Operational Linear Utility Erosion, Sediment, and Stormwater Control Plan

Lexington-Fayette Urban County Government

Adopted: September 1, 2017
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Introduction

Lexington-Fayette Urban County Government routinely constructs linear utility projects that involve less than one acre of disturbance and that require coverage under a Land Disturbance Permit issued by the Division of Engineering. The majority of these projects fall into four Divisions; Water Quality, Engineering, Streets and Roads, and Traffic Engineering. The primary points of contact for these Divisions are listed below:

**Division of Engineering**

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**Division of Water Quality**

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Purpose

This Operational Linear Utility Erosion, Sediment, and Stormwater Control Plan provides construction guidance and best management practice for linear utility construction projects conducted by the Lexington-Fayette Urban County Government. All utility construction/installation projects must follow the current edition of the LFUCG Stormwater Manual. Following the construction procedures, specification, and practices in this document will ensure that LFUCG is meeting the requirements of the
LFUCG Code of Ordinances and the Kentucky Pollutant Discharge Elimination System (KPDES) General Permit KYR10. This document also satisfies the requirements for the issuance of a Land Disturbance General Permit through the Division of Engineering at LFUCG, covering all linear utility projects for 24 months from the date of issuance, as described in Section 16-102 of the Code of Ordinances.

Construction projected for the next 24 months includes routine sanitary and storm sewer maintenance and rehabilitation, roadway repair, curb repair, bridge maintenance, and fiber optic installation. Project managers should notify the Division of Water Quality and Division of Engineering by email 2 days prior to project commencement. Notification should include the following:

- Project Location
- Type of Work to be Conducted
- Project Schedule
- Person Party for Permit Compliance
- Intent to Comply with this Plan

The notification email should be sent to – UtilityLDP@lexingtonky.gov

Project managers should also adhere to all other permitting requirements at the State and Federal level. This could include, but is not limited to: KPDES Individual Permit, Floodplain Construction Permit, KY 401 Water Quality Certification, or Federal Clean Water Act Section 404 Permit. Erosion, sediment, and stormwater BMPs as described in Chapter 11 of the LFUCG Stormwater Manual and this plan are required to be installed and maintained at all work sites. BMP types and specific locations will be selected based on the unique conditions at each work site.

**Erosion and Sediment Control Best Management Practices**

This section of the Operational Linear Utility Erosion, Sediment, and Stormwater Control Plan describes requirements for the planning and implementation of non-structural and structural best management practices (BMPs) to be used for erosion and sediment control during construction activities in Fayette County, Kentucky.

**Purpose**

Erosion control refers to efforts to maintain soil on a construction site. Sediment control refers to keeping the material that erodes from leaving the site. Sediment leaving a construction site may cause a traffic hazard (e.g., mud on paved roads), and can result in the following adverse impacts to the stream environment:

- Decreased light penetration and aquatic plant growth
- Smothering of benthic organisms by sediment
- Decreases in channel capacity to carry storm flows
- Decreases in reservoir and pond storage capacity
Non-structural practices, which are primarily avoidance practices (e.g., good housekeeping measures), and structural practices, which require construction (e.g., stabilized site exit), are also described in this section. A construction site will require the implementation of both types of practices. Details of structural practices are also given in this section.

General Approach for Linear Projects

Details for the erosion, sediment, and stormwater BMPs are provided in this plan. In general, the principles for controlling polluted runoff from linear projects include the following:

- Divert upslope runoff away from your project site as much as you can.
- Clear or excavate only as much area as you can successfully manage, in terms of ESC.
- Keep a small working footprint, by stabilizing completed areas as the project proceeds.
- Stabilize disturbed areas as soon as possible with straw or temporary seeding.
- Use silt fence or other sediment barrier to intercept downslope runoff.
- Use wire-backed reinforced silt fence along critical areas and for heavier flows.
- Curve silt fence ends upslope to prevent bypasses.
- Place soil stockpiles upslope of excavations if possible, or use straw, seed, or other cover.
- Use inlet protection for storm drains receiving flow from your project.
- Avoid placing soil or other pollutants on pavement; cover with a tarp if necessary.
- Where possible, cross streams or channels at right angles, with gently sloping banks.
- Minimize earth disturbance and vegetation removal along stream banks.
- Stage construction along streams and floodplains during dry weather if possible.
- Stabilize channel banks immediately after construction with seed and blanket/mat.
- Use a filter bag, silt fence enclosure, or other BMP to treat dewatering discharges.
- Ensure proper washout facilities for concrete, paint, and other potential contaminants.
- Keep litter, wastes, and hazardous materials in the proper containers and under cover.
- Clean up spills immediately, and report large spills as necessary.

Non-Structural Practices

Planning, design, and organizing/managing your work site can have a significant impact on controlling polluted runoff. Non-structural approaches for reducing erosion, sediment loss, and stormwater pollution include:

- Floodplain avoidance
- Stream buffer zones
- Reduced exposure time
- Limits on maximum disturbed area
- Embankment slope minimization
- Good housekeeping practices
**Floodplain Avoidance**
No construction or grading activities are permitted in the post-development floodplains, except for road and utility crossings and permanent stormwater management facilities. Therefore, only erosion and sediment control practices related to allowable construction activities are permitted in the post-development floodplain. Temporary sediment control in a permanent pond may be allowed in the post-development floodplain, but not in a stream.

**Vegetative Buffer Strips**
Buffer strips are required adjacent to all streams and wetlands in Fayette County. A fifty (50) foot vegetated buffer must be maintained between all land disturbance activities and the edge of any perennial or intermittent stream, wetland, open throat sinkhole, or municipal storm sewer inlet. Native vegetation in this zone must be preserved. Where a fifty foot vegetated buffer is not feasible due to the nature or purpose of the activity, a protective alternate erosion control must be used as described in this plan. In such cases, the utility construction crew must minimize disturbances in buffer zone areas.

**Reduced Exposure Time**
All on-site measures required by the Erosion and Sediment Control Plan must be made functional before other land disturbance takes place. Permanent or temporary soil stabilization, as described under structural practices, must be applied to disturbed or constructed areas within 14 days after final grade is reached. Temporary or permanent soil stabilization must be applied to all disturbed areas not at final grade, including soil stockpiles, dams, dikes, and diversions, which have been inactive for 14 days.

**Limits on Maximum Disturbed Area**
Linear projects should minimize the working footprint to reduce erosion and sediment control issues. Stabilizing disturbed areas as the project proceeds will help to minimize sediment runoff. Placing soil stockpiles upslope of excavated trenches will help to contain sediment movement. The maximum area that may be disturbed at any time during construction, without soil stabilization, is 25 acres.

**Embankment Slope Minimization**
Steep embankment slopes present increased opportunities for erosion and sediment production due to high runoff velocities. To minimize adverse effects of steep embankment slopes, constructed fill slopes and cut slopes must not be steeper than 3H:1V. For slopes of 4H:1V or steeper with slope lengths of greater than 100 feet, temporary diversion ditches must be constructed at the top of the slope and every 100 feet horizontally down the slope. Guidance is provided in the attached drawings for use of erosion control blankets or turf reinforcement mats on slopes.

**Good Housekeeping Measures**
Good housekeeping measures include practices that prevent or minimize the potential for pollutant discharges to the municipal separate storm sewer system (MS4) during construction. Such measures include concrete washouts, waste handling and disposal practices, proper storage of materials (e.g., fuel, oil, paint, fertilizer, other pollutants), spill prevention and cleanup, and other practices to keep pollutants out of the MS4 and surface/ground water.
Structural Practices for Soil Stabilization

This section describes the planning and implementation of the required structural BMPs to minimize erosion and off-site sedimentation through the stabilization of soil materials. These BMPs include:

- mulch
- temporary seeding
- permanent seeding
- sod
- road/parking stabilization
- construction entrance
- dust control
- nets and mats
- gabion mattress
- temporary diversion ditch
- level spreader
- permanent constructed waterway
- pipe slope drain
- impact stilling basin

**Mulch**
Mulch must be used as a soil stabilization measure for any disturbed area inactive for 14 days or longer. Areas requiring stabilization during December through February must receive only mulch held in place with bituminous material. Mulching must be used whenever permanent or temporary seeding is used. All mulch placed in December through February must be anchored with bituminous materials regardless of the slope. Permanent mulches must be used in conjunction with planting trees, shrubs, and other ground covers that do not provide adequate soil stabilization.

