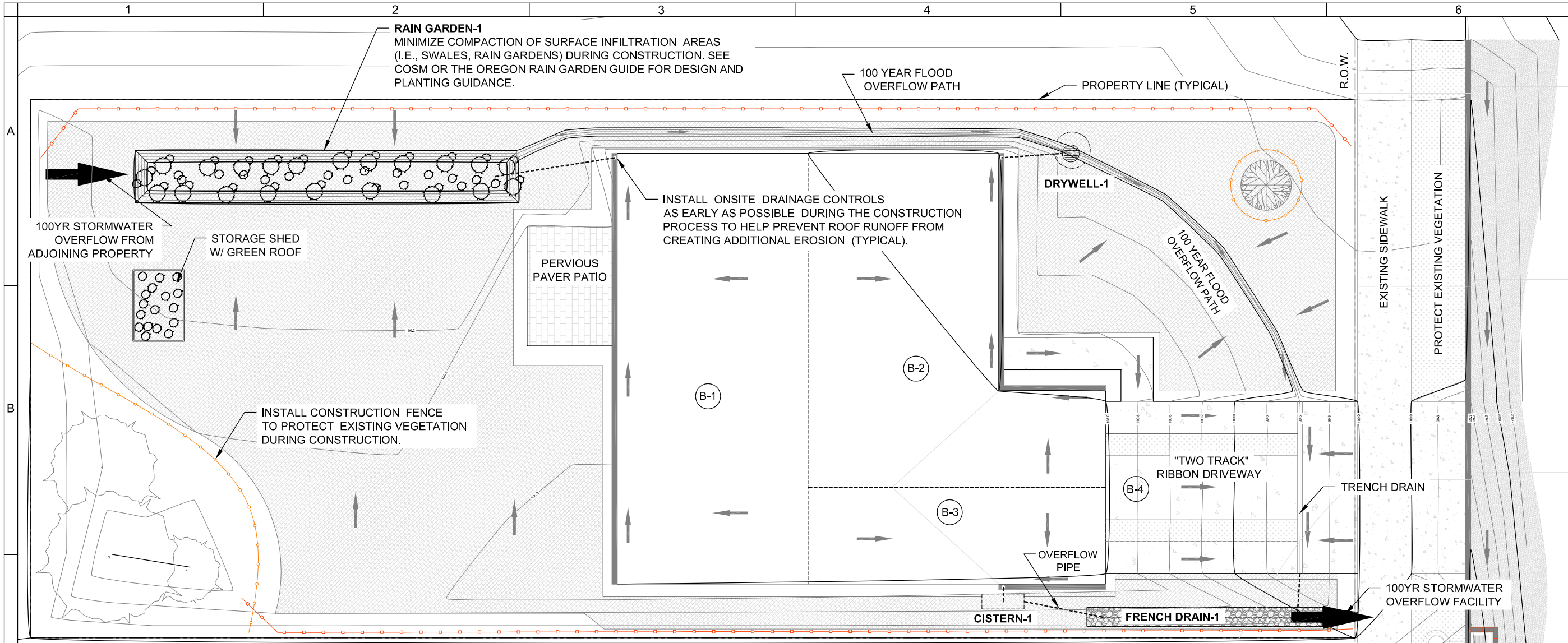
Appendix E

Construction Site Stormwater Activities



EXAMPLE DRAINAGE PLAN

NORTH

0 5' 10'

SCALE: 1" = 5'

LEGEND

- PROPERTY LINE
- SILT FENCE / TEMP. CONSTRUCTION FENCE
- PROPOSED DRAINAGE FACILITY
- PROPOSED DRAINAGE PIPE
- SLOPE DIRECTION
- PROPOSED GRASS
- EXISTING TREE
- EXISTING VEGETATION
- PROPOSED VEGETATION

REQUIREMENTS

- MEET THE PERFORMANCE STANDARDS OF BEND CODE TITLE 16 (SECTIONS 16.10.010 & 16.10.070 THROUGH 16.10.100).
- MEET ALL APPLICABLE COSM DESIGN REQUIREMENTS.
- REGISTER ALL NEW UIC'S WITH OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ). UIC'S RECEIVING ONLY DRAINAGE FROM RESIDENTIAL ROOF RUNOFF OR FOOTINGS DRAINS MAY BE EXEMPT FROM REGISTRATION; CONFIRM WITH DEQ.

GRADING NOTES

1. INSPECT ALL ROADWAYS ADJACENT TO THE CONSTRUCTION ACCESS ROUTE AT THE END OF EACH DAY. SIGNIFICANT AMOUNTS OF SEDIMENT THAT LEAVES THE CONSTRUCTION SITE MUST BE CLEANED UP WITHIN 24 HOURS AND STABILIZED BACK ON THE SITE OR PROPERLY DISPOSED.
2. COVER AND SECURE ALL DUMP TRUCK LOADS LEAVING THE CONSTRUCTION SITE TO MINIMIZE SPILLAGE ON ROADS; AND
3. KEEP SEDIMENT ON THE PROJECT SITE, TO THE MAXIMUM EXTENT PRACTICAL.
4. CONTROL FUGITIVE DUST FROM CONSTRUCTION ACTIVITY. DUST CONTROL MUST BE CONTINUOUS, PARTICULARLY DURING THE DRY SEASON
5. STABILIZE EXPOSED UNWORKED SOILS AS NEEDED TO PREVENT EROSION.
6. PROTECT INLETS, DRYWELLS, CATCH BASINS AND OTHER STORMWATER MANAGEMENT FACILITIES FROM SEDIMENT, SO THAT SEDIMENT DOES NOT ENTER THE CONVEYANCE SYSTEM (BOTH ON AND OFFSITE).
7. KEEP ROADS ADJACENT TO INLETS CLEAN; SEDIMENT AND STREET WASH WATER SHALL NOT BE ALLOWED TO ENTER THE CONVEYANCE SYSTEM (BOTH ON AND OFFSITE) WITHOUT PRIOR TREATMENT.
8. INSTALL SEDIMENT CONTROLS ALONG THE SITE PERIMETER ON ALL DOWN GRADIENT SIDES OF THE CONSTRUCTION SITE BEFORE COMMENCING EARTH DISTURBING ACTIVITIES.
9. WHENEVER POSSIBLE, CONSTRUCT STORMWATER CONTROL FACILITIES (DETENTION/RETENTION STORAGE POND OR SWALES) BEFORE GRADING BEGINS. THESE FACILITIES SHOULD BE OPERATIONAL BEFORE THE CONSTRUCTION OF IMPERVIOUS SITE IMPROVEMENTS;
10. DESIGNATE THE LOCATION OF A SLURRY PIT WHERE CONCRETE TRUCKS AND EQUIPMENT CAN BE WASHED OUT. SLURRY PITS ARE NOT TO BE LOCATED IN, OR UPSTREAM OF, A SWALE, DRAINAGE AREA, STORMWATER FACILITY, WATER BODY, OR IN AN AREA WHERE A STORMWATER FACILITY EXISTS OR IS PROPOSED.
11. STOCKPILE MATERIALS (SUCH AS TOPSOIL) ONSITE, KEEPING OFF OF ROADWAY AND SIDEWALKS.
12. COVER, CONTAIN AND PROTECT ALL CHEMICALS, LIQUID PRODUCTS, PETROLEUM PRODUCTS, OTHER HAZARDOUS MATERIALS, AND NON-INERT WASTE PRESENT ONSITE FROM PRECIPITATION AND/OR VANDALISM. MAINTAIN A SUPPLY OF MATERIALS ON HAND TO ADDRESS AND CONTAIN SPILLS;
13. DESIGNATE AN AREA FOR CLEANING PAINTING EQUIPMENT AND TOOLS. **NEVER CLEAN BRUSHES OR RINSE CONTAINERS INTO THE STREET, GUTTER, DRAINAGE INLET, OR WATERWAY;**
14. APPLY FERTILIZERS AND PESTICIDES, IN SUCH A MANNER, AND AT APPLICATION RATES, THAT INHIBITS THE LOSS OF CHEMICALS INTO STORMWATER RUNOFF FACILITIES.
15. INSPECT ON A REGULAR BASIS (DURING/AFTER A RUNOFF PRODUCING STORM EVENT) AND MAINTAIN ALL EROSION AND SEDIMENT CONTROL BMPS TO ENSURE SUCCESSFUL PERFORMANCE OF THE BMPS.
16. REMOVE TEMPORARY ESC BMPS WITHIN 30 DAYS AFTER THE TEMPORARY BMPS ARE NO LONGER NEEDED.

Example Drainage Calculations

DRAINAGE BASIN	IMPERVIOUS SURFACE (SQUARE FEET)	x 25YR STORM 0.2'	= VOLUME (CUBIC FT)	DISPOSAL FACILITY
B-1	#####	0.2'	#####	RAIN GARDEN-1
B-2	#####	0.2'	#####	DRYWELL-1 ①
B-3	#####	0.2'	#####	CISTERN-1 ②
B-4	#####	0.2'	#####	FRENCH DRAIN-1 ③

STORMWATER FACILITY SIZING

LENGTH (FEET)	x WIDTH (FEET)	x DEPTH (FEET)	= VOLUME (CUBIC FEET)
#####	#####	#####	#####
			#####
#####	#####	#####	#####
#####	#####	#####	#####

① SIZING = TOTAL ROCK VOLUME x .3 + DRYWELL VOLUME

② CISTERN = ESTIMATED AVAILABLE STORAGE VOLUME

③ SIZING = TOTAL ROCK VOLUME x .3

STORMWATER DISPOSAL FACILITIES SHOWN ON THIS PLAN ARE FOR EXAMPLE PURPOSES ONLY. OTHER APPROPRIATELY SIZED FACILITIES MAY BE USED.

100 YEAR STORM EVENT SAFE PASSAGE

TOTAL IMPERVIOUS	x 100 YR STORM 0.26'	- TOTAL STORAGE VOLUME	= SAFE PASSAGE VOLUME
#####	0.26'	#####	#####

BP##-####

STREET ADDRESS

EXAMPLE DRAINAGE PLAN

CITY OF BEND

REVISIONS:

DESIGNED BY:

DRAWN BY: DB

SCALE:

FILE:

DATE: 5/2/2013

VERIFY SCALES

0 1"

