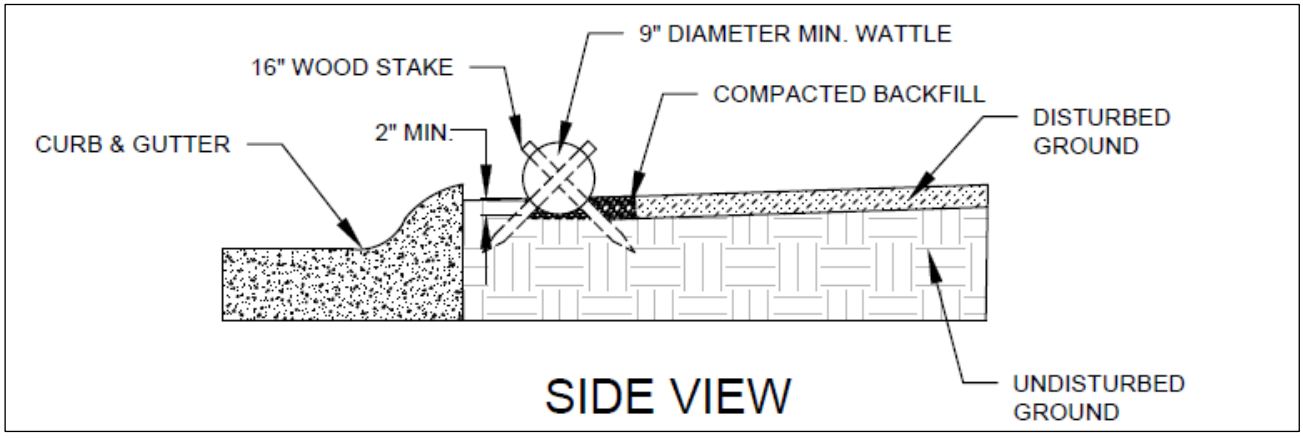
City of Bozeman
Construction Site Management Program



Best Management Practice (BMP) Manual for Construction Sites

March 1, 2019

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Overview

Manual Introduction

This manual provides Best Management Practices (BMPs) designed to mitigate pollution generated from construction activities. The City of Bozeman encourages developers, engineers, and contractors to use this resource to develop and implement required stormwater permits further detailed on Page 5.

Stormwater is rain and snowmelt that flows over hard surfaces and landscapes that does not infiltrate into the ground. As it flows over these surfaces, stormwater picks up pollutants, such as sediment, trash, animal waste, fertilizers, oils, and grease. Stormwater then enters curb inlets, passes through a network of underground pipes, and dumps into local rivers without treatment. One of the largest local stormwater pollution sources is uncontrolled stormwater runoff from unprotected construction sites.

Stormwater runoff from unprotected construction sites carries sediment and other pollutants offsite, causing degradation of rivers and infrastructure. A one-acre construction site can lose 150 to 200 tons of sediment to erosion per year. It is required that construction professionals manage stormwater on their sites to avoid enforcement penalties and ensure Bozeman continues to be “The Most Livable Place”.

Image 2 - Stormwater dumping into Bozeman Creek

Image 1 - Clogged stormwater pipe from construction

Overview

Permit Types

The City of Bozeman requires that project owners have an approved construction stormwater permit before initiating ground disturbing activities. Staff provides submitters the opportunity to schedule a pre-submittal meeting where local erosion and sediment control requirements, recommendations, and areas of concern are identified whereby decreasing preparation, approval, and implementation efforts.

Staff review, comment on, and, when deemed adequate, approve all construction stormwater permits. Project owners that do not submit or submit inadequate permits will not receive a building permit until one of the following is approved:

- **Construction Stormwater Permit - Single-Family Residential Projects**: Owners of single-family home construction or multi-family projects with less than 10,000 square feet of disturbance must submit this permit for review and approval. The permit is available at https://www.bozeman.net/government/stormwater/apply-for-a-construction-permit. There is no fee associated with this permit.
- **Construction Stormwater Permit - Sites Less than One (1) Acre:** Owners of multi-family, commercial, utility, demolition, and paving projects with a total land disturbance less than one acre must submit this permit for review and approval. The permit is available at https://www.bozeman.net/government/stormwater/apply-for-a-construction-permit. There is no fee associated with this permit. ***Presubmittal meeting with staff is highly encouraged.*
- **Montana Department of Environmental Quality (MDEQ) Notice of Intent, Stormwater Pollution Prevention Plan:** Owners of multi-family, commercial, utility, demolition, and paving projects with a total land disturbance greater than one acre must submit these documents to the City of Bozeman and MDEQ for review and approval. There is no City of Bozeman fee associated with this permit. ***Presubmittal meeting with staff is highly encouraged.*

Image 4 - Construction-related pollution event

Image 3 - Clogged stormwater inlet from construction

Overview

Local Erosion and Sediment Control Requirements

The City of Bozeman requires that contractors meet the following local erosion and sediment control requirements when preparing and implementing a stormwater permit for their site. They exist to provide a consistent message to contractors, improve permit content, and promote cleaner sites. Project owners must:

1. **Control disturbed areas**: Project boundaries require BMPs that control stormwater flowing from disturbed areas. Approved options include foam wattle, straw wattle, filter sock, weighted wattle, silt fence, and compacted earthen berm.
2. **Mitigate tracking:** Exit points require BMPs that mitigate the tracking of debris offsite. Approved options include angular rock trackpads, cattle guard/rock hybrid trackpads, and proprietary tracking control products.
3. **Control concrete waste:** Concrete and masonry activities require BMPs that allow for the containment and disposal of pollutants generated through masonry activities to prevent environmental contamination. Common regulated activities include concrete pours, masonry tool washing, and curb cutting. Approved options include reusable/disposable products, prefabricated roll-offs or containers, lined below-ground containment, lined above ground containment, and concrete slurry vacuum.
4. **Manage material stockpiles:** Material stockpiles, not already contained within an existing perimeter control, require perimeter BMPs that control stormwater flowing from disturbed areas or an erosion control BMP that prevents displacement of loose material. Approved options include foam wattle, straw wattle, silt fence, compacted earthen berm, and tarps/plastic sheeting. **Encroachment permits do not allow dirt stockpiles in the right-of-way**
5. **Manage dewatering flows:** Pumping activities that discharge into infrastructure or waterways are MDEQ permitted activities and as such are required to meet the effluent limitations in the MDEQ General Permit for Construction Dewatering. Approved options include filter treatment units, land application, or wells.
6. **Stabilize disturbed areas:** Disturbed areas, including surface stormwater facilities, require BMPs that prevent erosion of barren ground. Approved options include surface roughening, crimped straw mulch, wood mulch, rolled erosion control products, riprap, and sod.
7. **Protect onsite inlets**: Onsite inlets receiving site runoff require BMPs that filter stormwater before flowing into underground infrastructure. Approved option is drop inlet protection.
8. **Inspect and maintain BMPs**: Inspection and maintenance of all BMPs is required to ensure they are installed to specification and are in good working order.

Overview

Operational and Administrative Controls

Introduction

Operational and administrative control BMPs help keep construction sites clean and in compliance. The following should be considered when preparing and implementing a stormwater permit:

Communication – Ensure all contractors and sub-contractors are aware of regulations, responsibilities, and enforcement penalties.

Construction Barrier – Utilize site barriers to control the flow of vehicles and equipment. Several types exist, including concrete blocks, construction fencing, and cones.

Off-Site/Stabilized Parking – Utilize off-site parking to control tracking or stabilize on-site parking areas.

Spill Prevention and Response – Utilize a spill kit to clean up leaks and spills that occur. All parties should know its location and proper use.

Fleet Management – Utilize preventative maintenance to identify and eliminate leaks and drips of hydraulic fluid, gas, oil, etc. from equipment and vehicles.

Preservation of Existing Vegetation – Utilize preservation of existing vegetation techniques to reduce the amount of erodible area on a job site.

Street Sweeping – Implement a regular street sweeping program to remove all dirt and construction debris from streets, alleys, sidewalks, and parking lots.

Good Housekeeping – Keep a clean site by developing and adhering to a waste management plan that includes protocols for trash disposal, sanitary facility cleaning, and proper storage of chemicals.

BMP Inspection and Maintenance – Inspect and maintain all BMPs to ensure they are installed to specification and in good working order.

Image 5 - Site Barrier

Image 6 - Spill Kit

Image 7 - Equipment Management

Image 8 - Tarped stockpile

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Perimeter Control

Foam Wattle with Apron

Introduction
Foam wattles slow and pond stormwater flowing from construction and material stockpile areas less than ¼ acre per 100 linear feet of wattle. Proprietary foam wattles are available from local suppliers.

Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

Material Specifications/Approved Products
1. Gator Guard 2. DuraWattle

Image 9 - Properly installed foam wattle with apron

Installation Requirements	Inspection and Maintenance Requirements
☐ Before ground disturbing activities ☐ Perpendicular to the slope ☐ Trenched 1 inch below grade ☐ Backfilled with compacted soil ☐ Ends turned upslope at least 2 feet ☐ Minimum 2 feet from stockpiles or slopes ☐ Per manufacturer's specification	☐ **Inspect** weekly and before and after rain events ☐ **Repair or Replace** torn, flattened, or unraveled foam wattle. Replace degraded sections, ensuring to overlap with existing foam wattle. Replace stakes that have been broken, dislodged, or removed. ☐ **Maintain** once sediment accumulation reaches a depth of 3". Remove collected sediment using hand tools. ☐ **Remove** once the site reaches final stabilization. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground and throw away or reuse the foam wattle.

