 2-inches into the ground for stability.
- Support subsequent courses by placing a 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel donut.
- Provide an inlet slope of 3H:1V.
- Provide an outlet slope of 2H:1V.
- Provide a1-foot wide level stone area between the structure and the inlet.
- Use inlet slope stones 3 inches in diameter or larger.
- Use gravel ½- to ¾-inch at a minimum thickness of 1-foot for the outlet slope.

Figure II-4.2.8 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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Figure II-4.2.8
Block and Gravel Filter

Revised August 2015

Gravel and Wire Mesh Filter - A gravel barrier placed over the top of the inlet. This structure does not provide an overflow.

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
- Use coarse aggregate.
- Provide a height 1-foot or more, 18-inches wider than inlet on all sides.
- 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 gravel over the entire inlet opening and extend at least 18-inches on all sides.

Catchbasin Filters – Use inserts 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 catchbasin 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.

- 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 catchbasin filter in the catchbasin just below the grating.

Curb Inlet Protection with Wooden Weir – Barrier formed around a curb inlet with a wooden frame and gravel.

- 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 wire/fabric.
- Place weight on frame anchors.

Block and Gravel Curb Inlet Protection – Barrier formed around a curb inlet with concrete blocks and gravel. See Figure II-4.2.9 Block and Gravel Curb Inlet Protection (p.363).

- 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.

Curb and Gutter Sediment Barrier – Sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See Figure II-4.2.10 Curb and Gutter Barrier (p.364).

- 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 outside of the berm sized to sediment trap standards for protecting a culvert inlet.

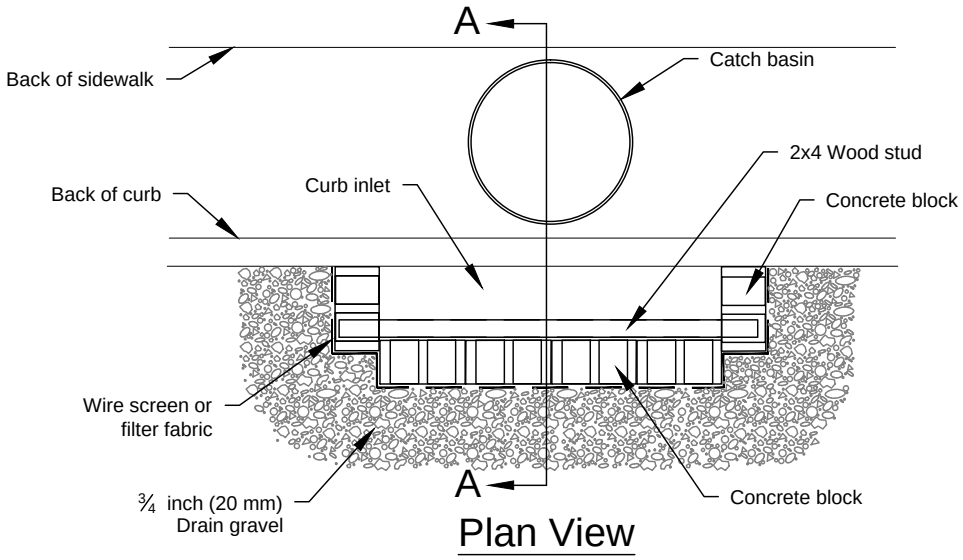
Maintenance Standards

- Inspect catch basin filters frequently, especially after storm events. Clean and replace clogged inserts. For systems with clogged stone filters: pull away the stones from the inlet and clean or replace. An alternative approach would be to use the clogged stone as fill and put fresh stone 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.

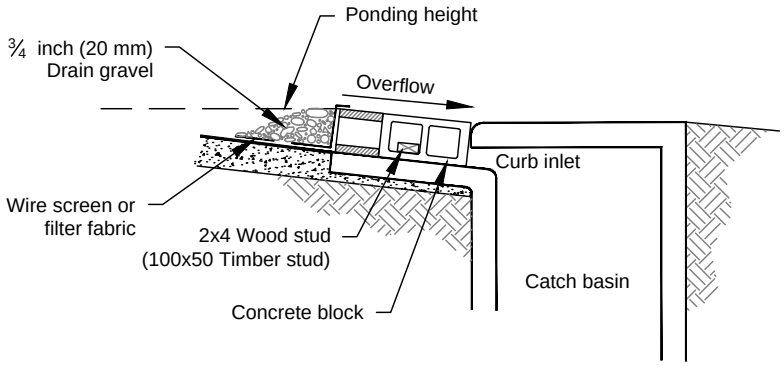
Approved as Equivalent

Ecology has approved products as able to meet the requirements of BMP C220: Storm Drain Inlet Protection. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept this product approved as equivalent, or may require additional testing prior to consideration for local use. The products are available for review on Ecology's website at http://www.ecy.wa.gov/programs/wq/stormwater/newtech/equivalent.html