BAR EQUALS ONE INCH ON ORIGINAL DRAWING

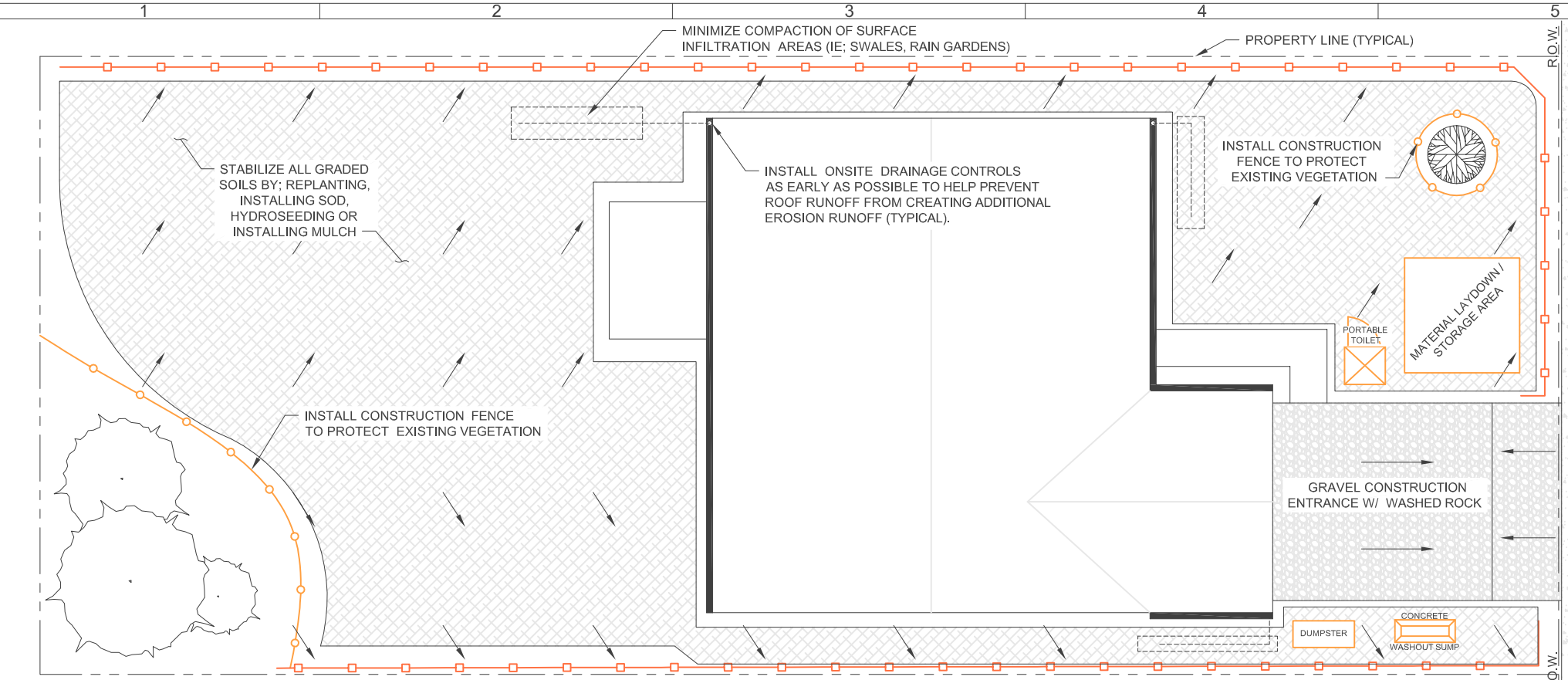
SHEET:

COB #

SUGGESTED BEST MANAGEMENT PRACTICES FOR SINGLE FAMILY CONSTRUCTION SITES

EROSION CONTROL PLAN (EXAMPLE)

DESCHUTES COUNTY, OREGON



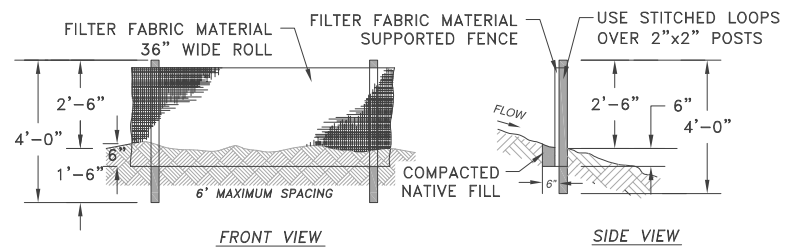
EXAMPLE EROSION & SEDIMENT CONTROL SITE PLAN

LEGEND

- PROPERTY LINE
- SILT FENCE
- TEMP. CONSTRUCTION FENCE
- ROOF DRAINAGE FACILITY
- GROUND SLOPE DIRECTION
- EXISTING VEGETATION
- STABILIZED SOIL
- EXISTING TREE
- EXISTING VEGETATION

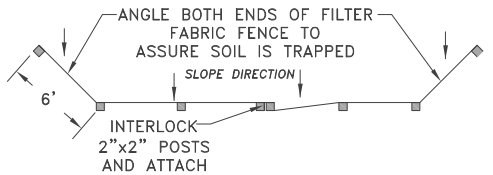
GOOD HOUSE KEEPING TIPS

- SWEEP AND PROPERLY DISPOSE OF ALL TRACKED SEDIMENT DAILY.
- STORE ALL PAINTS,STAINS, SOLVENTS AND HAZARDOUS MATERIAL IN A COVERED STORAGE AREA.
- TARP ALL LOADS BEFORE LEAVING THE SITE
- DISPOSE OF ALL TRASH IN A DUMPSTER OR TRASH CAN.
- CLEAN UP SPILLS PROMPTLY USING DRY CLEANUP METHODS.
- **DO NOT DUMP OR WASH ANY MATERIAL INTO THE STORM DRAIN (PER CITY CODE TITLE 16).**



FRONT VIEW
NTS

SIDE VIEW
NTS



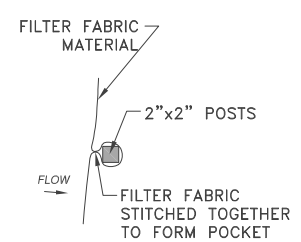
TOP VIEW
NTS

NOTES:

1. BURY BOTTOM OF FILTER FABRIC 6" VERTICALLY BELOW FINISHED GRADE.
2. 2"x 2" FIR, PINE OR STEEL FENCE POSTS.
3. STITCHED LOOPS TO BE INSTALLED DOWNHILL SIDE OF SLOPE.
4. COMPACT ALL AREAS OF FILTER FABRIC TRENCH.
5. MAXIMUM RECOMMENDED FENCE WIDTH IS 500 FEET. MAXIMUM TRIBUTARY AREA IS .25 ACRE PER 100' OF FENCE. MAXIMUM RECOMENDED SLOPE LENGTH IS 100'.

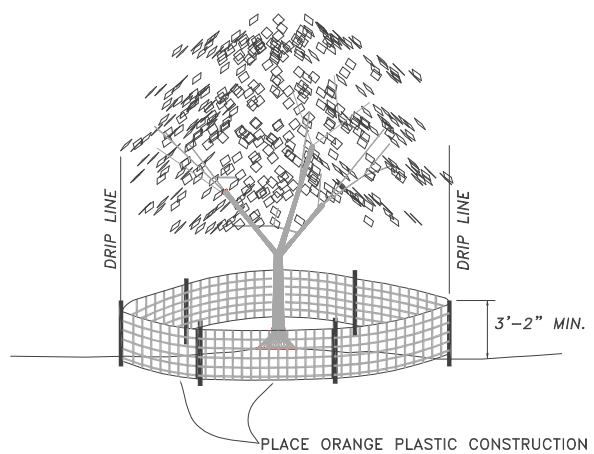
NOTES

1. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID USE OF JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM 6–INCH OVERLAP, AND BOTH ENDS SECURELY FASTENED TO THE POST, OR OVERLAP 2"X2" POSTS AND ATTACH AS SHOWN HEREON.
2. THE FILTER FABRIC FENCE SHALL BE INSTALLED TO FOLLOW THE SLOPE CONTOURS, TO MAXIMIZE PONDING EFFICIENCY WHERE FEASIBLE. THE FENCE POSTS SHALL BE SPACED A MAXIMUM OF 6 FEET APART AND DRIVEN SECURELY INTO THE GROUND A MINIMUM OF 18 INCHES.
3. THE FILTER FABRIC SHALL HAVE A MINIMUM VERTICAL BURIAL OF 6 INCHES. ALL EXCAVATED MATERIAL FORM FILTER FABRIC FENCE INSTALLATION, SHALL BE BACKFILLED AND COMPACTED, ALONG THE ENTIRE DISTURBED AREA.
4. STANDARD OF HEAVY DUTY FILTER FABRIC FENCE SHALL HAVE MANUFACTURED STITCHED LOOPS FOR 2"X2" POST INSTALLATION. STITCHED LOOPS SHALL BE INSTALLED ON THE UPHILL SIDE OF THE LOOPED AREA.
5. FILTER FABRIC FENCE SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY PROTECTED AND STABILIZED.
6. FILTER FABRIC FENCES SHALL BE INSPECTED BY APPLICANT/CONTRACTOR AFTER EACH RAIN OR SNOW EVENT AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.



FABRIC POST POCKET
NTS

DRAWN DB		CITY OF BEND	SCALE NTS
DIV STORM		STANDARD DRAWING	DATE 10/18/2010
REV / DATE / APPR		710 NW WALL ST., BEND, OREGON 97701	APPR
10/18/2010 Buchanan		TREE/VEGETATION PROTECTION FENCING	STD DWG E-3



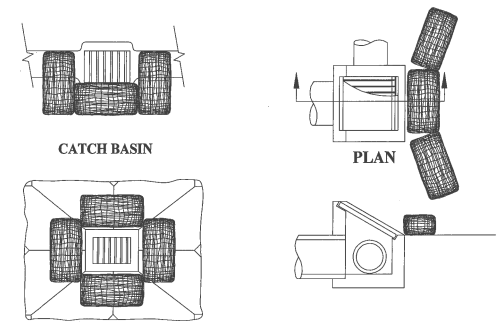
NOTE:

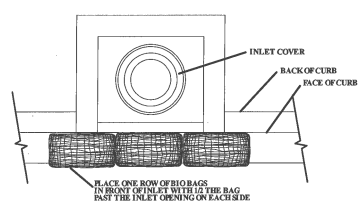
1. USE WOOD OR METAL FENCE POSTS. POST SPACING & DEPTH SHALL BE INSTALLED TO ADEQUATELY SUPPORT THE FENCE IN AN UPRIGHT MANNER.
2. MAXIMUM FENCE OPENINGS SHALL BE 2"X2".

DRAWN DB		CITY OF BEND	SCALE NTS
DIV STORM		STANDARD DRAWING	DATE 10/18/2010
REV / DATE / APPR		710 NW WALL ST., BEND, OREGON 97701	APPR
10/18/2010 Buchanan		TREE/VEGETATION PROTECTION FENCING	STD DWG E-3

USE: DEQ EROSION AND CONTROL MANUAL - APPENDIX F

STORM DRAIN INLET PROTECTION – SC-8





CURB INLET CATCH BASIN
BIO BAG INLET PROTECTION
NTS

Page 7 of 7

www.deq.state.or.us/wq/stormwater/escmanual.htm

CITY OF BEND
ENGINEERING DIVISION

CITY HALL ANNEX
745 NW BOND ST., BEND, OREGON 97701
PHONE: (541) 388-5570 FAX: (541) 388-5544

REVISIONS:
1.
2.
3.