Winter Requirements
During the winter, foam wattles must remain in place and in good working condition. Perimeter control BMPs shall be installed prior to the first freeze to ensure the greatest performance.

Perimeter Control

Foam Wattle with Apron

Approved Products

1. Gator Guard

Image 10 - Gator Guard foam wattle.

2. DuraWattle

Image 11 - *DuraWattle Foam Wattle. Image taken from www.durawattle.com.*

Perimeter Control

Straw Wattle

Introduction
Straw wattles slow and pond stormwater flowing from construction and material stockpile areas less than ¼ acre per 100 linear feet of wattle.

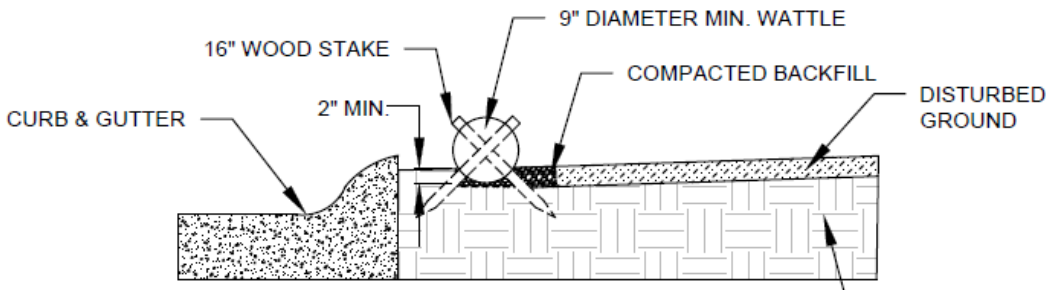
Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

Material Specifications/Approved Products
1. Weed-free straw 2. UV-degradable netting 3. 9-inch diameter 4. Minimum 16-inch wooden stakes

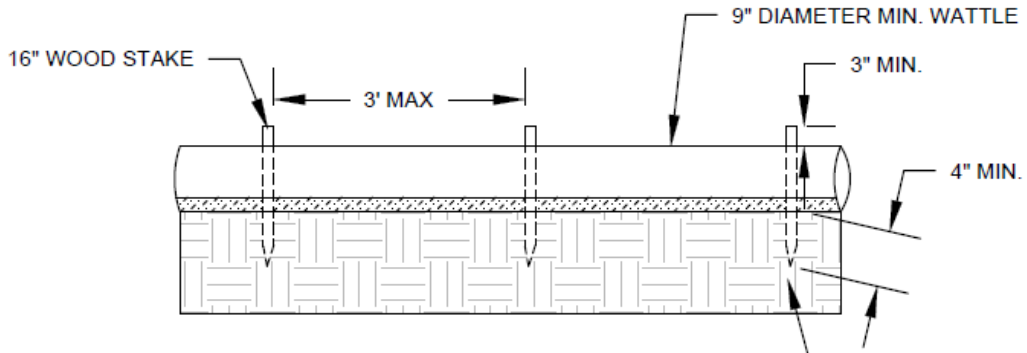
Image 12 - *Properly installed straw wattle.*

Installation Requirements	Inspection and Maintenance Requirements
☐ See detail on Page 12 ☐ Before ground disturbing activities ☐ Perpendicular to the slope ☐ Trenched 2 inches below grade ☐ Backfilled with compacted soil ☐ Staked at alternating 45 degree angles ☐ Staked every 3 feet ☐ Ends turned upslope at least 2 feet ☐ Minimum 1-foot overlap at joints ☐ Minimum 2 feet from stockpiles or slopes ☐ **Not** in areas of concentrated flow	☐ **Inspect** weekly and before and after rain events. ☐ **Repair or Replace** torn, flattened, or unraveled straw wattle. Replace degraded sections, ensuring to overlap with existing straw wattle. Replace stakes that have been broken, dislodged, or removed. ☐ **Maintain** once sediment accumulation reaches a depth of 3”. Remove collected sediment using hand tools. ☐ **Remove** once the site reaches final stabilization. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground and throw away waste.

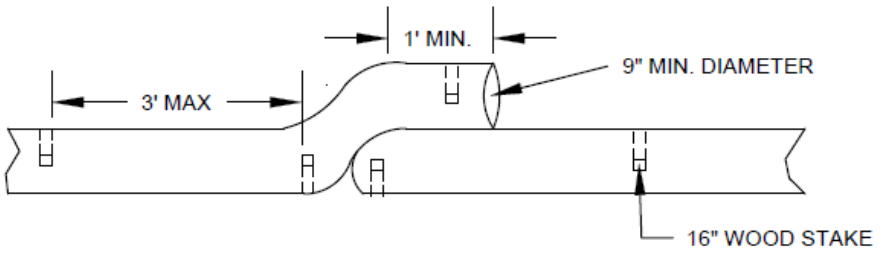
Winter Requirements
During the winter, perimeter control BMPs must remain in place and in good working condition. Perimeter control BMPs shall be installed prior to the first freeze to ensure the greatest performance.



SIDE VIEW



FRONT VIEW



TOP VEIW
(WATTLE JOINT)

* NOTES

1. WATTLE MUST BE TRENCHED 2" BELOW GRADE.

WATTLE INSTALL SPECIFICATION	DATE: 03/21/2016 DRAWN BY: WFS PROJECT No.:	THE CITY OF BOZEMAN STORMWATER DIVISION 20 E. OLIVE -- P.O. BOX 1230 BOZEMAN, MONTANA 59771-1230 PHONE: (406) 582-2280 -- FAX: (406) 582-2283

Perimeter Control

Filter Sock

Introduction
Filter socks slow, pond, and filter stormwater flowing from construction and material stockpile areas less than ¼ acre per 100 linear feet of wattle.

Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

Material Specifications/Approved Products
1. Wood mulch or compost fill 2. UV-degradable netting 3. Minimum 24-inch wooden stakes 4. Compost Filter Sock

Image 13 - Properly installed filter sock. Image from filtrexx.com

Installation Requirements	Inspection and Maintenance Requirements
☐ Before ground disturbing activities ☐ Perpendicular to the slope ☐ Staked every 10 feet ☐ Ends turned upslope at least 2 feet ☐ Minimum 1-foot overlap at joints ☐ Minimum 2 feet from stockpiles or slopes ☐ Per manufacturer's specification	☐ **Inspect** weekly and before and after rain events ☐ **Repair or Replace** torn, flattened, or unraveled compost wattle. Replace degraded sections, ensuring to overlap with existing filter sock. Replace stakes that have been broken, dislodged, or removed. ☐ **Maintain** once sediment accumulation reaches a depth of 3". Remove collected sediment using hand tools. ☐ **Remove** once the site reaches final stabilization. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground and throw away waste.

Winter Requirements
During the winter, filter socks must remain in place and in good working condition. Filter socks shall be installed prior to the first freeze to ensure the greatest performance.

Perimeter Control

Filter Sock

Approved Products

1. Compost Filter Sock

Image 14 - Compost Filter Sock. Image from Rocky Mountain Compost

Perimeter Control

Weighted Wattle

Introduction
Weighted wattles slow and pond stormwater flowing to and from construction and material stockpile areas on asphalt and concrete surfaces.

Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

Material Specifications/Approved Products
1. Gator Guard Gutter Wattle 2. Gator Guard Weighted Wattle

Image 15 - Properly installed weighted wattle.

Installation Requirements	Inspection and Maintenance Requirements
☐ Before ground disturbing activities ☐ Minimum 2 feet from stockpiles or slopes ☐ Per manufacturer's specification	☐ **Inspect** weekly and before and after rain events ☐ **Replace** damaged weighted wattle. ☐ **Maintain** once sediment accumulation reaches a depth of 3". Remove collected sediment using hand tools. ☐ **Remove** once the site reaches final stabilization. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground and throw away or reuse the weighted wattle.

Winter Requirements
During the winter, weighted wattles must remain in place and in good working condition. Weighted wattles shall be installed prior to the first freeze to ensure the greatest performance.

Perimeter Control

Weighted Wattle

Approved Products

1. Gator Guard Gutter Wattle

Image 16 - Gator Guard Gutter Wattle. Image taken from gatorguard.com.

2. Gator Guard Weighted Wattle

Image 17 - Gator Guard Weighted Wattle.

Perimeter Control

Silt Fence

Introduction
Silt fence slows and ponds stormwater flowing from construction and material stockpile areas less than ¼ acre per 100 linear feet of silt fence.