Figure II-4.2.9 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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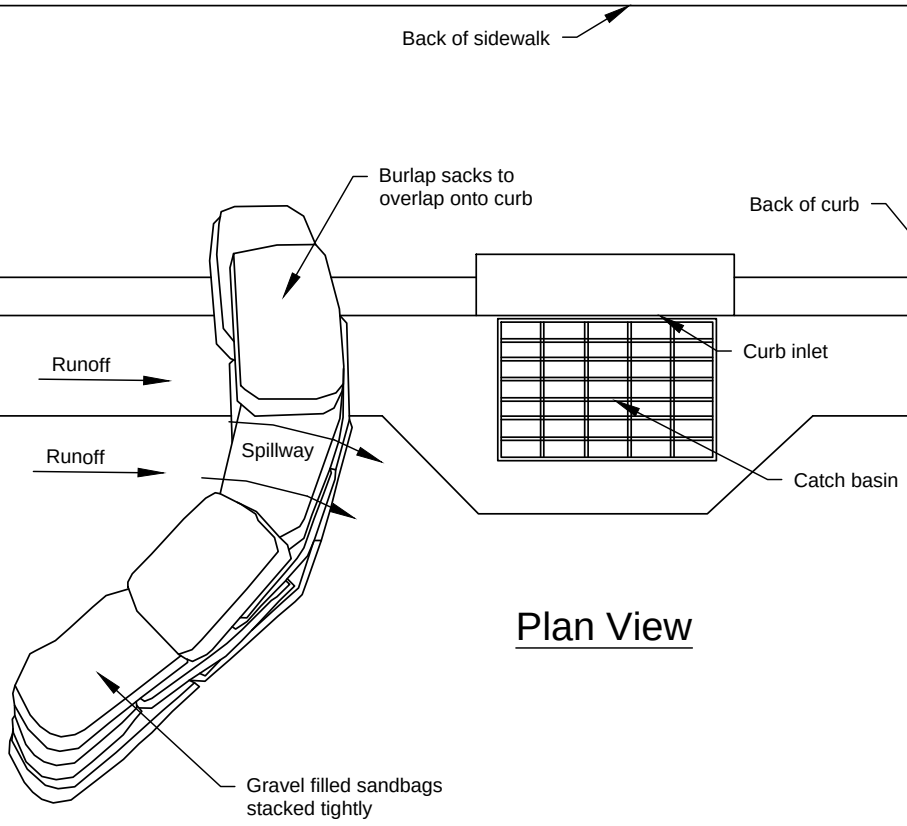
Figure II-4.2.9
Block and Gravel Curb Inlet Protection

Revised August 2015

Figure II-4.2.10 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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Figure II-4.2.10
Curb and Gutter Barrier

Revised September 2015

BMP C232: Gravel Filter Berm

Purpose

A gravel filter berm is constructed on rights-of-way or traffic areas within a construction site to retain sediment by using a filter berm of gravel or crushed rock.

Conditions of Use

Where a temporary measure is needed to retain sediment from rights-of-way or in traffic areas on construction sites.

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.
- 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

Maintenance Standards

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

BMP C233: Silt Fence

Purpose

Use of a 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. See Figure II-4.2.12 Silt Fence (p.369) for details on silt fence construction.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent soil carried by runoff water 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 pond.
- 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-4.2.12 Silt Fence

