

APPENDIX D

Best Management Practices

Appendix D Construction Stormwater Best Management Practices— Example Descriptions

This appendix addresses *Larimer County Procedural Guide for 1041 Permits*, Item 8.e, and the criteria and standards described in LUC Sections 8.12, 14.10.D.3, 10.14.D.4, and 14.10.D.11.

The TWP designers will reference appropriate technical manuals at the time of development of the Stormwater Management Plans (SWMPs), and select and indicate appropriate locations for best management practices (BMPs). Example descriptions of common construction BMPs that could be used during construction are provided for reference purposes below. These lists are not all inclusive. Items listed below, and/or other construction BMPs, will be selected as appropriate during design.

TABLE D-1

Example Structural Control Measures

SWMP(s) may include these and/or other construction BMPs

Possible Control Measure	Potential Location(s)	Description of Control Measure
Silt Fencing	Along the perimeter of the excavation sites, corridor, and disturbed areas.	Protects streams or wetland areas, reduces sediment transport, and keeps sediment onsite. Silt fencing consists of posts with filter fabric stretched across the posts. The bottom end of the fence is vertically trenched and covered with backfill. This prevents water from passing by the fence without being filtered. The fabric allows for the water to pass offsite while retaining the sediment onsite.
Wattles	Along the downhill perimeter of the disturbed sites.	Used to form a barrier or redirect water, and made of straw. Wattles work much like silt fencing and may be used instead of silt fencing.
Straw Bales	Installed around areas requiring protection, such as wetlands, to form a temporary containment.	Used to form a barrier or redirect water. Straw bales are often used in ditch check dams or as inlet protection rather than linear BMPs. The bales impede stormwater flow. Unlike silt fence, straw bales do not allow water to flow through freely, thus they are used where detention, not just filtration, is necessary.
Erosion Control Blankets	In areas requiring protection of exposed soil and/or additional stabilization.	Protects disturbed soil areas to minimize erosion and soil transport.
Inlet Protection	Around inlets to the storm sewer system.	Traps sediment with filtering material placed around an inlet to a receiving stream. It can be composed of gravel, stone with a wire mesh filter, concrete blocks and gravel, or straw bales.
Earth Dikes/ Berms	In areas where stormwater flow needs to be diverted around a potential contaminant source.	Diverts stormwater flow around or away from areas where soils are disturbed or stockpiled, or the location of potential contaminants, to minimize contact of the stormwater with those pollutant sources of concern.

TABLE D-1

Example Structural Control Measures

SWMP(s) may include these and/or other construction BMPs

Possible Control Measure	Potential Location(s)	Description of Control Measure
Check Dams	Typically where the grade change is more than 2 percent.	Slows the speed of the flow. A check dam is a small, temporary dam constructed across a drainage ditch or channel. The reduced runoff speed may result in less erosion and gully in the channel and allow the sediment to settle out. The check dams can be built with materials such as straw bales, rock, timber, or other material that may retain/slow water flow.
Vehicle Tracking Control	At entrances and exits into and out of the construction site.	Reduces tracking of soil off the site. Entrance and exit points are constructed of a riprap layer on top of filter fabric. The intent is for the mud and sediments on vehicle tires to adhere to the rough surface of the rocks/cobbles.
Temporary Swales	In low areas and at site boundaries, as appropriate.	Provides a preferential pathway for water flow to prevent erosion and provide a location for accumulation of sediment and debris.
Concrete Washout	In Contractor Staging Area or other approved location.	Provides a designated location and containment to washout concrete trucks. Washout areas are depressed impoundments or fabricated structures. Water used to wash out concrete trucks is contained within the depressed area. The wash water usually has a high pH, which, if released, can affect the quality of runoff. The wash water may be pumped out of the depressed area for proper disposal off-site. Hardened concrete is also periodically removed and disposed of properly.
Limit Number of Entrances/Exits	Designated construction site entrances/exits.	Reduces tracking of soil off site. Typically implemented with vehicle tracking control.

TABLE D-2

Example Stabilization Control Measures

SWMP(s) may include these and/or other stabilization practices.

Possible Control Measure	Potential Location(s)	Description of Stabilization Practice
Temporary Seeding	On appropriate disturbed areas if construction is complete or suspended for an extended period of time, but prior to the entire site being permanently reseeded.	Provides stabilization of the soil and reduces erosion.
Permanent Seeding	On appropriate disturbed areas once construction is complete.	Provides stabilization of the soil and reduces erosion.
Sod Stabilization	On appropriate areas where rapid stabilization and protection of disturbed ground surface is desirable and/or where it will be difficult to reseed the area.	Provides stabilization of the soil and reduces erosion and protects water quality.
Mulching	On slopes steeper than 2:1 or on areas that have been seeded.	Provides soil stabilization or erosion control where materials such as grass wood chips, hay, etc. are placed on the soil surface to protect disturbed soil areas and/or establish seeded areas.
Vegetative Buffer Strips	As appropriate and where feasible, retain or install between large areas of disturbed soil or pavements.	Intercepts and slows sheet flow moving across disturbed or paved areas. Improves water quality, reduces erosion potential, and assists in retaining sediment onsite.
Furrow-Contour Side Hill Slopes	On side hill slopes of exposed soil.	Minimizes wind and water erosion, provides a microclimate of wind protection for new plants, and helps conserve precipitation for use in growth of new seed, which reduces sediment erosion.
Geotextiles	On appropriate disturbed areas or slopes.	Provides coverage and stabilization of disturbed soils and slopes to reduce erosion potential.

TABLE D-3

Example Materials Handling Control Measures for Construction Sites

SWMP(s) may include these or other materials handling control measures.