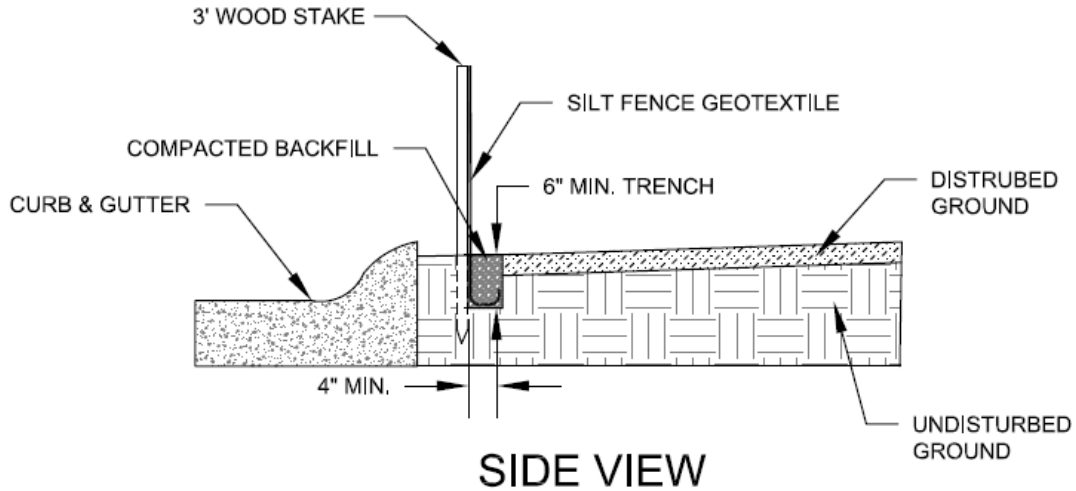
Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

Material Specifications/Approved Products
1. Woven geotextile fabric 2. Minimum 3-foot wooden stakes

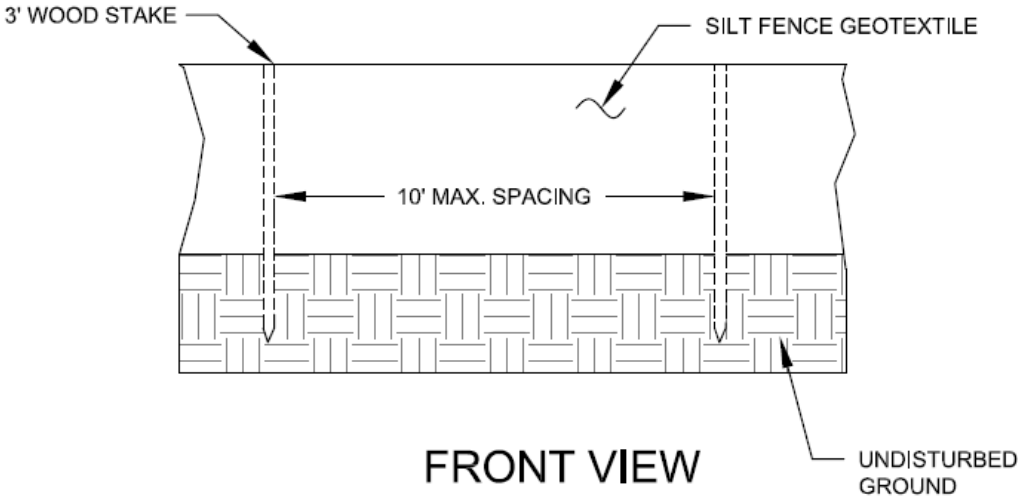
Image 18 - Properly installed silt fence

Installation Requirements	Inspection and Maintenance Requirements
☐ See detail on Page 18 ☐ Before ground disturbing activities ☐ Perpendicular to the slope ☐ Staked every 10 feet ☐ Staked on the down gradient side ☐ Trenched 6 inches in a "J" configuration ☐ Backfilled with compacted soil ☐ Ends turned upslope at least 5 feet ☐ Minimum 2 feet from stockpiles or slopes ☐ Joined per detail on Page 18. ☐ **Not** in areas of concentrated flow	☐ **Inspect** weekly and before and after rain events ☐ **Replace** ripped, torn, or flattened silt fence. Cut out and replace severely degraded sections, joining per detail on Page 18. Replace broken, dislodged, or removed stakes. ☐ **Reattach** fallen silt fence to the stakes. ☐ **Maintain** once sediment accumulation reaches a depth of 3". Remove collected sediment using hand tools. ☐ **Remove** once the site reaches final stabilization. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground and throw away waste.

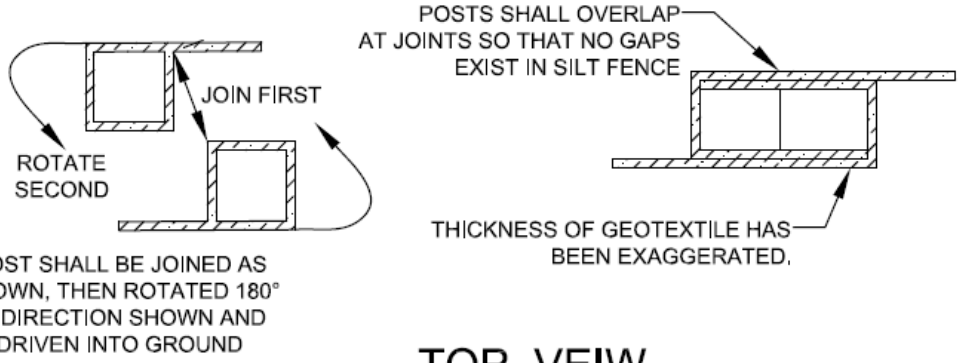
Winter Requirements
During the winter, silt fence must remain in place and in good working condition. Silt fence shall be installed prior to the first freeze to ensure the greatest performance. Wire-backed silt fence is required in the winter.



SIDE VIEW



FRONT VIEW



TOP VEIW
(SILT FENCE JOINT)

* NOTES

1. SILT FENCE MUST BE TRENCHED 6" BELOW GRADE.

SILT FENCE INSTALL SPECIFICATION	DATE: 03/21/2016 DRAWN BY: WFS PROJECT No.:	THE CITY OF BOZEMAN STORMWATER DIVISION 20 E. OLIVE -- P.O. BOX 1230 BOZEMAN, MONTANA 59771-1230 PHONE: (406) 582-2280 -- FAX: (406) 582-2263

Perimeter Control

Compacted Earthen Berm

Introduction
Compacted earthen berms slow, pond, and divert stormwater flowing from construction and material stockpile areas. Compacted earthen berms should be used to divert stormwater to a sediment trap.

Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

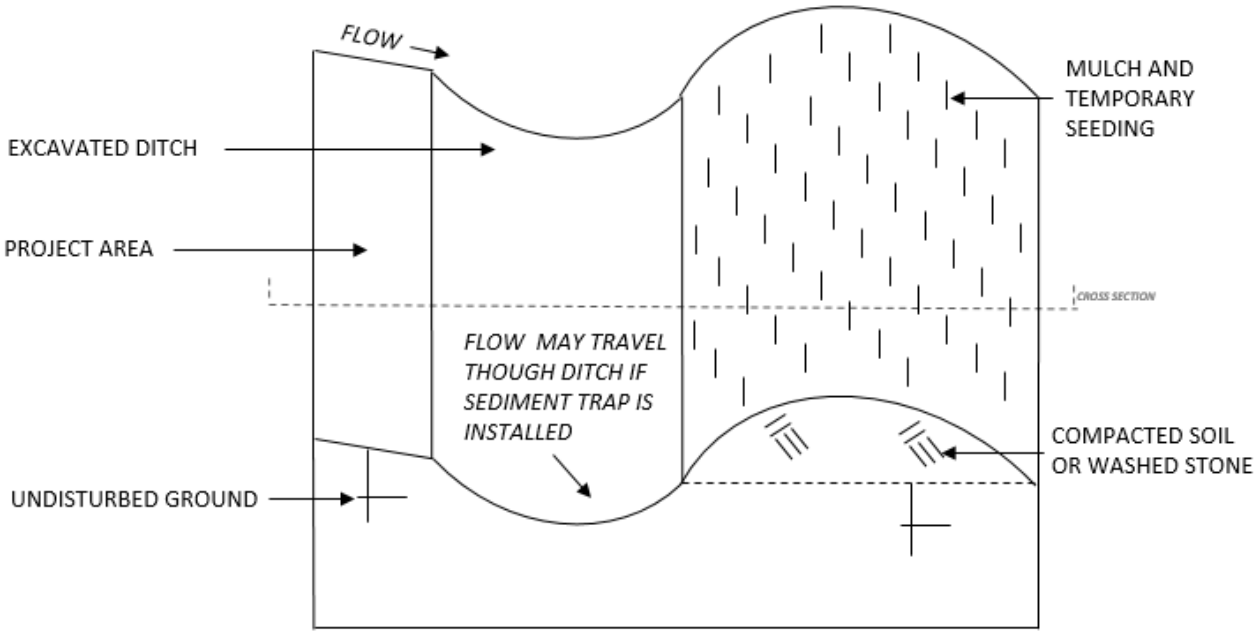
Material Specifications/Approved Products
1. Compacted soil or stone

Image 19 - Installed compacted earthen berm

Installation Requirements	Inspection and Maintenance Requirements
☐ Before ground disturbing activities ☐ Minimum 2 feet high ☐ Minimum 3 feet wide ☐ Ends turned upslope at least 5 feet ☐ Compacted ☐ Stabilized with an erosion control BMP	☐ **Inspect** weekly and before and after rain events ☐ **Repair** washed out, eroded, and flattened compacted earthen berms. Repair with a piece of equipment or hand tool capable of excavating, contouring, and compacting back to its original design. ☐ **Maintain** once sediment accumulation reaches 1/3 of its height. Use equipment or hand tools to remove. Maintain erosion control BMP. ☐ **Remove** once the site reaches final stabilization. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground.