DESIGNED BY:
DRAWN BY: DB
SCALE:
FILE:
DATE: 1/31/2012

SHEET: E1

COB #

ACWA CONSTRUCTION SITE STORMWATER GUIDE

Illustrated Best Management Practices

oregon association of CLEAN WATER agencies

March, 2013

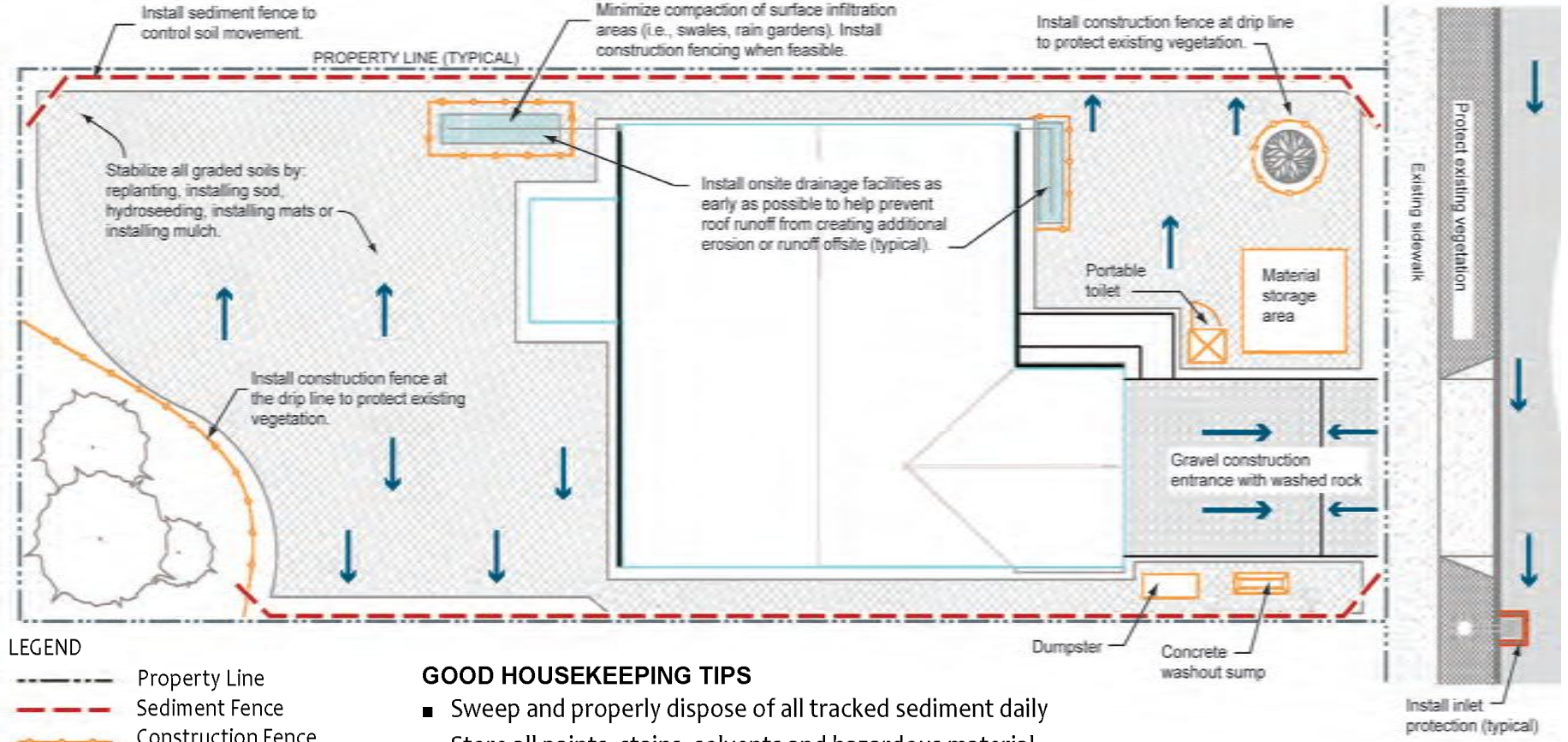
Table of Contents

Objectives

This guide highlights the most common best management practices (BMPs) to help inspectors and construction contractors address common problems related to erosion and construction site stormwater pollution. This guide assumes inspectors and contractors are familiar with design criteria for the BMPs used on their site. This guide covers ***runoff controls***, which are used to divert and control drainage at a site; ***erosion prevention practices***, which are used to prevent movement of soils; ***sediment controls***, which manage soils and debris that are moving; and ***pollution prevention practices***, which prevent pollutants from reaching the storm drain system or waterbodies.

Disclaimer

This guide is a field reference to help protect water quality and assist with local and Oregon Department of Environmental Quality (DEQ) regulatory compliance. Project proponents should still be familiar with and comply with local and DEQ stormwater requirements. Appendix materials have not been reviewed by the Association of Clean Water Agencies (ACWA) or DEQ.



LEGEND

- Property Line
- Sediment Fence
- Construction Fence
- Roof Drainage Facility
- Ground Slope Direction
- Existing Vegetation
- Stabilized Soil
- Existing Tree
- Existing Vegetation

Source: City of Bend, 2013

GOOD HOUSEKEEPING TIPS

- Sweep and properly dispose of all tracked sediment daily
- Store all paints, stains, solvents and hazardous material in a covered and bermed storage area
- Tarp all loads before leaving the site
- Dispose of all trash in a covered dumpster or trash can
- Clean up spills promptly using dry cleanup methods
- Remove temporary controls when no longer needed
- Do not dump or wash any material into the storm drain

Examples for a Typical Site

Common Best Management Practices

RUNOFF CONTROLS

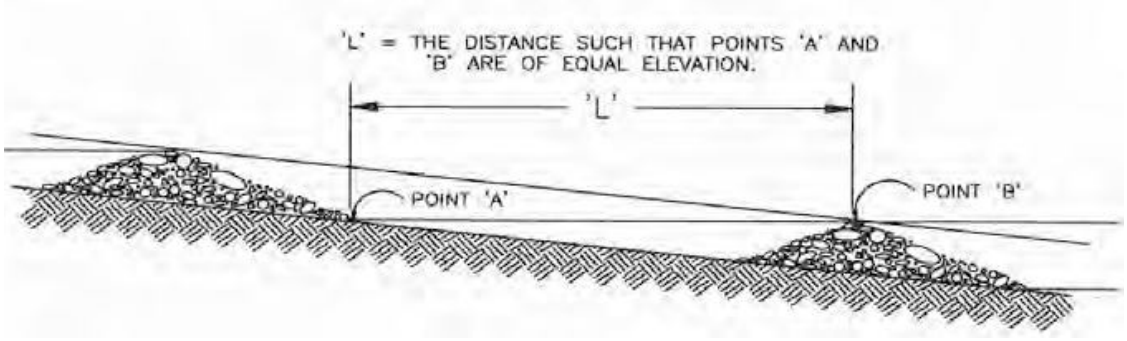
► Check Dams

A small dam designed to reduce gully erosion and allow some settling of suspended sediment in a swale or ditch. The dam may be constructed of washed rocks or other approved materials such as gravel bags, triangular silt dikes, biobags, or sandbags.

Installation Tips

- Extend dam across the swale or ditch to reduce the speed of flows.
- Install along a level contour.
- Check dams should be constructed to prevent flow around the dam.
- Ensure good surface contact to reduce undermining.
- The center, or spill way of the check dam should be lower (e.g., at least 6 inches for smaller check dams (6 feet across or less), and up to 2 feet lower than the edges for larger dams) than the outside edges so that the flow will not go around the ends of the dam.
- Tightly abut bags and stack gravel bags using a pyramid approach. Gravel bags should not be stacked any higher than per the approved plan or local design manual specifications.
- Overlap the upper rows of gravel bags across the joints in lower rows.
- The bottom (i.e., toe) of the uphill check dam should be level with the top of the downhill check dam (measured from the center). Notice how "point A" is level with "point B" in "Spacing Between Check Dams" figure.
- Extend the downstream portion of the check dam to also act as a splash block to prevent erosion when flows crest the dam.
- DEQ staff prescribe flow-through rock check dams. Water should flow through as well as over rock check dams (recommended rock size typically 3"-6" to avoid filling void spaces).

Spacing Between Check Dams



Source: DEQ, 2005

Inspection and Maintenance Tips

- Inspect and repair check dams before, during, and after rainfall events for damage such as undermining, breaching, or short-circuiting. Check the center elevation to ensure it is appropriately lower than the ends.
- Remove accumulated sediment prior to permanent seeding or soil stabilization. Incorporate removed sediment in the project or dispose of it properly.
- Remove sediment as needed to allow drainage, and as required.
- Remove check dam and sediment when check dams are no longer needed. Where vegetation is used to line ditches, remove check dams when vegetation has matured enough to protect the ditch or swale. Immediately following check dam removal, seed, mulch or mat the area where the check dams were.

Source: Clean Water Services

Source: Clean Water Services

► Diversion of Run-On

Diversion structures are used to divert runoff away from sloping land or sensitive areas.

Installation Tips

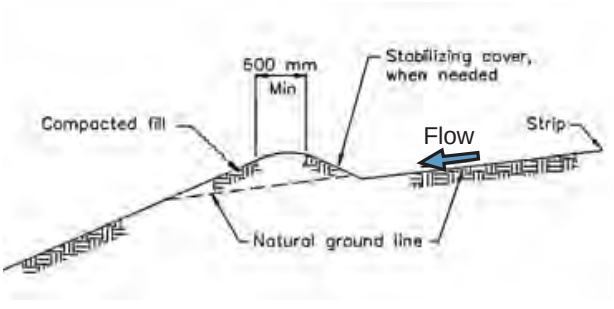
- Diversion dikes, swales, and pipe slope drains collect and convey smaller, generally sheet flows, to a safe stabilized outlet (e.g., sediment trap or basin).
- Make sure the diversion structure is properly sized to convey the design flows.
- Install diversion structures parallel to the contour at appropriate intervals across a disturbed slope.
- For slopes with erodible soils (e.g., steeper than 2:1 with more than 10 feet of vertical relief), construct benches or shorten distance between dikes or swales.
- May need erosion control mats to protect seed bed and channel from erosion.
- Use with check dams to slow stormwater, disperse flows and reduce erosion.
- The bottom width should be level across the swale.

Inspection and Maintenance Tips

- Inspect on a regular schedule as well as before, during, and after rain events.
- Check for erosion in channel, on embankments, or side slopes caused by concentrated flows that could result from improper construction. Inspect and repair as necessary.
- Check swale vegetation to ensure it is not overly impacted by high flow speeds.
- Remove debris and sediment, repair linings, replace lost riprap.
- Clean out clogged pipes (as part of the swale system) under roads.
- If the dike or swale regularly overflows, increase the capacity and/or number of dikes/swales.
- Minimize construction traffic over temporary dikes and swales.

Source: Clean Water Services

Typical Earth Dike



Source: DEQ, 2005 (Appendix D)

► Preservation of Existing Vegetation

Vegetated buffers protect sensitive areas such as wetlands, streams and lakes. They also preserve greenways or significant trees and native plants by protecting soils' infiltration capacity, stream shade (which cools surface water), wildlife habitat and scenic views.

Installation Tips

- Use a pre-construction meeting to confirm which vegetation is to be preserved and how to preserve it.
- Protect vegetation from:
  - Injury from construction equipment both above and below ground level, including breakage, scarring, cutting roots or compaction of root zone.
  - Grade changes, which affect plants' ability to obtain air, water or minerals. Placing a layer of gravel and a drainage/aeration tile system over the roots before a major fill allows air and water to circulate and protects the roots.
  - Root exposure.
  - Damage caused by excavations for utility lines.
- Clearly establish ground disturbance limits outside the drip line (or the tips of the branches) of preserved trees, using orange construction safety fence or flagging if approved. This will help prevent disturbance and over-compaction of the soil around the roots.
- Terrace the area around the plant or leave the plants on an undisturbed mound to help increase the plants' survival chances.
- Preserve buffers adjacent to waterways where earth disturbance will occur (EPA has set a 50-foot buffer or equivalent sediment load reduction requirement).[1]

Inspection and Maintenance Tips

- Inspect fencing often to ensure it is clearly marked and remains properly located throughout the life of the project. Repair fencing and/or flagging as necessary.
- Contact an arborist before cutting roots. Do not allow tree roots to be left exposed to the air—keep moist and cover with soil as soon as possible. Smoothly cut off damaged or cut roots at an angle. Re-cover and/or seal exposed plant roots.
- Remove the fences and barriers last, after final cleanup and landscaping is completed.

Source: City of Bend

Source: Clean Water Services

[1] *77 Federal Register 12286*

► Mulches

Use mulches to prevent erosion, to promote germination and to protect seeds from direct heat and from being carried off by runoff. Additional measures may be required to improve effectiveness on slopes.

Installation Tips

SELECTION

- Mulch may be required for seeding areas during the dry season if:
  - Grass growth is expected to be slow,
  - Soils are highly erodible,
  - There is a water body close to the disturbed area, or
  - Significant precipitation is anticipated before the grass will provide effective cover.
- Compost should be fully cured to optimize plant growth. Hot composting techniques will prevent most weed seeds from growing.
- Straw mulch should not be moldy, caked, or decayed.
- Wood chips and grindings are not suitable for areas that require close mowing.
- Hydraulic mulches and tackifiers are interim measures to prevent erosion until permanent cover is established.
- Gravel or crushed rocks are suitable for short slopes and areas subject to foot or vehicle traffic. Larger pit run rock can be used on steep slopes that are likely to have sub-surface water (springs) being carried off as runoff.