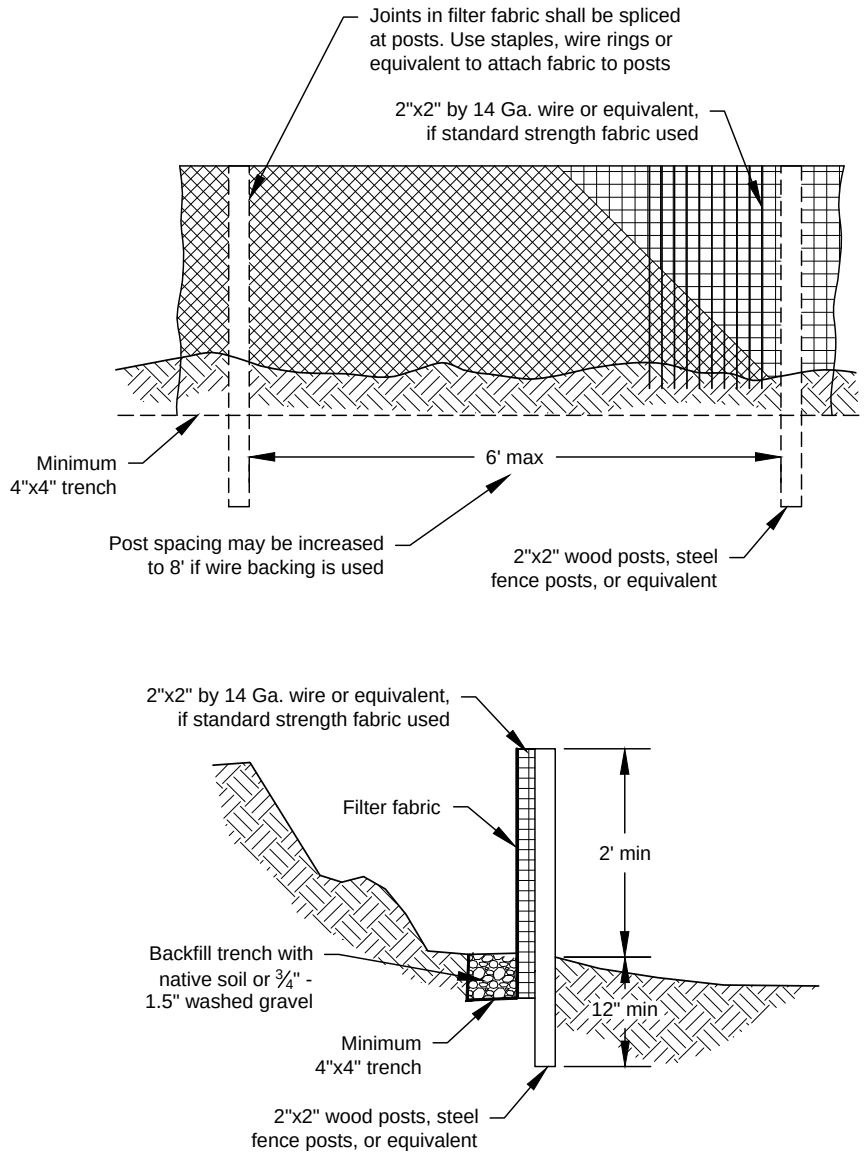

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Figure II-4.2.12
Silt Fence

Revised October 2014

Design and Installation Specifications

- Use in combination with sediment basins or other BMPs.
- Maximum slope steepness (normal (perpendicular) to fence line) 1H:1V.
- Maximum sheet or overland flow path length to the fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- The geotextile used shall meet 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-4.2.3 Geotextile Standards (p.370)):

Table II-4.2.3 Geotextile Standards

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 fabrics with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the fabric. Silt fence materials are available that have synthetic mesh backing attached.
- Filter fabric 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 local regulations.
- Refer to Figure II-4.2.12 Silt Fence (p.369) 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 filter fabric shall be sewn together at the point of manufacture to form filter fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided the Contractor can demonstrate, to the satisfaction of the Engineer, that the overlap is long enough and that the adjacent fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the filter fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the filter fabric to the posts in a manner that reduces the potential for tearing.
6. Support the filter 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 filter 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 filter fabric it supports.
8. Bury the bottom of the filter fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the filter fabric, so that no flow can pass beneath the 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 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 dimensions of 2-inches by 2-inches wide min. and a 3-feet min. length. Wood posts 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.

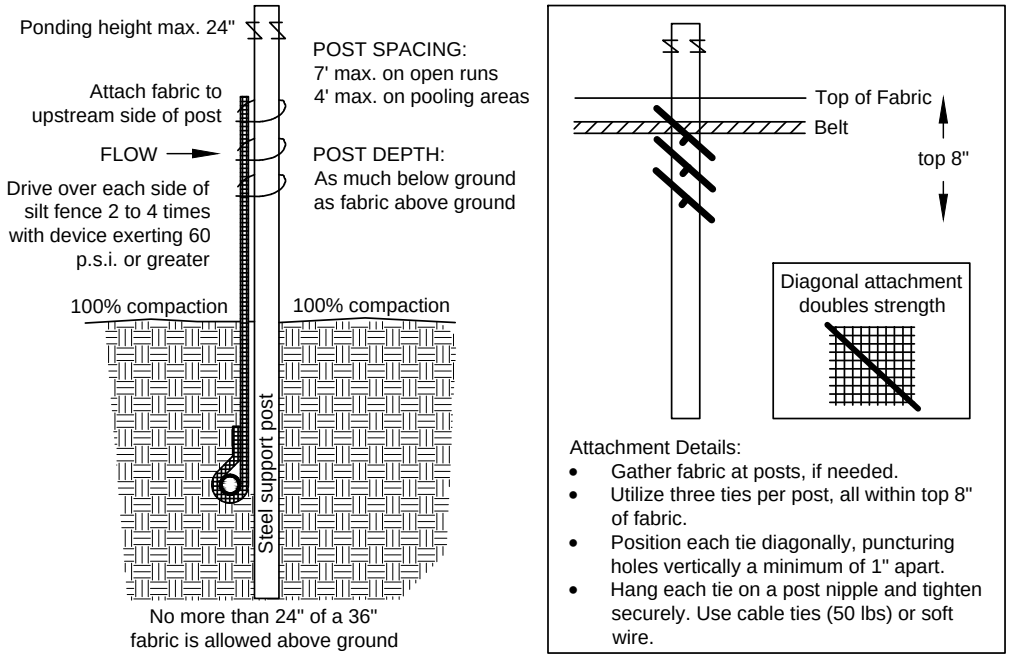
11. Locate silt fences on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.
12. If the fence must cross contours, with the exception of the ends of the fence, place gravel 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.
    - Gravel check dams shall be approximately 1-foot deep at the back of the fence. Gravel 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.
    - Gravel check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Gravel check dams shall be located every 10 feet along the fence where the fence must cross contours.