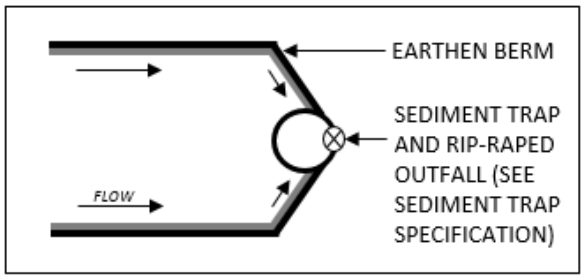
Winter Requirements
Inspections required after snow melt events to verify the berm is still functioning properly.

EARTHEN BERM

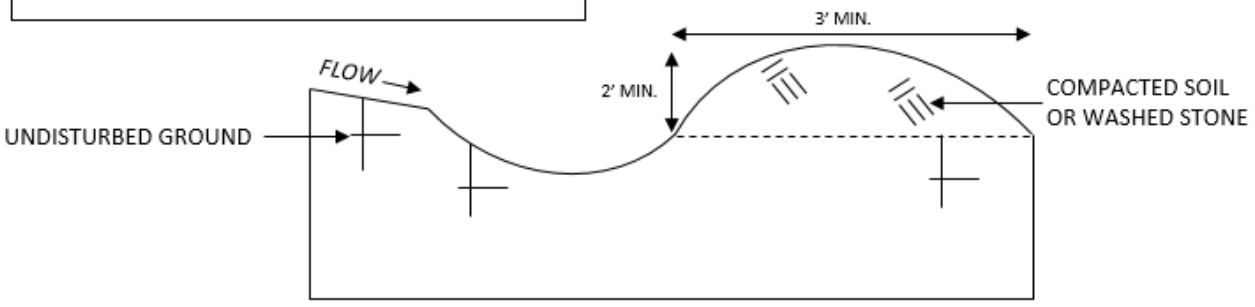


TOP VIEW

CONCEPTUAL VIEW



NOTES: 1) MATERIAL IN BERM MUST BE FIRMLY COMPACTED
2) TURN BERM UPSLOPE AT EACH END
3) SIZE MUST MEET MINIMUM SIZING STANDARDS
4) SIZE MUST BE INCREASED DEPENDENT ON UPSLOPE DISTURBED AREA



SIDE VIEW

**NOT TO SCALE

EARTHEN BERM SPECIFICATION	**DATE: 4/22/2016** **DRAWN: KLM** **PROJECT: CITY OF BOZEMAN STORMWATER MANUAL**	**THE CITY OF BOZEMAN** **STORMWATER DIVISION** **20 E. OLIVE – P.O. BOX 1230** **BOZEMAN, MONTANA 59771**

Perimeter Control

Sediment Trap

Introduction
Sediment traps capture and hold stormwater flowing from construction sites and material stockpile areas, allowing suspended sediments to settle out.

Applicable Local Requirements
1. Control disturbed areas 2. Manage material stockpiles

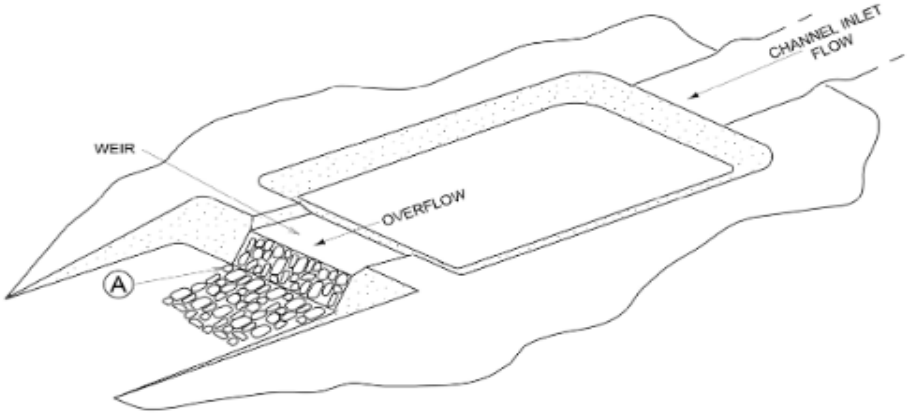
Material Specifications/Approved Products
1. Excavated area 2. Armored overflow

Image 20 - Sediment trap and armored overflow

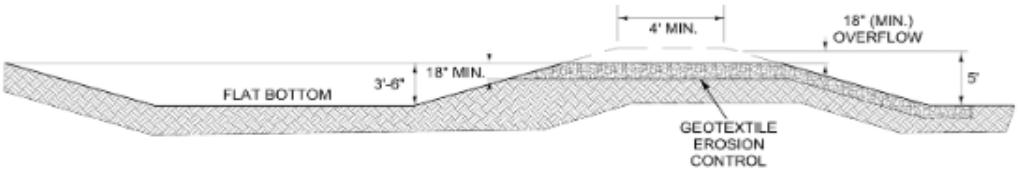
Installation Requirements	Inspection and Maintenance Requirements
☐ Before ground disturbing activities ☐ Rip-rap overflow underlain with nonwoven geotextile ☐ 1,890 cubic feet (70 CY) of storage per acre of contributing drainage area ☐ Maximize distance between inlet and outlet to facilitate settling	☐ **Inspect** weekly and before and after rain events ☐ **Repair** washed out or eroded sediment traps. Repair with a piece of equipment or hand tool capable of excavating, contouring, and compacting back to its original design. ☐ **Maintain** once sediment accumulation impacts function or storage capacity. Use equipment or hand tools to remove. ☐ **Remove** once the site reaches final stabilization or transition to post-construction BMP. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground.

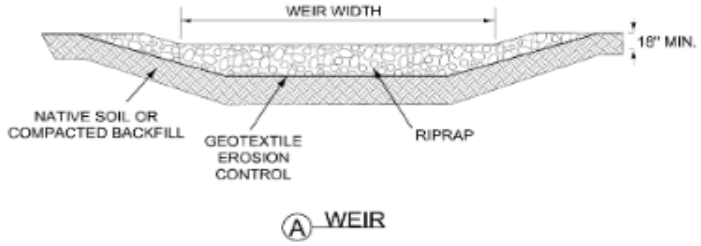
Winter Requirements
Sediment traps must remain clear to be functional. Sediment traps are not to be used as snow storage.

SC-3 Sediment Trap



TYPICAL SEDIMENT TRAP WITH SPILLWAY TYPE OUTFALL





Ⓐ WEIR

DRAINAGE AREA (ACRES)	WEIR WIDTH (FEET)
1	4
2	6
3	8
4	10
5	12

WEIR WIDTH TABLE

SEDIMENT TRAP
SC-3

MDT MONTANA DEPARTMENT OF TRANSPORTATION

**Note: Taken from MDT's December 2016 Erosion and Sediment Control Best Management Practices Manual

Infrastructure Protection

Inlet Protection

Introduction
Inlet protection BMPs filter stormwater before it enters underground infrastructure. Inlet protection is the last line of defense, and the City requires its use to be in conjunction with other erosion and sediment control BMPs. Inlet protection is not required in the public right-of-way, however, inlet protection is still required for all inlets receiving runoff within the interior of the project boundary.

Image 21 - Installed inlet protection. Image taken from www.ADS-Pipe.com

Applicable Local Requirements
1. Protect inlets

Material Specifications/Approved Products
1. Pre-manufactured devices that drop inside inlets 2. Storm Sentinel 3. Inlet Pro

Installation Requirements	Inspection and Maintenance Requirements
☐ Before ground disturbing activities ☐ Per the manufacturer's specification	☐ **Inspect** weekly and before and after rain events ☐ **Replace** damaged or ripped inlet protection. ☐ **Maintain** by removing accumulated sediment using equipment or hand tools. ☐ **Remove** once the site reaches final stabilization.

Winter Requirements
Increased maintenance will be required during winter to prevent clogging from snow and ice.

Infrastructure Protection

Inlet Protection

Approved Products

1. Storm Sentinel

Image 22 - Storm Sentinel drop inlet protection. Image taken from enpac.com

2. Inlet Pro

Image 23 - Inlet Pro drop inlet protection. Image taken from www.hgcinletpro.com.

Infrastructure Protection

Tracking Control

Introduction
Offsite tracking control BMPs remove sediment from vehicle and equipment tires before they exit construction sites.