PREPARATION

- Divert concentrated runoff away from mulched areas.
- Ensure mulch is properly prepared and of high quality.
- Rock mulches should be appropriately washed before application.

APPLICATION

- Ensure all exposed soils are adequately and evenly covered with mulch.
- Properly crimp, net, or tackify loose mulches like straw or compost to the ground.
- Ensure straw is deep enough to prevent erosion (e.g., 2 to 2.5 tons per acre, or 2 inches uniform coverage).
- Apply wood chips or grindings with mulch blower, excavation equipment or by hand.
- Apply wood or cellulose fiber with a hydromulcher at a rate dependent upon the soil type and slope. Use tackifier as recommended by manufacturer.
- Apply hydraulically applied mulches from multiple directions to ensure adequate coverage.

Inspection and Maintenance Tips

- Maintain specified mulch cover thickness.
- Monitor long-term performance through the establishment of vegetative cover.
- Areas that fail to establish enough cover to prevent erosion should be re-mulched as soon as such areas are identified. Re-apply and/or protect eroding areas with a net or blanket. If the problem is related to drainage, fix the drainage problem and re-mulch the eroded area.
- Hydraulically treated areas should be inspected and monitored after installation and periodically thereafter. If sheet or rill erosion is evident, promptly re-apply treatments and/or take additional measures.
- If hydraulic mulch or tackifiers are applied without seeding, the longevity of the products must match the length of time soil will remain bare or until re-vegetation occurs.

Source: Clean Water Services

Source: Clean Water Services

► Seeding and Planting (Temporary and Permanent)

Well-established vegetation is one of the most effective ways to reduce erosion.

Installation Tips

- To ensure success, take care in site preparation, seed selection, application rate, and site maintenance.
- Properly calculate the seeding rate based on seed purity and germination information.
- Plant more than one plant species so that at least one species will do well under site conditions.
- For optimum seeding conditions, preserve topsoil and turn stockpile material in low windrows (to avoid compaction and development of anaerobic conditions) until final grades are established, then spread soil over area to be seeded.

SITE PREPARATION

- Bring the seedbed area to final grade; remove all larger clods, rocks and debris and grade surface irregularities to less than 2 inches. The seedbed should be firm but not compact. The top layer of soil (e.g., 4 to 6 inches) should be loose and moist.
- If the seedbed has been idle long enough for the soil to become compact, the topsoil should be broken up and smoothed out.
- Tracking or furrowing should be done horizontally across the face of the slope, so ridges are along the slope contour.
- Divert concentrated flows away from seeded area.
- Spread topsoil over final grades. Or conduct soil test to determine pH and nutrient content and incorporate amendments into the soil as needed to adjust pH to 6.0 to 7.5.

SEEDING/SEED PURITY

- Seed must have soil contact for optimum germination. Incorporate broadcast seed into the soil by raking or chain dragging and then lightly tamp down to provide good seed-soil contact. Double the rate of seed application when mulch and seed are applied in a single application.
- Use seed specified in the project plan and measured by Pure Live Seed (PLS) weight.
- Use recommended erosion control seed mixes for your area.
- Apply seed before applying straw mulch or other ground cover applications.

TIMING OF SEED APPLICATION

- Temporary vegetative cover must be fully established by the date specified in the project plan or other ground cover measures must be implemented.
- Apply permanent seeding when no further disturbances are planned. On steep slopes (e.g., greater than 10 percent), apply hydroseed and mulch with a bonding agent (tackifier) in accordance with seed supplier recommendations.
- Supply permanent or temporary irrigation especially in abnormally hot or dry weather or on adverse sites. Control water application rates to provide adequate moisture without causing runoff.

FERTILIZER

- Test areas that are being seeded for final landscaping to determine type and quantity of fertilizer needed.
- Use slow-release fertilizers and do not over apply.
- Use non-phosphorus fertilizer on disturbed areas within 50 feet of water bodies and wetlands.
- Use stockpiled topsoil or compost to reduce the need for fertilizer.
- Do not apply sprays in high wind or just before precipitation events.
- Sweep up over sprayed product and use or properly dispose of it.

Inspection and Maintenance Tips

- Inspect newly seeded areas frequently to ensure plants are growing.
- If the seeded area is damaged due to runoff, additional BMPs may be needed. Re-seed and mulch damaged areas to prevent sheet and rill erosion.
- Spot seed to fill in bare spots where plants did not grow properly. If spot seeding is ineffective, use an alternate method, such as sod or matting. Contact the designer if problems continue.

Source: Clean Water Services

Source: Clean Water Services

Source: Clean Water Services

► Erosion Blankets and Mats

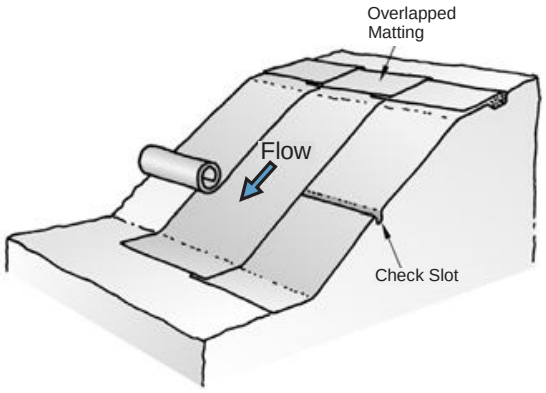
Erosion blankets and mats (mats) are used to cover the soil to prevent erosion and assist in establishment of vegetation.

Installation Tips

- Make sure slopes are appropriately stabilized promptly as grading progresses and following construction.
- Select mats based on selected design and site characteristics because mats come in various materials. Select mat material based on length of use required, slope, soil type, and shear stress on channel bottom.
- Grade the surface to remove all debris and undulations larger than 2 inches in any dimension. Make sure slopes are appropriately stabilized promptly following construction.
- Apply seed and fertilizer (if using) prior to matting.
- Install mats in complete contact with soil surface. Drape rather than stretch the mat across the terrain to prevent vegetation from pushing the mat up and reducing soil contact.
- Trench the mat at the top of the slope to prevent runoff from flowing under the mat.
- Provide adequate overlap between adjacent mats so erosion does not occur between them. Install the overlaps in the downslope or downstream direction to prevent runoff from lifting mats, similar to shingles on a roof.
- Follow manufacturer's specifications for staple pattern and size for the onsite soil type and slope. Make sure you use enough staples to prevent erosion from occurring under the mat (under-rilling), and long enough staples to prevent failure.

Inspection and Maintenance Tips

- Inspect following installation and before, during, and after storms.
- Ensure mats have good ground contact.
- Check for erosion and undermining. Repair damaged areas. Staple into the ground any areas not in close contact with the soil.
- If erosion occurs, repair and protect the eroded area. If washout or breakage occurs, repair the slope and then reinstall mat.



Source: Multi-jurisdictional Erosion Prevention and Sediment Control Planning and Design Manual, 2008

Source: Clean Water Services

► Entrance/Exit Tracking

Properly implemented construction entrances/exits help prevent the tracking of soil onto public or private roadways that could flow into stormwater conveyance systems or surface waters. They are usually stabilized rock pads placed at each construction site entry and exit point. Other plates, panels or structural systems may also be used.

Installation Tips

- Install prior to initiating any site work.
- Encourage only essential vehicles to come on and off site.
- Use only washed rock to minimize sediment runoff.
- Use appropriate size rock (e.g., 3 to 6 inches for larger site developments; or per local regulation for single-family residential).
- Whenever possible, construct the pad on a firm, level, and compacted subgrade. Avoid entrances with steep grades or located on curves of roadway.
- Do not install rock on paved surfaces. Use wooden curb ramps instead.
- Install geotextile under rock when subgrade is not stable or is "pumping" up into the pad.
- Include a tire wash facility if entrance is not effectively retaining sediment onsite.

Inspection and Maintenance Tips

- The construction entrance and tire wash requires daily, ongoing inspection.
- Immediately sweep up and remove rock or sediment carried from the site. Stabilize onsite sediment generation areas to prevent tracking onto pavement.
- **DO NOT FLUSH ROCK OR SEDIMENT FROM THE SITE INTO THE DRAINAGE SYSTEM!**
- Add or replace rock as needed to maintain the specified dimensions.
- If using a tire wash facility, inspect routinely and remove accumulated sediment.

Source: City of Bend

Source: Clean Water Services

► Sediment Fence

A sediment fence is a temporary sediment trap made of filtering geotextile fabric stretched between and attached to support posts; it is installed to treat overland/sheet flow.

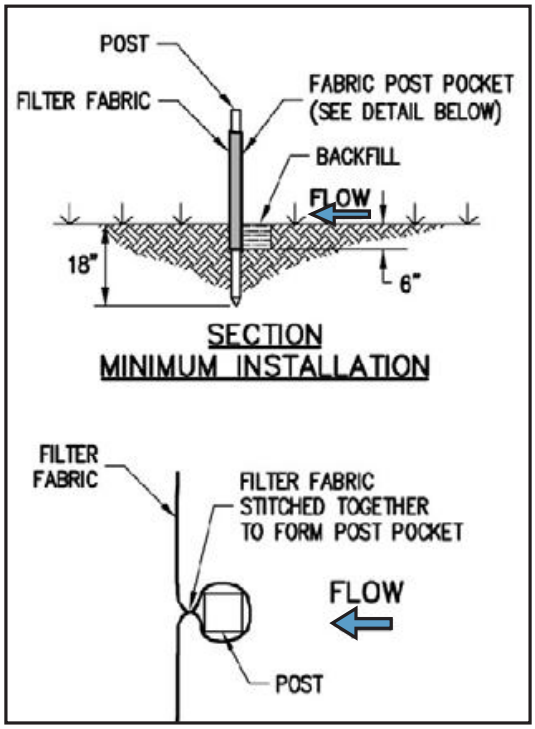
Installation Tips

- Use only for sheet and rill erosion; not for concentrated flow and never across waterways.
- All sediment fence filter fabric should have manufactured stitched loops with posts, sized as specified. Install stitched loops on the uphill side of the sloped area. Standard or heavy duty sediment fence fabric must meet specific ASTM requirements.
- Drive posts securely into the ground.
- Install parallel to ground contours according to the specified barrier spacing for the slope. In areas where cross contours cannot be avoided, use check dams or wings to slow flow and prevent erosion.
- Considering specific site characteristics, either install at toe of slope or slightly away (e.g., 3 feet) from toe of slope to maximize storage capacity.
- When sediment fence approaches its end point, turn fence uphill and extend one full panel (6 feet).
- Bury the lower "hem" of the fabric in a trench (e.g., minimum 6 inch trench) along the contour to prevent sheet flow from piping under the fence. Backfill trench and compact the soil on both sides of the fence.
- When joining two or more sediment fences, connect the two end stakes by wrapping them together at least one and one half turns and driving the joined stakes into the ground together.

Source: Clean Water Services

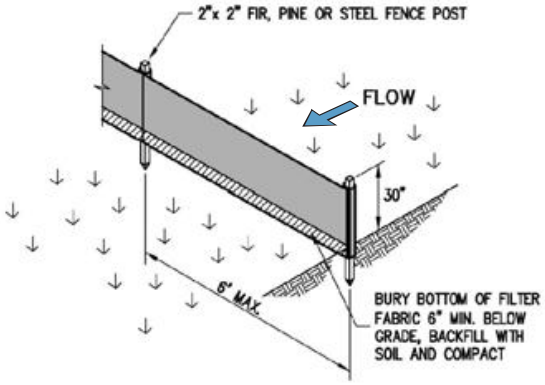
Inspection and Maintenance Tips

- Inspect frequently. Immediately repair damage (e.g., split, torn, slumping, weathered fabric; broken posts).
- Remove accumulated sediment once it has reached 1/3 the fence height.
- Inspect for channel formation parallel to the fence. Splice in lateral sediment fence "wings" to slow velocity, or place bio-bags at intervals appropriate to the slope.
- Replace deteriorated or clogged geotextile.
- Check for undercutting or piping under fence.
- Remove fences when upslope area has been stabilized and is no longer needed.