- Refer to Figure II-4.2.13 Silt Fence Installation by Slicing Method (p.374) for slicing method details. Silt fence installation using the slicing method specifications:
    1. The base of both end posts must be at least 2- to 4-inches above the top of the filter 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 filter fabric, enabling posts to support the filter fabric from upstream water pressure.
    4. Install posts with the nipples facing away from the filter fabric.

5. Attach the filter fabric to each post with three ties, all spaced within the top 8-inches of the filter fabric. Attach each tie diagonally 45 degrees through the filter 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 fabric around the end posts and secure with 3 ties.
7. No more than 24-inches of a 36-inch filter fabric is allowed above ground level.

   Compact the soil immediately next to the filter 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 fabric deeper into the ground if necessary.

Figure II-4.2.13 Silt Fence Installation by Slicing Method



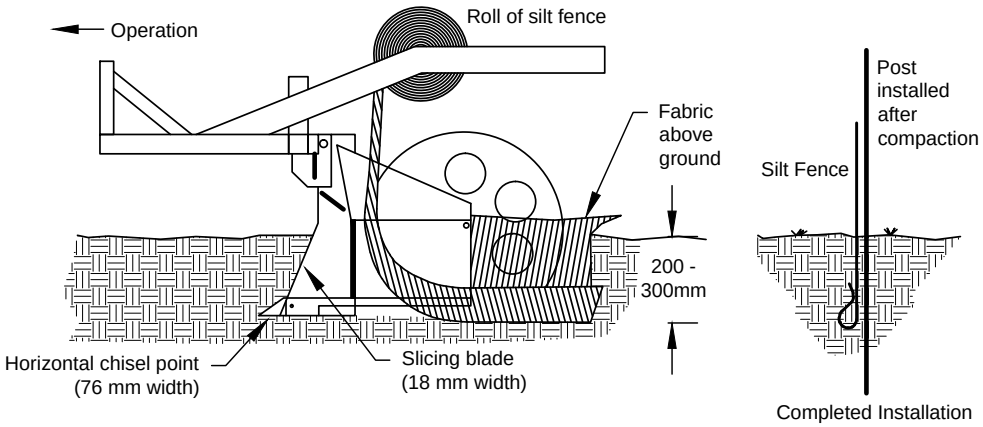


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Figure II-4.2.13
Silt Fence Installation by Slicing Method

Revised November 2015

Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment pond.
- Check the uphill side of the 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 or 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 filter fabric that has deteriorated due to ultraviolet breakdown.

BMP C234: Vegetated Strip

Purpose

Vegetated strips reduce 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

- Vegetated strips may be used downslope of all disturbed areas.
- Vegetated strips are not intended to treat concentrated flows, nor are they intended to treat substantial amounts of overland flow. Any concentrated flows must be conveyed through the drainage system to a sediment pond. The only circumstance in which overland flow can be treated solely by a strip, rather than by a sediment pond, is when the following criteria are met (see Table II-4.2.4 Contributing Drainage Area for Vegetated Strips (p.375)):

Table II-4.2.4 Contributing Drainage Area for Vegetated Strips

Average Contributing Area Slope	Average Contributing Area Percent Slope	Max Contributing area Flowpath Length
1.5H : 1V or flatter	67% or flatter	100 feet
2H : 1V or flatter	50% or flatter	115 feet
4H : 1V or flatter	25% or flatter	150 feet
6H : 1V or flatter	16.7% or flatter	200 feet
10H : 1V or flatter	10% or flatter	250 feet