Applicable Local Requirements
1. Mitigate tracking

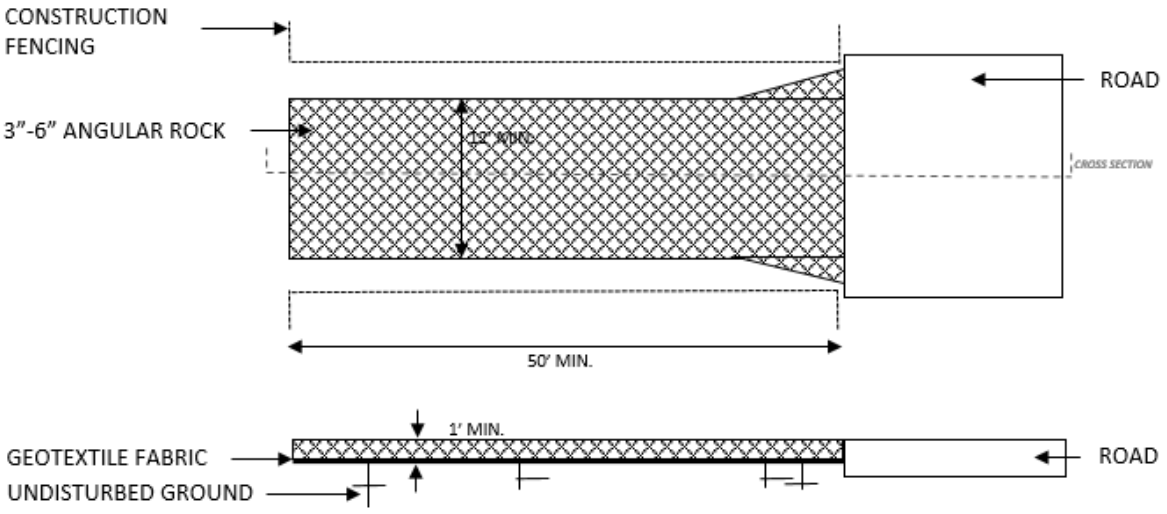
Material Specifications/Approved Products
1. 3 to 6-inch angular rock 2. Minimum 12-foot by 20-foot cattle guard with sediment capture bay below 3. FODS 4. Pro-Grid

Image 24 - Properly installed cattle guard/angular rock hybrid entrance

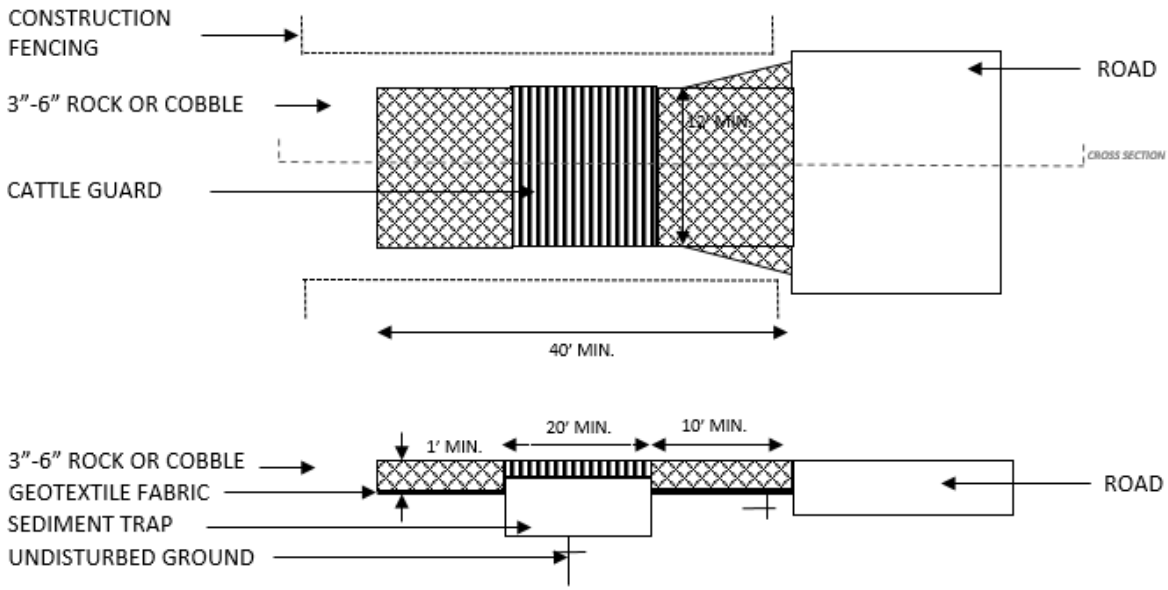
Installation Requirements	Inspection and Maintenance Requirements
1. Angular rock: ☐ Before construction activities ☐ Minimum 1 foot of angular rock ☐ Rock underlain with geotextile fabric ☐ 50 feet long 2. Cattle guard/angular rock hybrid: ☐ Before construction activities ☐ Minimum 1 foot of angular rock ☐ Rock underlain with a geotextile fabric ☐ 40 feet long 3. Proprietary tracking control product: ☐ Before construction activities ☐ Per the manufacturer's specification to achieve two full tire rotations	☐ **Inspect** weekly and before and after rain events ☐ **Maintain** once the voids fill with sediment. Refresh the surface by adding to or turning over the aggregate. For proprietary tracking control products, remove the sediment as directed by the manufacturer. ☐ **Remove** once there is a permanently stabilized site entrance. Fill, compact, and vegetate areas of ground disturbance to blend with adjacent ground.

Winter Requirements
Increased maintenance will be required during winter due to snow and ice accumulations.

Tracking Control



OPTION 1 – ANGULAR ROCK ENTRANCE



OPTION 2 – CATTLE GUARD ENTRANCE

**NOT TO SCALE

TRACKING CONTROL SPECIFICATION	DATE: 4/22/2016 DRAWN: KLM PROJECT: CITY OF BOZEMAN STORMWATER MANUAL	THE CITY OF BOZEMAN STORMWATER DIVISION 20 E. OLIVE – P.O. BOX 1230 BOZEMAN, MONTANA 59771

Infrastructure Protection

Tracking Control

Approved Products

1. FODS

Image 25 - FODS tracking control product

2. Pro-Grid

Image 26 - Pro-Grid tracking control product. Image from Key Rentals Group

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Infrastructure Protection

Dewatering from Excavated Areas and Wells

Introduction
Dewatering control BMPs manage and treat pumped water before it flows into infrastructure or waterways. Contractors must consider the expected volume of water, duration, discharge location, and site conditions before selecting and installing dewatering BMPs.

Applicable Local Requirements
1. Manage dewatering flows

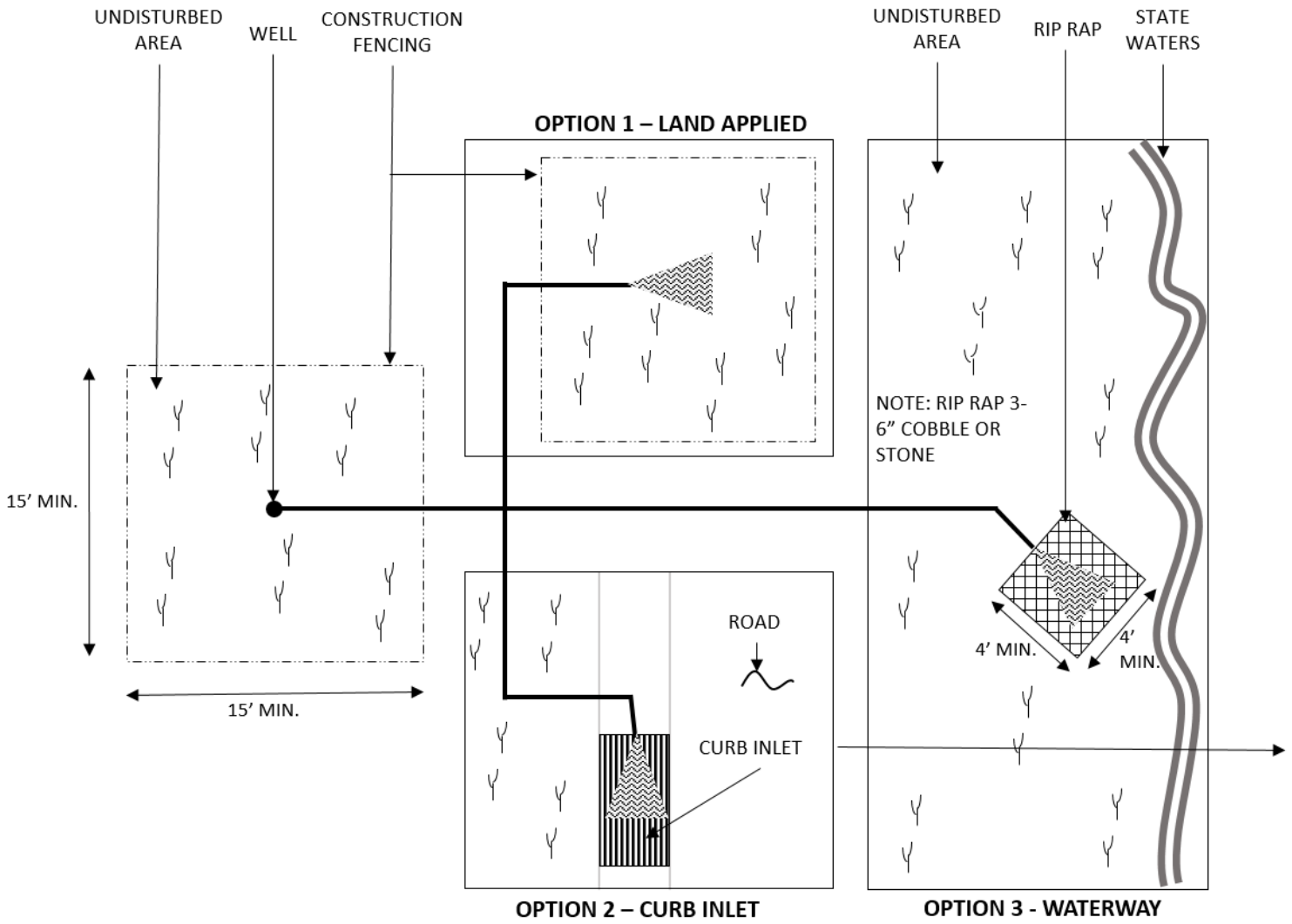
Approved Options
1. Well Dewatering – lowers water table through the use of wells and pumps 2. Excavation Dewatering – removes accumulated water from an excavation.