Detail Fabric Post Pocket

Source: Clean Water Services, 2012



Typical Prefabricated Sediment Fence Layout

Source: DEQ, 2005

► Inlet Protection

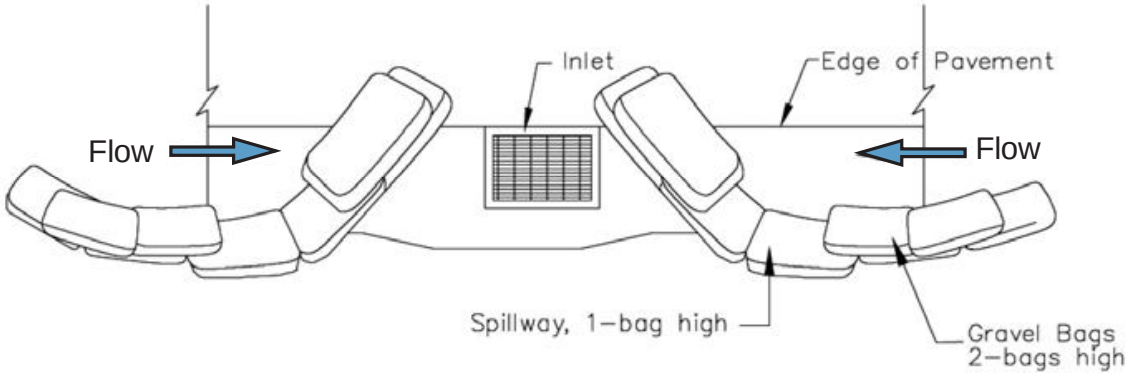
Inlet protection devices filter coarse sediments from runoff, preventing them from entering storm drainage systems.

Installation Tips

- Install inlet protection devices in areas with low flows and low sediment loads. Additional measures must be considered depending upon soil type.
- Place in areas where ponding will not have adverse impacts.
- Type and installation must allow for overflow in a severe storm event.
- Properly install and maintain the devices to prevent short-circuiting of flow.
- Make sure when using biobags that they are not constructed of such a dense material that they do not allow enough flow–through that would result in too much ponding and overtopping.
- DEQ recommends biobags not be used on streets or other paved areas due to their high maintenance and potential for damage or displacement. If biobags are used in high-traffic areas, it is recommended that additional measures be implemented to help prevent them from being run over (e.g., flagging several feet high).

Source: Clean Water Services

Typical Protection for Inlet with Opposing Flow Directions



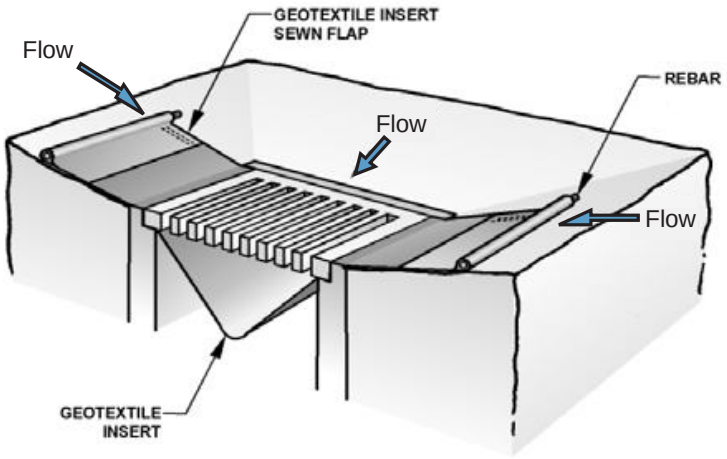
Source: DEQ, 2005

Inspection and Maintenance Tips

- Regularly check and maintain placement of inlet protection, particularly in high traffic areas.
- Remove accumulated sediment after every storm and during and after each significant storm.
- If inlet protection becomes clogged with sediment, sediment must be carefully removed and inlet protection cleaned or replaced.
- Use mechanical means (shovel, broom, sweeper/vactor) to remove sediment as needed to maintain intended functions.
- ***NEVER FLUSH SEDIMENTS INTO DRAINAGE SYSTEM!***
- Repair or replace materials as needed to ensure proper functioning. If rock becomes clogged with sediment, it must be carefully removed and cleaned or replaced.

Source: Clean Water Services

Inlet – Prefabricated Filter Insert



Source: Multi-jurisdictional Erosion Prevention and Sediment Control Planning and Design Manual, 2008

► Fiber Rolls or Wattles

Fiber rolls or wattles (wattles) intercept and capture sediment entrained in sheet flow. Use these light-weight and easy-to-install rolls in place of sediment fences on steep slopes or as an alternative to biobags for inlet protection.

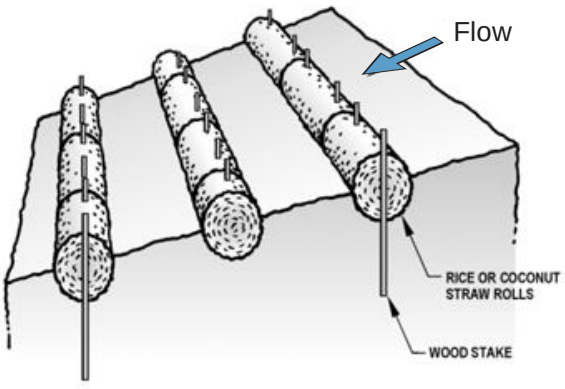
Installation Tips

- Place in shallow trenches along the contour of newly constructed or disturbed slopes and stake into the ground. Trench should be deep enough to ensure good contact on gentle slopes and to accommodate up to 1/3 the thickness of the wattle for steeper slopes, especially on sandy soils. Wattle must be tight against the soil in trench.
- Make sure no gaps exist between wattles. Overlap ends of adjoining wattles.
- Stakes must be securely driven into undisturbed material to specified depth. Drive additional stakes on the down slope side of the trenches in highly erodible soils or on very steep slopes.
- If live willow stakes are installed, use a crowbar or rebar to drive holes through wattles.

Inspection and Maintenance Tips

- Make sure wattles are in contact with the soil and stakes are holding.
- Clear sediment build-up frequently.
- Re-stake, re-seed, re-plant vegetation, and/or install matting as necessary to stabilize slope.
- May be allowed to degrade in place if biodegradable or photodegradable material is used.

Wattle Roll Installation



Source: Multi-jurisdictional Erosion Prevention and Sediment Control Planning and Design Manual, 2008

Source: Clean Water Services

► Concrete Management

Concrete management prevents or reduces discharge of pollutants to stormwater from concrete waste.

Installation Tips

- Perform on-site washout in designated areas only.
- Train employees, delivery drivers, and subcontractors on how to use the system.
- Do not wash out concrete trucks into storm drains, open ditches, streets or streams. Do not allow excess concrete to be dumped on site, except in designated areas.
- Wash out wastes into a properly sized temporary pit or bermed area where the concrete can be set, later broken up and properly disposed.
- Locate washout area at least 50 feet from storm drains, open ditches or water bodies.
- When washing concrete to remove fine particles and expose the aggregate, avoid creating runoff by suctioning water to a tank or draining the water to a bermed or level area. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid ordering and mixing excess amounts of concrete.
- If dewatering the concrete management facility, contact the local agency or DEQ to see if pretreatment is needed.

Inspection and Maintenance Tips

- Ensure that concrete truck drivers are adhering to project practices.
- Inspect routinely, when applicable activities are underway to ensure that concrete washout does not overflow and that freeboard is adequate to contain concrete and rain.
- Clean out designated washout areas when the washout is mostly full (e.g., 3/4 full).
- Properly clean out any designated on-site washout areas and remove all debris upon project completion.

Source: Clean Water Services

Source: Clean Water Services

► Stockpile and Materials Management

Stockpile management reduces or eliminates the discharge of pollutants to stormwater from stockpiles of soil, sand, rock sub-base material, concrete, mulch, compost, building materials, etc.

Materials management prevents or reduces discharge of pollutants to stormwater from material delivery and storage by minimizing the storage of hazardous materials on site, storing materials in a designated area, installing secondary containment, conducting regular inspections and training employees and subcontractors.

Installation Tips

STOCKPILE MANAGEMENT

- If feasible, locate stockpiles a minimum of 50 feet away from inlets, drainage courses, or water bodies.
- Keep stockpiles organized and surrounding areas clean.
- Protect stockpiles with a perimeter sediment barrier such as berms, sediment fences, or fiber rolls.
- Protect storm drain inlets, drainage courses, and receiving waters from stockpiles, using inlet protection and perimeter controls as appropriate.
- Implement dust control and dust suppression practices, such as temporary or vegetative cover, as appropriate to prevent wind and rain erosion of stockpiled material.
- Temporary stockpiles not removed or used by the end of one workday should be protected.

MATERIALS MANAGEMENT

- Designate areas of the construction site for material delivery and storage of soil, pesticides/herbicides, fertilizers, detergents, plaster or other products, fuel, oil, grease or other petroleum products and other chemicals such as acids, lime, glues, paints, solvents and curing compounds.
- Place storage areas near construction entrances, and ensure storage and transport is away from drainage paths or waterways. Place in an area that will be paved and surround materials with earthen berms.
- Keep an up-to-date inventory of materials delivered and stored on site. Order materials when they are needed and only in the quantity needed.
- Handle materials as infrequently as possible.
- Store materials, especially treated wood and galvanized metals, in a covered area.
- Place chemicals, drums and bagged materials in secondary containment.
- Minimize hazardous materials on site. Handle them as infrequently as possible.
- Storage of reactive, ignitable, or flammable liquids must comply with local fire codes. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area.

Inspection and Maintenance Tips

STOCKPILE MANAGEMENT

- Inspect stockpiles regularly; repair and/or replace covers or perimeter controls as needed.

MATERIALS MANAGEMENT

- Keep chemicals in their original containers and the contents labeled.
- Train employees and subcontractors on spill prevention and spill response procedures.
- When dangerous materials or liquid chemicals are unloaded, employees trained in emergency spill cleanup procedures should be present.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and contaminated soil.

Source: Clean Water Services

Source: Clean Water Services

Source: Clean Water Services

Source: Clean Water Services

Notes:

Notes:

Thanks for the hard work of the ACWA group that guided development of this field guide, under the able leadership of Wendy Edde, City of Bend. The group guiding this effort included:

- John Bushard, City of Troutdale
- Delynn Clark, City of Lake Oswego
- Billy Curtiss, City of Eugene
- Keri Handaly, City of Gresham
- Dawn Hottenroth, City of Portland
- Tony Gilbertson, Clean Water Services
- Scott Gillespie, City of Eugene
- Linda Hulme, City of Fairview
- Nitin Joshi, City of Salem
- Jim Krawczyk, City of Salem
- Jennifer Morgan, Rogue Valley Sewer Services
- John Nagy, Clackamas County Water Environment Services
- Roger Thom, City of Medford
- Deborah Topp, City of Salem

Resources

Additional resources for preventing erosion and reducing site sediment runoff include:

- DEQ – Erosion and Sediment Control Manual (2005)
  http://www.deq.state.or.us/wq/stormwater/docs/escmanual/manual.pdf
- DEQ - Inspector Guidance Booklet for Construction Site Erosion and Sediment Control (2005)
  http://www.deq.state.or.us/wq/stormwater/docs/escmanual/inspectorguide.pdf
- Environmental Protection Agency – Stormwater Information
  http://cfpub.epa.gov/npdes/stormwater/const.cfm
- EPA – Developing your Stormwater Pollution Prevention Plan for Construction Sites
  http://cfpub.epa.gov/npdes/stormwater/swppp.cfm
- Local stormwater design manuals – check with your local municipality or district

About ACWA

The Oregon Association of Clean Water Agencies is a private, not-for-profit professional organization of Oregon's wastewater treatment and stormwater management utilities, along with associated professionals. ACWA's mission is to protect and enhance Oregon's water quality. More about ACWA can be found at *www.oracwa.org*

oregon association of CLEAN WATER agencies

March, 2013

CITY OF BEND
ANNOUNCES STORMWATER MANAGEMENT TRAINING WEBINARS

May 2012

Why?