Possible Control Measure	Description of Control Measure
Good Housekeeping	Implement general good housekeeping at the construction site. Keep the site free, as much as practicable, from trash, spilled fuels or oils, and miscellaneous construction debris
Provision of Trash Receptacles	Provide trash receptacles (i.e., dumpsters or garbage cans) for daily domestic-type trash and garbage. Use sturdy receptacles placed in areas where they are unlikely to be knocked or blown over. Empty receptacles on a regular basis.
Trash Removal	Remove domestic-type garbage from trash receptacles, construction or materials packaging, and other general trash and debris from the site on a regular basis.
Safety Data Sheets (SDSs)	Make SDSs available for review and use for substances used or stored on the construction site.
Materials Inventory	Maintain an inventory of materials stored onsite
Materials Storage	Provide proper storage and containment for chemicals, fuels, oil, and any other products requiring storage/containment.
Vehicle Fueling and Maintenance Containment	Limit areas where fueling and maintenance occur, and perform away from storm inlets and waterways. Provide spill kits and clean up/dispose of the spill and cleanup materials properly. Prepare a spill control and secondary containment plan for fuel storage.

TABLE D-4

Example BMP Maintenance Guidelines

SWMP(s) may reference/include these and/ or other inspection and maintenance guidelines.

SILT FENCE

- Is the fence damaged, collapsed, un-entrenched, or ineffective?
- Has sediment been removed from behind the fence?
- Is the silt fence properly positioned?

STRAW BALE BARRIER

- Are the straw bales damaged, ineffective, or un-entrenched?
- Has sediment been removed from behind the bales?
- Are the bales installed and positioned correctly?

EROSION CONTROL BLANKET

- Is fabric damaged, loose, or in need of repair?

INLET PROTECTION

- Is the inlet protection damaged, ineffective, or in need of repair?
- Has sediment been removed?

EARTH DIKES/BERMS

- Are dikes or berms in good condition, without gaps or damaged areas?
- Are dikes or berms installed in areas of soil stockpiles?

CHECK DAM

- Has accumulated sediment and debris been removed from behind the dam?
- Have the removed materials been disposed of properly?

TEMPORARY SWALES

- Has any sediment or debris been deposited within the swales?
- Have the slopes of the swale eroded or has damage occurred to the lining?

SURFACE ROUGHENING

- Are there any vehicle tracks evident on roughened slopes?
- Is there any evidence of erosion?

VEHICLE TRACKING AT ENTRANCE/EXITS

- Is the gravel surface clogged with mud or sediment?
- Is the gravel surface sinking into the ground?
- Has sediment been tracked onto public roads; if so, has it been cleaned up?

CONCRETE WASHOUT STRUCTURE

- Is structure more than two-thirds full?
- Is the structure performing properly?
- Is liner in adequate condition?

PERMANENT SEEDING

- Are the seedbeds protected by mulch?
 - Has any erosion occurred in the seeded area?
 - Is there any evidence of vehicle tracking on seeded areas?
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TABLE D-4

Example BMP Maintenance Guidelines

SWMP(s) may reference/include these and/ or other inspection and maintenance guidelines.

SOD STABILIZATION

- Is sod properly installed?
 - Are there gaps or areas of exposed soil between sod sheets?
 - Is sod stressed or dead?
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MULCHING

- Is mulch distributed uniformly on all disturbed areas?
 - Is there any evidence of mulch being blown or washed away?
 - Has the mulched area been seeded?
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VEGETATIVE BUFFER STRIPS

- Are vegetative buffer strips installed or maintained?
 - Are areas of vegetative buffer strips appropriately protected or designated to minimize damage?
 - Are vegetative buffer strips covered or filled with debris or sediment?
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FURROW CONTOURING

- Is furrow contouring implemented on final slopes, as practicable?
 - Is erosion visible cross-cutting furrow contours?
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GEOTEXTILES

- Is fabric damaged, loose, or in need of repair?
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TABLE D-5
Example Groundwater BMPs

Possible Control Measure	Description of Control Measure
Trench Plug	Mitigates a decline in groundwater levels due to draining of groundwater through the pipeline bedding material. Install periodically along and perpendicular to the pipeline at locations determined by designer.
Draining Mechanism	Mitigates groundwater rising due to pipeline installation.
Bedding	Allows for increased water flow through the pipe zone to account for the impervious area caused by the pipe.
Groundwater Disposal	Disposal in accordance with CDPHE regulations and the requirements of the construction dewatering permits. Temporary retention ponds, land application, and routing to storm drains are options for groundwater disposal.
Reduction in Impervious Materials	Minimizes impervious materials to maximize groundwater recharge

TABLE D-6
Example Other Areas or Procedures BMPs

Possible Control Measure	Description of Control Measure
Bentonite Containment/Disposal	Includes proper pit containment and removal/disposal once operations are complete or as necessary. Bentonite associated with trenchless installation methods may present a potential site pollutant.
Appropriate Backfill Technique	Minimizes the effects of subsurface drainage. BMPs such as appropriate trench materials, compaction techniques, and proper compaction with the correct equipment can be utilized.
Street Sweeping	Reduces the potential of sediment transport and tracking. Sweeping operations involve scraping and/or sweeping large quantities of sediment from pavement, via hand or mechanical means, to remove as much deposited sediment as possible. Streets within and immediately surrounding a construction site would be cleaned of earth material when sediment has been deposited on the roadway and is being tracked off site. Scraped or swept material would not be deposited in the storm sewer. Sweeping and vacuuming may not be effective when soil is wet or muddy.