Image 27 - Proprietary bag filtration unit option for excavation dewatering

Installation Requirements	Inspection and Maintenance Requirements
1) Well Dewatering ☐ Well placed in an undisturbed area ☐ Initial turbid discharge contained (purging of well) ☐ Reinforced discharge location preventing erosion ☐ Discharge clean water to waterways, stormwater infrastructure, or vegetated lands. 2) Excavation Dewatering ☐ Compliant with MDEQ General Permit for Construction Dewatering ☐ **No** discharge to sanitary sewer	☐ **Inspect** routinely to ensure dewatering controls are functioning and resulting in a clear discharge ☐ **Maintain** treatment unit per manufacturer's recommendation. ☐ **Monitor and Maintain** discharge location(s) if any noticeable erosion is identified by moving the hose or refortifying the ground surface using 3 to 6-inch cobble or stone. ☐ **Remove** once the site reaches final stabilization and is no longer required. Fill, compact, and seed areas of ground disturbance to blend with adjacent ground.

Winter Requirements
Land application is not an acceptable option in the winter months as the primary management strategy for excavation dewatering.

DEWATERING USING WELLS

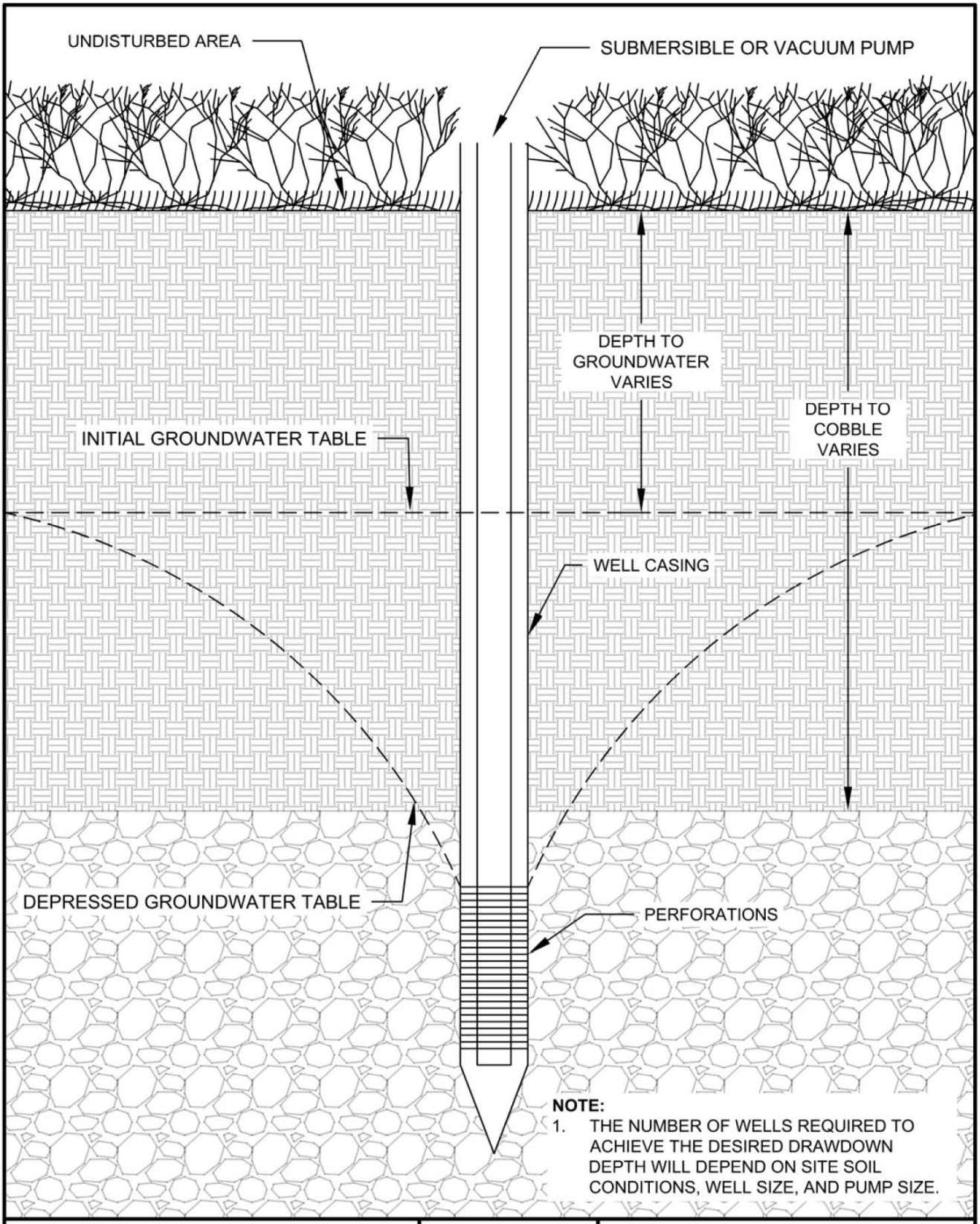


NOTES: INITIAL FLUSHING OF WELL WATER MUST BE INFILTRATED
UNDISTURBED AREAS MUST EXIST FOR THE ENTIRETY OF THE PROJECT
DISCHARGE MUST BE MONITORED FOR CHANGE IN COLORATION, VOLUME, AND EROSION

THE CITY OF BOZEMAN
STORMWATER DIVISION
20 E. OLIVE – P.O. BOX 1230
BOZEMAN, MONTANA 59771

DATE: 4/29/2016
DRAWN: KLM
PROJECT: CITY OF BOZEMAN STORMWATER MANUAL

DEWATERING SPECIFICATION



WELL PROFILE	DATE: 02/20/2019 DRAWN BY: CJF PROJECT No.:	THE CITY OF BOZEMAN STORMWATER DIVISION 20 E. OLIVE -- P.O. BOX 1230 BOZEMAN, MONTANA 59771-1230 PHONE: (406) 582-2280 -- FAX: (406) 582-2283

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Pollutant Management

Concrete and Masonry Waste Management

Introduction
Concrete and masonry wastes are toxic slurries generated from the washing of mixer chutes, pump trucks, and other masonry equipment, as well as, from concrete cutting activities.

Applicable Local Requirements
1. Control concrete waste

Approved Options
1. Reusable or Disposable Product 2. Prefabricated Roll Off or Container 3. Lined Below Ground Containment 4. Lined Above Ground Containment 5. Concrete Slurry Vacuum

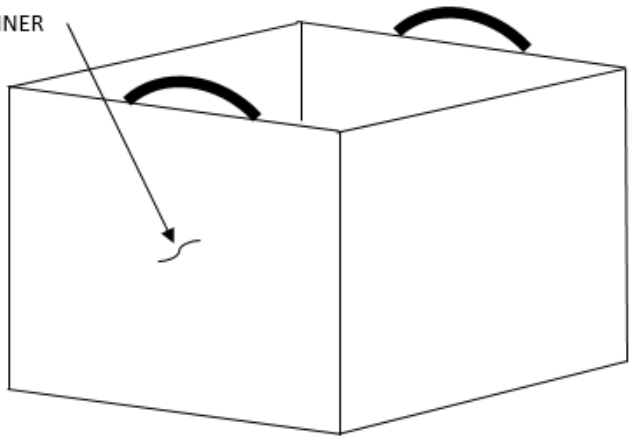
Image 28 - Reusable or disposable product

Installation Requirements	Inspection and Maintenance Requirements
1. Concrete washouts ☐ Before concrete and masonry work ☐ Per this manual or manufacturer's specification ☐ Marked with signage stating "concrete washout area" ☐ Adequate capacity and structure to prevent spill and splash over 2. Concrete slurry vacuums ☐ During and immediately following concrete cutting activities	☐ **Inspect** weekly and before and after rain events ☐ **Repair** if the liner is leaking or washout is in a state of disrepair. ☐ **Maintain** when the facility reaches 75% capacity. Remove or evaporate clear washout water. Remove or recycle all solids and dispose into a roll off dumpster, haul trailer, or solid waste receptacle. ☐ **Remove** concrete washout once the site reaches stabilization and is no longer required. If applicable, fill, compact, and seed areas of ground disturbance to blend with adjacent ground.

Winter Requirements
Increased maintenance will be required during winter due snow and ice accumulations.