Protection of our water resources is important for our river, and associated economy; and for protection of our drinking water aquifers. Private and public Underground Injection Controls (UICs) such as drywells and drill holes are prevalent here along with outfalls to the river. All of these must meet Oregon Department of Environmental Quality and federal requirements to protect water quality. The workshops will provide tools to help effectively address stormwater quality requirements, including Bend Code Title 16.

Location

City of Bend,
City Council Chambers
710 NW Wall Street
Bend, Oregon 97701

Acronyms

ASCE: American Society of Civil Engineers
BMPs: Best Management Practices
IECA: International Erosion Control Association
NPDES: Nation Pollutant Discharge Elimination System

Engineers, Project Managers, Construction Field Personnel, Project Proponents, Reviewers, and Agency Staff Are Invited

The City of Bend Stormwater Utility is sponsoring these upcoming training opportunities. Attendance is free. Please see registration information on back.

Integrating Stormwater Harvesting into Low Impact Development

Thursday, June 14, 2012 8:30 AM to 10:00 AM

From ASCE's website announcement:
While stormwater harvesting has traditionally been used to meet water supply goals or to achieve LEED points, new EPA rules emphasize infiltration and stormwater capture and reuse. Fortunately, stormwater reuse systems can be integrated to meet both water supply and stormwater management goals. This webinar breaks down the differences and provides a process to integrate stormwater reuse projects (both above and below ground storage) into Low Impact Development (LID) and Green Infrastructure systems. This seminar is co-sponsored by ASCE's Environmental & Water Resources Institute (EWRI) and ASCE Continuing Education. PDH's are available.
Instructor: Jennifer J. Walker, P.E., D.WRE, CFM, M.ASCE

Introducing "Final Tuesday Talks..."

Held on the last Tuesday of each month, these short webinars from International Erosion Control Association experts on construction site management techniques will help you meet regulatory requirements and then quickly get on with your day....

Types of Erosion Processes

Tuesday, June 26, 2012 7:00 AM to 8:00 AM

From IECA announcement:
This prerecorded webinar discusses how thousands of dollars are often invested in erosion control practices that fail, simply because of an ignorance of the type of soil erosion that they are dealing with. It is important for the professional to know what type of erosion process that s/he is dealing with, so that further action can lead to successful erosion control projects. Topics include: (1) Water erosion (rainsplash erosion, sheet erosion, rill erosion, gully erosion, river erosion, and coastal erosion), (2) Wind erosion (abrasion and deflation), (3) Ice erosion, and (4) Gravity erosion.
Instructor: Pablo Garcia-Chavesich

Top Ten Misunderstood Elements in Construction Stormwater Compliance

Tuesday, July 31, 2012 7:00 AM to 8:00 AM

From IECA announcement:
This prerecorded webinar will help stormwater designers, inspectors and regulators better understand the proper use and implementation of BMPs that are often misunderstood, or installed and used improperly. This includes: silt fence, check dams, inlet protection devices, and ponds or basins. This course will also discuss elements of the stormwater pollution prevention plans that are often not in compliance with the Construction General Permit.
Instructor: Shirley Morrow

Technical Design and Construction for Field Personnel
Tuesday, August 28, 2012 7:00 AM to 8:00 AM

From IECA announcement:

This prerecorded webinar is designed to give field construction personnel a basic understanding of the BMPs that are commonly used to control and reduce erosion and sedimentation from stormwater runoff on construction sites. The proper use and placement of BMPs, along with the critical details of construction will be presented. In addition, the webinar will address the administrative aspect of the NPDES permit process that must be performed in the field. These processes include inspection and record keeping, and maintenance and control of documents that are required to be kept on site. This webinar is targeted to all levels of field personnel expertise.

Instructor: Roger Coupe

Basics of Revegetation for Erosion and Sediment Control
Tuesday, September 25, 2012 7:00 AM to 8:00 AM

From IECA announcement:

This prerecorded webinar course will cover the basis required to initiate the establishment of vegetation where the primary purpose is to stabilize the site from erosion with vegetation. Contrary to many courses where this information is provided by engineers, contractors or material suppliers, this course will be instructed by a botanist and ecologist.

Instructor: Tom Williams

TO REGISTER

For the webinars, please register by emailing or calling Wendy Edde, City of Bend, wedde@ci.bend.or.us or (541) 317-3018 with your name, agency/company, and contact information.

Register today—seating is limited!

CITY OF BEND PUBLIC WORKS DEPARTMENT

62975 BOYD ACRES RD.
BEND, OREGON, 97701
541-317-3000
FAX: 541-317-3046
Wendy Edde, *Stormwater Program Manager*

Accessible Meeting Information

This meeting event/location is accessible. Sign language, interpreter service, assistive listening devices, materials in alternate format, such as Braille, large print, electronic formats and audio cassette tape, or any other accommodations are available upon advance request. Please contact the City of Bend Accessibility Manager Susan Duncan no later than three days prior to the webinar at 541-693-2141, Accessibility@ci.bend.or.us, and/or fax 541-385-6676. Providing at least 3 days notice prior to the event will help ensure availability.

Thank you for Attending!

International Erosion Control Association

Top 10 Mistakes in NPDES Compliance Webinar (July 31, 2012)

PLEASE SIGN IN

	Name (Please Print)	Affiliation	Print email if you would like to receive additional City stormwater announcements
1	Ric Ross	City of Bend	
2	Tyler Luebbert	City of Bend	
3	Cliff Swirey	City of BEND	
4	Terry Bower	CITY of Bend	
5	[illegible]	City of Bend	
6	Ian Isiotz	City of Bend	
7	DAVID OLTIC	✓	
8	Kristy Rathfft	DEQ	
9	Chris Hart Henderson	♡ Springs Landscape	
10	Wendy Edde	City of Bend	
11	[illegible]	City of Bend	
12			
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Thank you for Attending!

International Erosion Control Association

Top 10 Mistakes in NPDES Compliance Webinar (July 31, 2012)

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19			
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Top 10 Mistakes in NPDES Compliance

By
Shirley D. Morrow, CPESC, CISEC
ABC's of BMP's, LLC

Erosion vs. Sediment Control

- Erosion control devices lay on the earth's surface to intercept the raindrop, dissipate the energy of the raindrop and protect the soil from erosion.
- Sediment control devices slow and pond the sheet flow to dissipate the energy in the flowing stormwater so sediment in suspension settles out.

Erosion vs. Sediment Control cont.

- Erosion control is prevention

- Sediment control is remediation

Silt Fence

- Why do we ring the site with silt fence?
  - Must have perimeter controls
  - Only where stormwater leaves the site
- Must be on the contour
- Not in concentrated flow channels

Where silt fence should **NOT** be used

Inlet Protection

- On purpose we want to block the stormwater inlet so less sediment will enter the stormwater system.
- This will pond water.
  - More ponding – the better the treatment
  - Less ponding – more sediment may discharge
- How much of the inlet you block and where it is located will dictate how much ponding you will have.

Inlet Protection cont.

- Using silt fence around an inlet allows for the potential to have two feet of ponded water.

Inlet Protection cont.

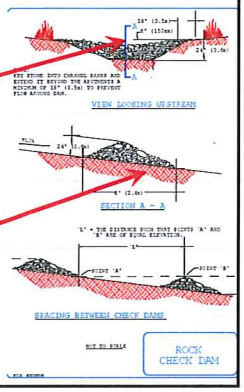
- Ponding in the wrong place is called flooding!

Check Dams

- How do they work – why do we use them?
  - Stormwater flow will increase in velocity as the slope increases.
  - Check dams are installed and spaced so there is no increase in slope or velocity as the flow moves down the slope.

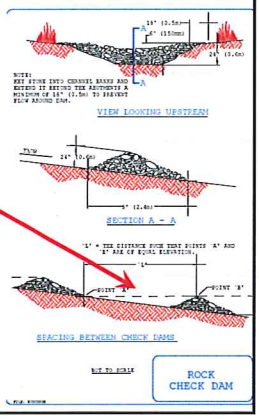
Check Dams cont.

- Step one – The center must be the lowest point
- Step two – The downhill side should be longer to act as a splash block



Check Dams cont.

- Step three – the spacing is such that the top of the lower dam is at the same elevation as the bottom of the upper dam



Ponds and Basins

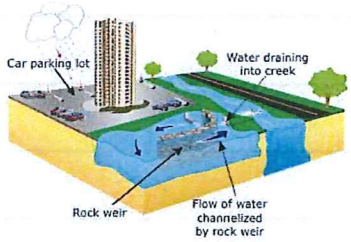
- Sediment traps and Sediment basins are designs to hold sediment during construction activities
- Detention basins are dry and used as post construction stormwater control
- Retention ponds are wet, designed to hold stormwater flow and used as post construction stormwater control

Short Circuiting

- When the inflow to the pond is very near the outflow

Short Circuiting cont.

- Create a weir or berm between the two pipes



Establishing Vegetation

- Must have topsoil
- Seed is not final stabilization
- Must provide for erosion control until vegetation is at a density of 70% or greater over the entire disturbed site.

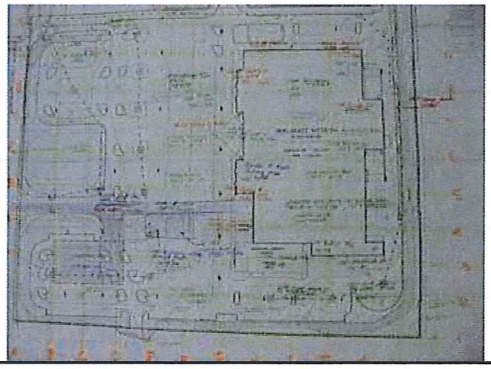
Inspect for Compliance

- Compliance includes every requirement within the permit
  - Paperwork
  - Inspection reporting
  - Site map and detail sheets
  - Public posting signage

SWPPP Maintenance and Updates

- SWPPP is a living document that should record all soil disturbance that will affect stormwater runoff.
- Location and dates BMPs were installed, moved, or removed.
- SWPPP is not complete until the NOT is filed.

SWPPP Maintenance and Updates cont.



SWPPP Maintenance and Updates cont.

Post Construction O&M Information

- Are there requirements in the States CGP?
- When are the post construction devices to be installed?
  - Site should be fully stabilized
  - These devices are not designed for sediment loads
- Who takes over the O&M after construction is complete?

Questions

IECA Webinar: "Top 10 Mistakes in NPDES Compliance"

1. Please evaluate the webinar (1 being poor, 3 average, 5 excellent)

	1	2	3	4	5	Rating Count
Overall Webinar	0.0% (0)	20.0% (1)	**60.0% (3)**	20.0% (1)	0.0% (0)	5
Presentation Addressed Topics as Advertised	0.0% (0)	**40.0% (2)**	20.0% (1)	20.0% (1)	20.0% (1)	5
Audio/Visual Quality	0.0% (0)	0.0% (0)	**40.0% (2)**	**40.0% (2)**	20.0% (1)	5
Please provide any comments/suggestions for improvement (please specify)						0
					answered question	**5**
					skipped question	**0**

2. Have you/will you be able to use the information that you gained from the webinar in your work?

		Response Percent	Response Count
Yes, directly		**80.0%**	**4**
Yes, indirectly		20.0%	1
Maybe/Not Sure		0.0%	0
No		0.0%	0
		answered question	**5**
		skipped question	**0**

3. Please rank the facility and refreshments (1 being poor, 3 being average, 5 being excellent).

	1	2	3	4	5	Rating Count
Facilities	0.0% (0)	0.0% (0)	40.0% (2)	0.0% (0)	**60.0% (3)**	5
Refreshments	20.0% (1)	0.0% (0)	20.0% (1)	20.0% (1)	**40.0% (2)**	5
			Comments/Suggestions for Improvements (please specify)			1

answered question	**5**
skipped question	**0**

4. Please list one or more new things that you learned as part of the presentation(s).

	Response Count
	1

answered question	**1**
skipped question	**4**

5. What additional stormwater training(s) would you feel would be useful (mark all that apply)?

	Short training (1-2 hours)	Mid-length training (1/2 - full day)	In-depth training (1-2 day)	Rating Count
Additional trainings on construction site management (erosion control and pollution prevention)	**100.0% (3)**	0.0% (0)	0.0% (0)	3
Field-visit examples--construction site management	33.3% (1)	**66.7% (2)**	0.0% (0)	3
Additional trainings on site design, and low impact development	0.0% (0)	**100.0% (1)**	0.0% (0)	1
Additional trainings on facility sizing	**50.0% (1)**	**50.0% (1)**	0.0% (0)	2
Additional trainings on Central Oregon Stormwater Manual	**66.7% (2)**	33.3% (1)	0.0% (0)	3
Long-term operation and maintenance	**100.0% (1)**	0.0% (0)	0.0% (0)	1
Illicit Discharges	**100.0% (3)**	0.0% (0)	0.0% (0)	3
			Other (please specify)	0
			answered question	**5**
			skipped question	**0**

6. Please provide any additional comments/suggestions for improvement.

	Response Count
	0
answered question	**0**
skipped question	**5**

Page 1, Q3. Please rank the facility and refreshments (1 being poor, 3 being average, 5 being excellent).		
1	Starbucks Coffe, Scones would be great!	Aug 1, 2012 4:17 PM

Page 1, Q4. Please list one or more new things that you learned as part of the presentation(s).		
1	Having downstream portion of the scheck dam extend out more as a splash block is a good idea.	Jul 31, 2012 4:07 PM

CITY OF BEND

Construction Site ESC Compliance featuring the International Erosion Control Association (IECA)

- Free Training Opportunity -

April 30, 2013

Contractors, developers, engineers, municipal inspection and construction staff…if you are not completely familiar with Bend Code Title 16, you do not want to miss this! The City of Bend Stormwater Utility is sponsoring an IECA Erosion and Sediment Control Live Training Course. Attendance is free and PDHs are available. This training will include information to help keep you in compliance with the City's new regulations in a cost-effective manner. As construction ramps up, now is the time to learn the new rules.

TRAINING COURSE:

Complying with Erosion and Sediment Control Requirements

DATE: *Tuesday, May 14, 2013* **TIME:** *9:00 am to 11:30 am*

LOCATION: *Municipal Court - 555 NE 15th St, Bend OR 97701*

Course Description:

This course will first provide a brief overview of erosion and sediment control requirements in Bend and provide an update on enforcement response. The main course is taught by an erosion and sediment control expert from the IECA, Alex Zimmerman, who will focus on the ever expanding set of tools now available to assist with erosion and sediment controls on active jobsites. Course participants learn how to control costs, prevent erosion, protect water quality, and comply with regulatory requirements in a positive, proactive, profitable manner. Classroom topics will include both choosing and properly implementing Best Management Practices (BMPs), maintenance and inspection, and proper documentation. The session also includes a half hour onsite field demonstration visit.

To Register:

Please register by contacting David Buchanan (Bend), at dbuchanan@ci.bend.or.us or 541-693-2176 with your name, agency/company, and contact information.

Interested but Can't Make This Time?

Then join us for a repeat of the classroom presentation hosted by Central Oregon Builders Association (COBA), Tuesday May 14, 2013 from 1pm-3pm at the COBA offices, located at 1051 NE 4th Street in Bend. Contact Gretchen Palmer (COBA) at 541-389-1058 for registration information and costs.

A New Enforcement Program:

Over the past year City Staff has been focused on providing education and outreach materials on the recently adopted Stormwater Ordinance – Bend Code Title 16. Now that the (1 year) education and outreach campaign has been completed, the City is going to transition into an education and enforcement program. To avoid costly delays and/or fines please review Bend Code Title 16 and attend this training.

Alex Zimmerman CPESC, CISEC, CESSWI. Alex Zimmerman brings over 15 years of large scale construction experience to Erosion and Sediment Control training. From large disturbance, linear, and single family construction to restoration and emergency landslide repair his experiences add to informative trainings on real world compliance issues for construction site operators, inspectors, and designers. Focusing on productive site management and site audits to identify potential problems and more effectively insure regulatory compliance. Awarded the Educational Achievement award for 2009 by the International Erosion Control Association, Alex continues to keep up to date and present the latest information on regulations and compliance challenges.

IECA: The International Erosion Control Association (IECA) is a non-profit, member organization that provides education, resource information and business opportunities for professionals in the erosion and sediment control industry. IECA has 2,500 members representing over 30 countries and 22 fields of professional practice.

ALL SITES ARE REQUIRED TO MEET THE MINIMUM PERFORMANCE STANDARDS:

ESC & Pollution Prevention

- Minimize tracking of sediment and debris onto roadways.
- Protect roadways, properties and stormwater facilities from sediment and debris.
- Properly wash out concrete trucks and equipment.
- Protect water bodies, streams and wetland from sediment and pollutants.
- Remove temporary BMPs after permanent controls have been established.

See Bend Code Title 16 (link on back) for additional minimum performance standards:

16.10.070 Clearing & Grading
16.10.090 Blasting
16.10.100 Tree Preservation
16.15.040 Post Construction

Commonly Used Erosion and Sediment Pollution Preventions Measures

❒ Construction Access

Purpose: A temporary construction entrance is a gravel pad located where vehicles leave a construction site. This rock pad is designed in such a way to allow vehicle tires to slightly sink into the rock. This helps to remove mud and debris from vehicle tires.

City Standard Drawing: R-27

Tips

- Locate Construction Entrance away from existing catch basins
- Limit the number of Access points
- Cover Trucks before they leave the site

❒ Sediment Control

Purpose: Sediments from construction activity can find their way into the stormwater system through storm sewers, storm grates and storm inlets. This sediment can plug inlets, pipes, dry wells, drill holes, and may cause flooding or impact water quality in the Deschutes River. Sediment fences, waddles and compost filter berms can help capture and remove sediment from construction site runoff.

City Standard Drawing: E-1

Tips

- Install silt fence along lower edges of the project site
- Inspect and maintain sediment controls regularly
- Remove once permanent controls are established

❒ Soil Stabilization

Purpose: Wind rain and snow combined with the removal of ground cover accelerates the process of erosion. Using hydro-seeding, applying a layer of straw, planting native grasses or installing jute matting can help stabilize soils and prevent sediment from being washed or blown off site.

City Standard Drawing: E-5 & E-6

Tips

- Phase construction operations to limit the amount of un-stabilized soil
- Stabilize disturbed soil as soon as possible after work is completed

❒ Inlet Protection

Purpose: Storm drain inlet protection measures prevent soil and debris from entering storm drain inlets. These measures are temporary and should be implemented before a site is disturbed. Inlet protection is the last line of defense in protecting the stormwater system from sediment.

City Standard Drawing: E-2

Tips

- Routinely inspect and remove excess sediment regularly
- Place bulk material stockpiles away from catch basins and paved surfaces

❒ Good Housekeeping

Purpose: Proper storage, maintenance, clean-up and disposal of materials and machinery can prevent pollutants from entering storm drainage facilities.

Tips

- Properly store paints and chemicals; clean up accidental spills safely and promptly.
- Sweep up sediment or debris tracked onto roadways; put litter in appropriate receptacles.
- Keep machinery properly maintained; use an oil pan when needed; repair leaks promptly.

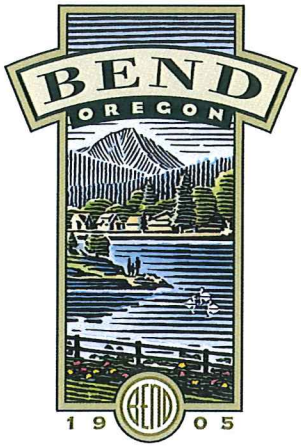
CITY OF BEND
STORMWATER UTILITY
575 NE 15 ST
BEND, OREGON, 97701
541-317-3000

Additional Links

City of Bend Code Title 16
http://www.ci.bend.or.us/modules/showdocument.aspx?documentid=6732

City of Bend Design Standards
www.ci.bend.or.us/modules/showdocument.aspx?documentid=2104

Business and Home Best Management Practices
www.bendoregon.gov/index.aspx?page=298



Engineering and Infrastructure
Planning Department

Complying with Construction Site Erosion and Sediment Control Requirements

An International Erosion Control Association
Live Training

AGENDA

Tuesday, May 14, 2013
Central Oregon Builders Association

1:00- 1:05 PM **Welcoming Remarks**
Wendy Edde, Stormwater Program Manager
City of Bend

1:05- 1:15 PM **Stormwater and the City**
Russell Grayson, City Engineer
City of Bend

1:15-3:00 PM **Construction Site Erosion and Sediment Controls— the Good, the Bad, and the Ugly**
Alexander Zimmerman, IECA

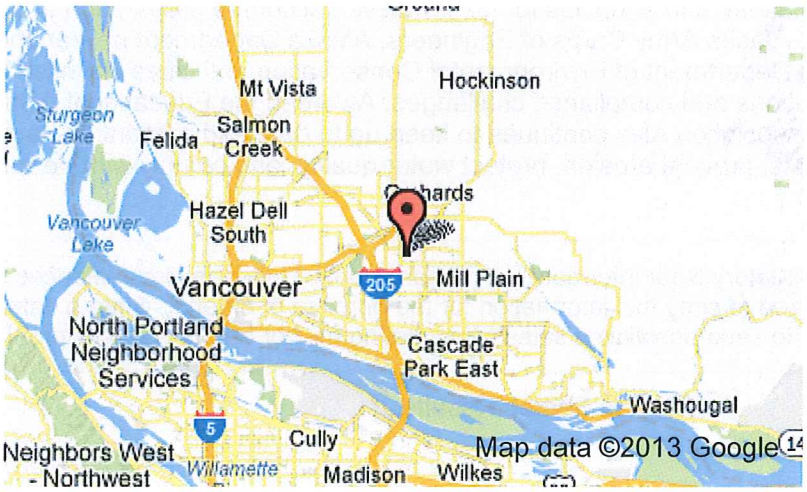
Alex Zimmerman, CPESC, CISEC, CESCL

Creative Courses

Manager

Membership Information:
Professional Member
Mountain States Chapter
Pacific NW Chapter
Western Chapter
IECA Member since 9/13/1999

Contact Information:
12320 NE 37th St
Vancouver, WA 98682-7505
Work Phone: (360) 910-4800
Email: azim07@comcast.net



Committee/Volunteer Activities:
Chapter Officers/Contacts
- *Vice President*

Additional Resources

The following resources are available on the City of Bend's Stormwater website at:
http://www.bendoregon.gov/index.aspx?page=298#Construction