CONCRETE WASHOUT AND WASTE MANAGEMENT

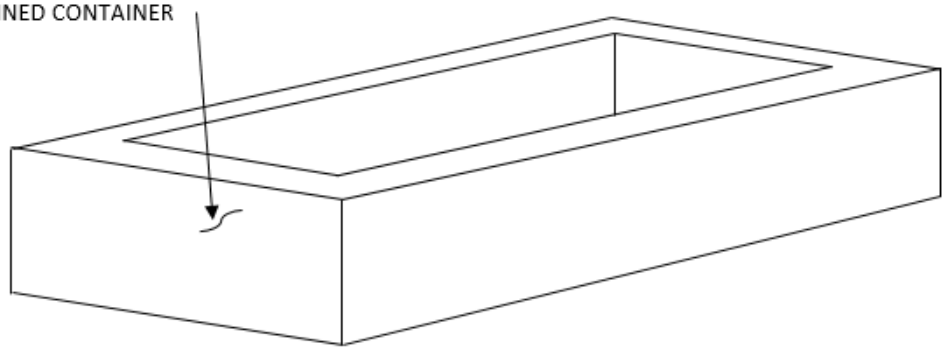
ENCLOSED/LINED CONTAINER



**NOTES: 1) NUMEROUS OPTIONS EXIST AND CAN BE FOUND ONLINE OR AT LOCAL SUPPLIERS.
2) INTENDED FOR SMALL PROJECTS

OPTION 1 - REUSABLE OR DISPOSABLE PRODUCTS

ENCLOSED/LINED CONTAINER



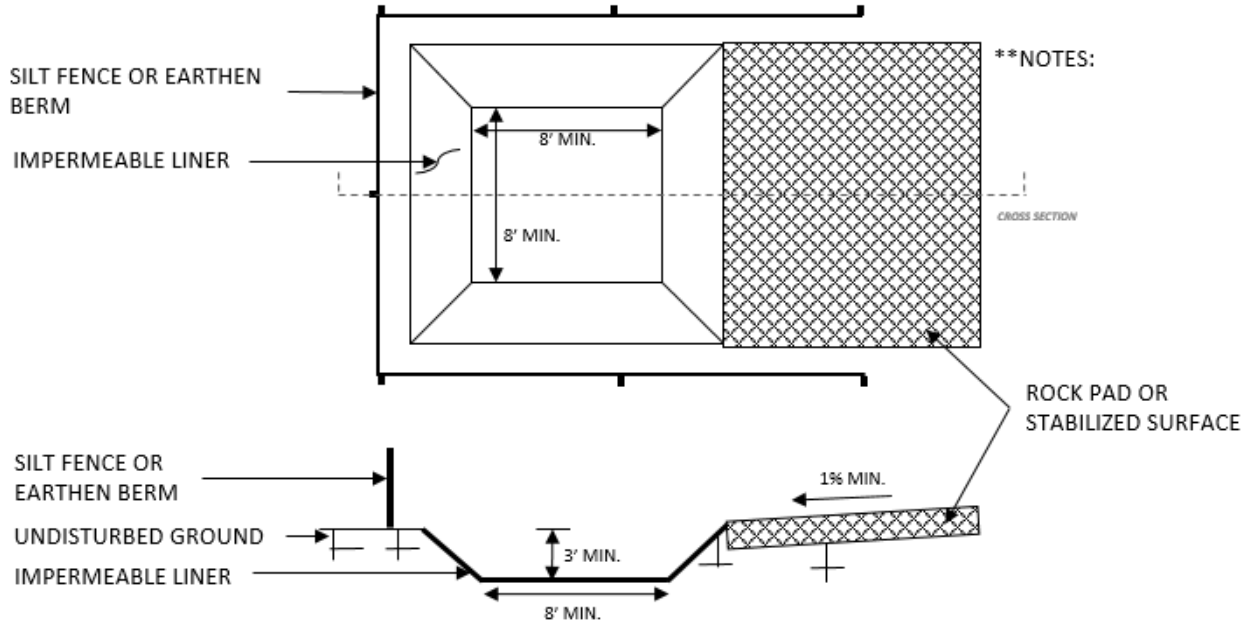
**NOTES: 1) NUMEROUS OPTIONS EXIST AND CAN BE FOUND AT LOCAL SUPPLIERS.
2) SIZE ADEQUATELY FOR EXPECTED VOLUME OF WASTE
3) PLACE ONSITE WITHIN PERIMETER PROTECTION AND NOT IN THE CITY'S RIGHT OF WAY

OPTION 2 – PREFABRICATED ROLL OFF OR CONTAINER

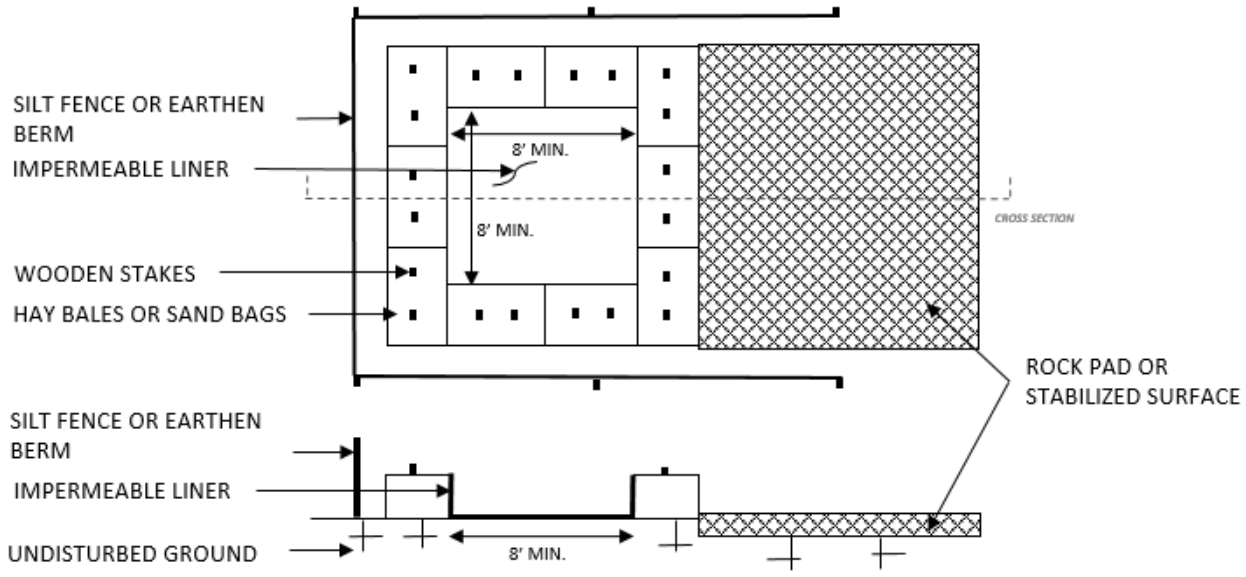
**NOT TO SCALE

CONCRETE WASHOUT SPECIFICATION	**DATE: 4/26/2016** **DRAWN: KLM** **PROJECT: CITY OF BOZEMAN STORMWATER MANUAL**	**THE CITY OF BOZEMAN** **STORMWATER DIVISION** **20 E. OLIVE – P.O. BOX 1230** **BOZEMAN, MONTANA 59771**

CONCRETE WASHOUT AND WASTE MANAGEMENT



OPTION 3 – BELOW GROUND CONTAINMENT



OPTION 4 – ABOVE GROUND CONTAINMENT

**NOT TO SCALE

CONCRETE WASHOUT SPECIFICATION	DATE: 4/26/2016 DRAWN: KLM PROJECT: CITY OF BOZEMAN STORMWATER MANUAL	THE CITY OF BOZEMAN STORMWATER DIVISION 20 E. OLIVE – P.O. BOX 1230 BOZEMAN, MONTANA 59771

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Stabilization Measures

Disturbed Area

Introduction
Stabilization measures reduce erosion, increase infiltration, slow the flow of water, and minimize raindrop impact of disturbed areas during and after construction activities. Stabilization measures can be temporary or permanent depending on their type and application. Disturbed areas that will remain inactive for 14 or more days are required to be stabilized.

Applicable Local Requirements
1. Stabilize disturbed areas

Approved Options
1. Surface Roughening: Consists of 3” minimum depressions running perpendicular to slopes using equipment, such as a grouser or sheep’s foot. 2. Crimped Straw Mulch: Consists of weed-free straw with a 12” minimum length evenly distributed at a rate of 4000 lbs/acre and crimped into the soil. Straw blowers and hand broadcasting are useful distribution methods. Flat shovels and disc plows work well for crimping. 3. Wood Mulching: Consists of shredded wood and compost evenly distributed. Apply wood mulch and compost to a depth of 2”-3”. 4. Rolled Erosion Control Products: Consists of biodegradable blankets composed of fibers such as jute, straw, coconut, or a combination of straw and coconut fibers. Installation criteria to consider include anchor slots, overlapping adjacent blankets, check dams, and staking. See page 36 for an installation specification 5. Sod: Immediately stabilizes disturbed areas. Consider sod type, soil preparation, soil amendments, and irrigation until establishment 6. Hydro-Seed: Consists of wood mulch, tackifier/binder, and seed sprayed by machine or hand depending on the application and area. Hydro-seed immediately stabilizes barren ground and can be used in temporary or permanent applications.