Construction Site Management

- Central Oregon Stormwater Manual - August 2010
- Maintain Construction Site BMPs Poster
- Erosion and Sediment Control Fact Sheet
- Grading Clearing & Erosion Permit Flow Chart
- Drainage Submittal Flow Chart
- Sample Site Plan - Single Family Residential
- Stormwater Maintenance Agreement
- Construction Stormwater Pollution Prevention (NPDES Webcasts)
- Construction Stormwater Pollution Prevention Plan Development (EPA)

Links to Certification Programs and Associations

- Certified Professional in Erosion and Sediment Control
- International Erosion and Sediment Control Association

Upcoming Trainings Information

Permanent Facilities / Site Design / Low Impact Development

- Considering Stormwater at the Conceptual Planning Stage Brochure
- One Backyard at a Time Video - viewing requires windows media player
- Central Oregon Stormwater Manual - August 2010
- Central Oregon Plants for Stormwater Facilities - May 2012
- Stormwater Maintenance Agreement (Word doc)
- Developers: Introduction to Low Impact Development (EPA Webcast)
- Green Infrastructure in Arid Climates (EPA)

Maintenance and Illicit Discharge Minimization

- Illicit Discharge Minimization Best Management Practices Manual
- Central Oregon Stormwater Manual - August 2010 (redirects to COIC website)
- Resources List

Business

- Pressure Washing Brochure - Nov 2010
- Restaurants/Food Service - Clean It Right
- Restaurant/Food Service Poster
- Automotive Industry (ecobiz.org)
- Auto Repair and Maintenance Tips (DEQ)
- Hazardous Waste (Deschutes County)
- Industrial Stormwater: Concrete, Crushed Stone,
  Sand and Gravel (DEQ Webcast)

Household

- Hazardous Waste Disposal (Deschutes County)
- Protect Your Well Water
- Motor Oil Brochure
- Motor Oil Poster
- Oregon Rain Garden Guide (OSU)
- Healthy Lawns, Healthy Families (DEQ)

Construction Site ESC Compliance - May 14, 2013

Thank you for Attending!

PLEASE SIGN IN

	Name	Affiliation	Sign-in
1	David Abbas	City of Bend	
2	Terry Angle	Angle Consulting Engineering	
3	Edie Birindelli	City of Bend	
4	Brice Blackwelder	City of Bend	
5	Christopher Blake	City of Bend	
6	Chris Brelje	City of Bend	
7	David Buchanan	City of Bend	
8	Chris Chambers	DevTech Engineering Inc.	
9	Dennis Coffman	City of Bend	
10	Aaron Collett	City of Bend	
11	Dennis Collins	StormWater Services	
12	Mark Douglas	Hickman, Williams & Associates	
13	Wendy Edde	City of Bend	
14	Austin Faller	City of Bend	
15	Russell Grayson	City of Bend	
16	Hardy Hanson	City of Bend	
17	Grant Hardgrave	Hickman, Williams & Associates	
18	Chris Henningsen	CA Rowles Engineering	
19	Kim Kampmann	City of Bend	
20	Ian Klotz	City of Bend	
	Grant Hamilton	City of Bend	
	Craig Chenoweth	City of Bend	

Construction Site ESC Compliance - May 14, 2013

Thank you for Attending!

PLEASE SIGN IN

	Name (Please Initial)	Affiliation	Sign-in
21	Richard Kuss	City of Bend	
22	Heidi Lansdowne	City of Bend	
23	Victor Lucero	City of Bend	
24	Joseph McClay	City of Bend	
25	Ryan Oster	City of Bend	
26	Brett Parker	Hickman, Williams & Associates	
27	Kevin Ramsey	City of Bend	
28	Jackie Saul	City of Bend	
29	Michael Scannell	Woodcraft Inc.	
30	Travis Smith	Ambient Architecture LLC	
31	Travis Somers	City of Bend	
32	Doug Straw	City of Bend	
33	Christopher Struck	City of Bend	
34	Jason Suhr	City of Bend	
35	Chad Towell	City of Bend	
36	Julia Wellner	City of Bend	
37	Jim Wodrich	City of Bend	
38	Chris Mosher	COB	
39	Robert Anderson	COB	
40	Cory Vroom	Cory A Vroom Remodeling	
41	DAVID OAK	COB	
42	Jason Powell	BPRD	

Construction Site ESC Compliance - May 14, 2013 (1-3pm Class)

Thank you for Attending!

PLEASE SIGN IN

	Name	Affiliation	Sign-in
1	Wendy Edde	City of Bend	Wendy Edde
2	MIKE ARDELJAN	DREAM HOME BUILDING & DESIGN	
3	Jim Lord	CENTURY WEST ENGINEERING	
4	THOMAS HEADLEY	CENTURY WEST ENGINEERING	
5	AUDREY ALLEN	ALLEN DESIGN STUDIO / ALLEN CONTRACTING	
6	STEVE BENNETT	BENNETT BUILDERS INC.	
7	Bryan Rossiter	Choice One Builders	
8	RYAN OSTER	CITY OF BEND	
9	BILL TURNER	BILL T. Const Co	
10	KELLY VINEYARD	KELLY VINEYARD - Drywall	
11	Erik Huffman	Century West Engineering	
12			
13			
14			
15			
16			
17			
18			
19			
20			

Corey Vroom
2250 NE 11th Pl Bend OR 97701

View Summary

Filter Responses | Download Responses | Browse Responses »

PAGE: COURSE SURVEY

1. Quality Of Subject Matter

	Excellent	Good	Average	Poor	Rating Count
Course Content	**73.1% (19)**	23.1% (6)	3.8% (1)	0.0% (0)	26
Audio/Visual	**65.4% (17)**	30.8% (8)	3.8% (1)	0.0% (0)	26
Presentation Overall	**65.4% (17)**	30.8% (8)	3.8% (1)	0.0% (0)	26
				answered question	**26**
				skipped question	**0**

2. Course Level

	Advanced		Intermediate	Basic	Rating Count
What level would you rate this course?	15.4% (4)		**61.5% (16)**	23.1% (6)	26
What level would be most suitable for your needs?	15.4% (4)		**69.2% (18)**	15.4% (4)	26
				answered question	**26**
				skipped question	**0**

3. The course met my expections.

	Response Percent	Response Count
Yes	**100.0%**	**25**
No	0.0%	0
	answered question	**25**
	skipped question	**1**

4. The level of this course was appropriate for my background.

	Response Percent	Response Count
Yes	**92.0%**	**23**
No	8.0%	2
	answered question	**25**
	skipped question	**1**

5. If no, why not?

	Response Count
answered question	**2**
skipped question	**24**

5. If no, why not?

Hide replies 2

1.	Everyone needs basic reminders from time to time.	Mon, May 20, 2013 3:37 PM	Find...
2.	A bit advanced with acronyms	Mon, May 20, 2013 3:22 PM	Find...

answered question 2

skipped question 24

PAGE: LEARNING EXPERIENCE

1. Please rate the following:

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know - N/A	Rating Count
The program design effectively blended speaker's and attendees' knowledge	32.0% (8)	**64.0% (16)**	0.0% (0)	0.0% (0)	4.0% (1)	25
The course stimulated new ideas and improved my understanding of important concepts.	47.8% (11)	**52.2% (12)**	0.0% (0)	0.0% (0)	0.0% (0)	23
I obtained information and ideas that will be useful in my work.	**56.5% (13)**	39.1% (9)	4.3% (1)	0.0% (0)	0.0% (0)	23
I will refer to the course notes frequently (at least	20.8% (5)	**58.3% (14)**	12.5% (3)	0.0% (0)	8.3% (2)	24

answered question 25

skipped question 1

1. Please rate the following:

once a month) when I return to my job.						
A sufficient amount of time was allocated for delivery of the program content.	30.4% (7)	**65.2% (15)**	4.3% (1)	0.0% (0)	0.0% (0)	23
I will consider contacting one of the session speakers for additional information/reference.	13.0% (3)	**56.5% (13)**	8.7% (2)	4.3% (1)	17.4% (4)	23
Overall I am satisfied with the value I received with this learning experience.	37.5% (9)	**62.5% (15)**	0.0% (0)	0.0% (0)	0.0% (0)	24

answered question **25**

skipped question **1**

2. I attended this course to: (Check all that apply)

	Response Percent	Response Count
Obtain Continuing Education Credits	33.3%	8
Fulfill Employer Requirements	25.0%	6
Meet Certification Requirement	8.3%	2
Improve My Professional Skills	**83.3%**	**20**

answered question **24**

skipped question **2**

PAGE: PRESENTER EVALUATION - ALEX ZIMMERMAN

1. The presenter provided value/usefulness for the categories shown

	Strongly Agree	Agree	Disagree	Strongly Disagree\	Don't Know - N/A	Rating Count
Knowledge of Subject	**91.3% (21)**	8.7% (2)	0.0% (0)	0.0% (0)	0.0% (0)	23
Presentation & Facilitation Skills	**60.9% (14)**	39.1% (9)	0.0% (0)	0.0% (0)	0.0% (0)	23
Organization & Clarity of Content	**63.6% (14)**	36.4% (8)	0.0% (0)	0.0% (0)	0.0% (0)	22
Content Relevance to Learner Outcomes	**56.5% (13)**	43.5% (10)	0.0% (0)	0.0% (0)	0.0% (0)	23

answered question **23**

skipped question **3**

2. What is the most significant takeaway from this session, the idea or insight you won't forget and are likely to share with others?

	Response Count
Hide replies	14

answered question **14**

skipped question **12**

2. What is the most significant takeaway from this session, the idea or insight you won't forget and are likely to share with others?

1.	Site cleanliness, mud coverage ingress and egress to job site.	Mon, May 20, 2013 3:39 PM	Find...
2.	Erosion Control BMPs introduce opportunities to save money and protect stakeholders.	Mon, May 20, 2013 3:38 PM	Find...
3.	To use gravel at site access.	Mon, May 20, 2013 3:36 PM	Find...
4.	Cater them doing good to motivate. Keep good records - problems and how solved. Chromium in concrete washout - wow!	Mon, May 20, 2013 3:34 PM	Find...
5.	Visual examples	Mon, May 20, 2013 3:32 PM	Find...
6.	The real way to improve runoff water, proper water erosion control.	Mon, May 20, 2013 3:28 PM	Find...
7.	Good broad overview, informative, good first or second step.	Mon, May 20, 2013 3:26 PM	Find...
8.	Correct methods of installation. Documentation and how to protect ourselves on projects.	Mon, May 20, 2013 3:25 PM	Find...
9.	Introduction - Alex was great, very knowledgeable. However rest a bit fast. He talks fast, sometimes difficult to follow.	Mon, May 20, 2013 3:23 PM	Find...
10.	Document everything; correct BMPs that don't work & document how, what, when	Mon, May 20, 2013 3:21 PM	Find...

< 1 > 10 responses per page

answered question	**14**
skipped question	**12**

3. Testimonial

	Response Count
answered question	**4**
skipped question	**22**

3. Testimonial

Hide replies 4

1.	It has been valuable as an engineer to learn more about the end results of regulation and design.	Mon, May 20, 2013 3:38 PM	Find...
2.	Nice facilities! Interesting and useful presentation. Thank you!	Mon, May 20, 2013 3:34 PM	Find...
3.	My only complaint is Alex needs to slow down while speaking.	Mon, May 20, 2013 3:31 PM	Find...
4.	He spoke pretty fast - sometimes hard to understand.	Mon, May 20, 2013 3:20 PM	Find...

answered question **4**

skipped question **22**

International **Erosion Control** Association

3401 Quebec St. Suite 3500, Denver, Colorado 80207~ 303 640-7554 ~ www.ieca.org

CERTIFICATE OF ATTENDANCE

May it be known by all who read this that:

Wendy Edde

has successfully attended

BASIC BMP'S

and has earned 3 Professional Development Hours

Presented this 14th day of May, 2013

Executive Director

President

This program is based on the honesty and integrity of the individual. IECA may be contacted to verify the authenticity of this individual's PDH accumulation.