Image 29 - Surface Roughening

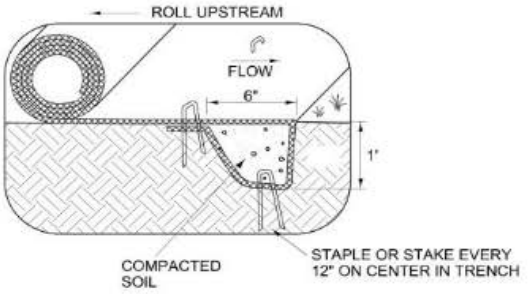
Image 30 - Crimped Straw Mulch

Image 31 - Wood Mulching

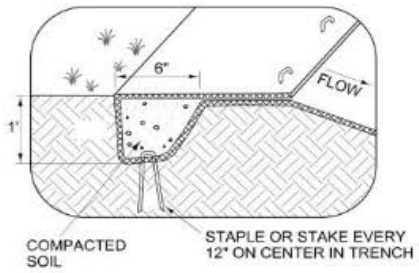
Image 32 - Erosion Control Product

Image 34 - Sprayed hydro-seed

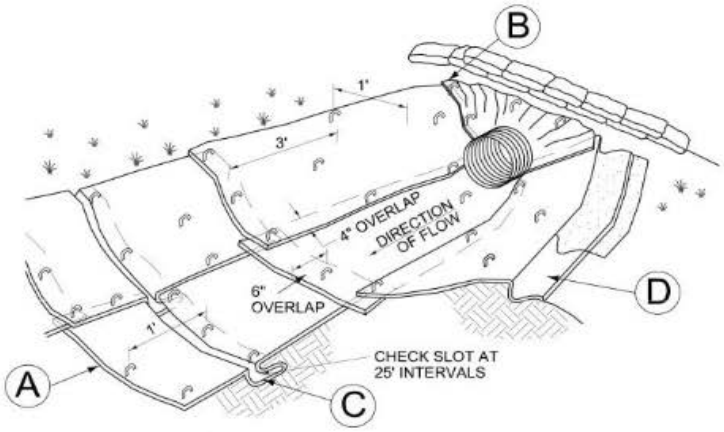
SS-6 Rolled Erosion Control Products



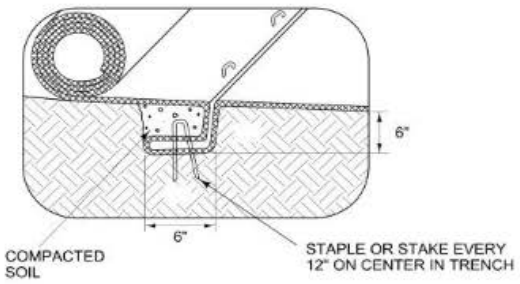
A INITIAL CHANNEL ANCHOR TRENCH



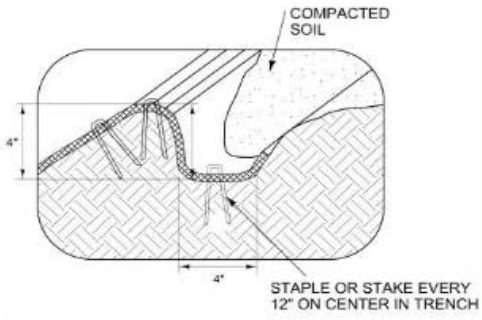
B TERMINAL SLOPE & CHANNEL ANCHOR TRENCH



TYPICAL CHANNEL DETAIL



C INTERMITTENT CHECK SLOT



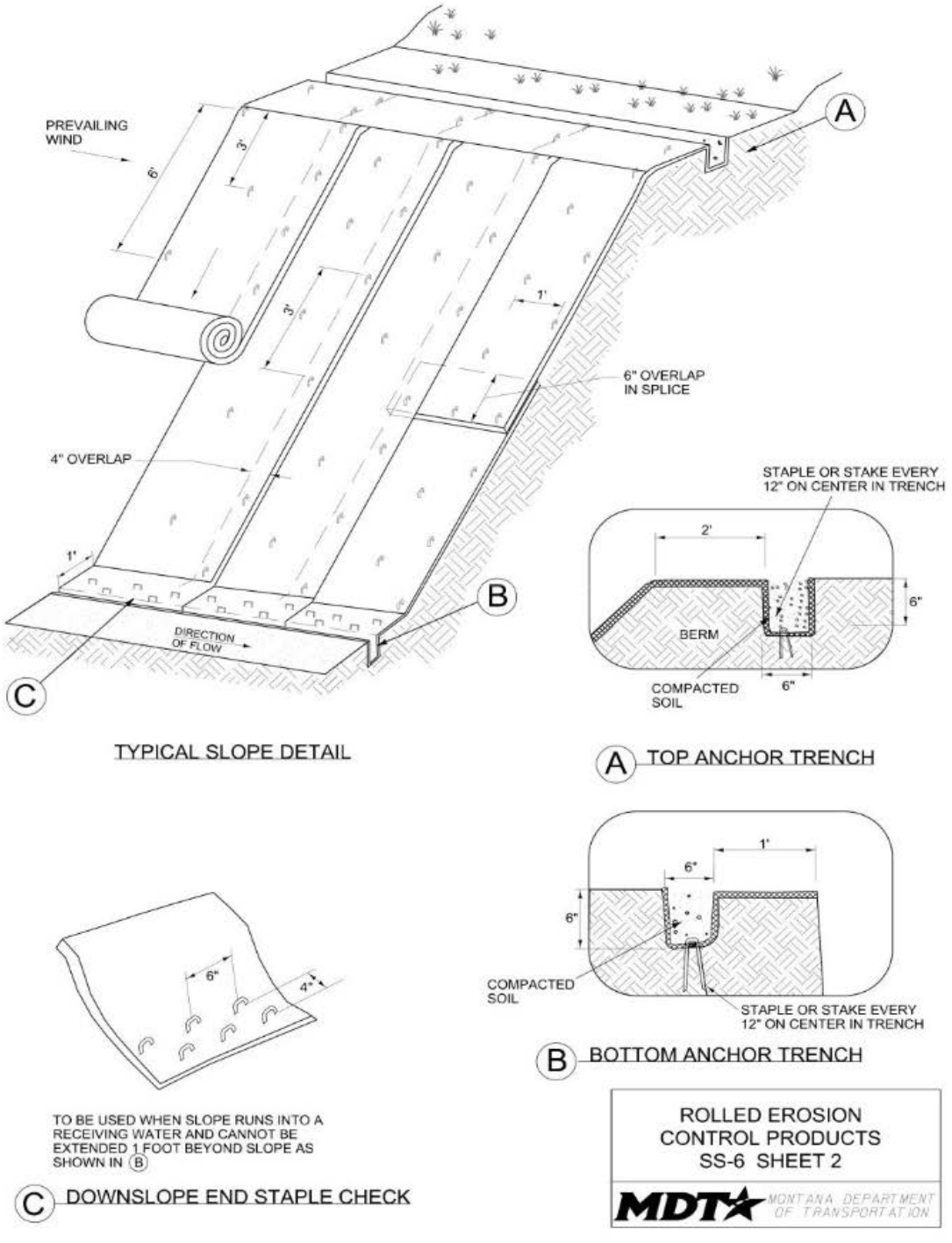
D LONGITUDINAL ANCHOR TRENCH

ROLLED EROSION CONTROL PRODUCTS
SS-6 SHEET 1

MDT MONTANA DEPARTMENT OF TRANSPORTATION

**Note: Taken from MDT's December 2016 Erosion and Sediment Control Best Management Practices Manual

SS-6 Rolled Erosion Control Products



**Note: Taken from MDT's December 2016 Erosion and Sediment Control Best Management Practices Manual

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Single-Family Residential

Single-Family Home Construction Site Protection Plan

Stage of Construction and Timing of BMP Implementation

#	Minimum Expectation	Stage 1 Foundation	Stage 2 Utilities	Stage 3 Structure	Stage 4 Flat Work	Stage 5 Landscaping
1	Protect Inlets	*n/a // Cost: n/a*				
2	Contain Disturbed Area	*Foam wattle, straw wattle, compost wattle, silt fence, or earthen berm // Cost: $50 - $100 (reusable)*				
3	Mitigate Tracking	*Gravel drive entrance // Cost: $420*				
4	Control Concrete Waste	*Prefabricated roll-off or lined container // Cost: $20-$30*				
5	Contain Material Stockpiles	*Tarp or within perimeter control // Cost: $25-$50*				
6	Manage Dewatering Flows	*Land apply or wells // Cost: ~$500*				
7	Stabilize Disturbed Area					*Sod // Cost: n/a*

Example BMPs

Contain Disturbed Area
Straw Wattle

Control Concrete Waste
Washout Bag

Contain Material Stockpiles
Silt Fence

Manage Dewatering Flows
Wells

www.alexanderdewatering.com

Mitigate Tracking
Gravel Drive Entrance

Stabilize Disturbed Area
Sod

Infrastructure Protection

Single-Family Home Construction Site Protection Plan