**Temporary Seeding**
Temporary seeding must be used for soil stabilization when grades are not ready for permanent seeding, except during December through February. The seed must be applied within 14 days after grading has stopped. Only rye grain or annual rye grass seed must be used for temporary seeding. The use of mulch and erosion blankets, matting and netting with temporary seeding must be in accordance with this plan.

**Permanent Seeding**
Permanent seeding must be applied within 14 days after final grade has been reached, except during December through February. Permanent seeding must also be applied on any areas that will not be disturbed again for a year even if final grades have not been reached. The use of mulch and erosion blankets, matting and netting with permanent seeding must be in accordance with the information in this plan. “Seed mats” may be used for permanent seeding in accordance with manufacturers’ recommendations.
**Sod**
Sod must be used for disturbed areas that require immediate vegetative cover, e.g. the area surrounding a drop inlet in a grassed waterway, the design flow perimeter of a grassed waterway that will convey flow before vegetation can be established, and the inlet of a culvert. Sod may be installed throughout the year. “Seed mats” and seed with geotextiles may be used in place of sod when done in accordance with manufacturers’ recommendations.

**Road/Parking Area Stabilization**
Gravel or paved material must be used to stabilize permanent roads or parking areas or roads or parking areas used repeatedly by construction traffic. Stabilization must be accomplished within 14 days of grading or initiation of use for construction traffic. Unstabilized roads are not acceptable except in instances where the road will be used less than one month.

**Construction Entrance**
A stabilized construction entrance must be constructed wherever vehicles are leaving a construction site to enter a public road or at any unpaved entrance/exit location where there is a risk of transporting mud or sediment onto paved roads. A construction entrance must be constructed at the beginning of the project before construction traffic begins to enter and exit the site.

**Dust Control**
Dust control measures must be implemented on all sites.

**Nets, Blankets, and Mats**
Mulch netting, erosion control blankets (ECBs) and turf reinforcement mats (TRM) must be used on sloping areas as indicated in the Appendix drawings. Mats or nets and permanent seeding may be used as an alternate to sod for culvert entrances and grassed waterways. TRMs shall be used at the water line to control wave action in wet ponds. TRMs shall be used in accordance with manufacturer’s recommendations and this plan.

**Gabion Mattress**
Gabion mattresses must be used at the outlets of all culverts and storm drains with an exit velocity greater than 5 feet per second when flowing full, except where there are paved ditches. Gabion mattresses must also be used at the outlet of impact stilling basins.

**Temporary Diversion Ditch**
Temporary diversion ditches must be used to collect sediment-laden runoff from disturbed areas and direct it to a sediment pond where applicable. Temporary ditches are those expected to be in use for less than one year. Temporary diversion ditches do not require stabilization.

**Level Spreader**
Level spreaders must be constructed at the outlets of temporary diversion ditches. Level spreaders must also be constructed at outlets of permanent constructed waterways where they terminate on undisturbed areas.
**Permanent Constructed Waterway**
Permanent constructed waterways must be used to divert stormwater runoff from upland undisturbed areas around or away from areas to be disturbed during construction. A waterway expected to be in place for at least one year is considered to be permanent. Permanent waterways must be lined with sod or permanent seeding and nets, mats, or TRMs.

**Pipe Slope Drain**
Pipe slope drains must be used whenever it is necessary to convey water down a steep slope, which is not stabilized or which is prone to erosion, unless paved ditch (flume) is installed.

**Impact Stilling Basin**
Impact stilling basins must be used at the outlet of culverts and storm sewers with calculated exit velocities greater than 15 feet per second when flowing full.

**Structural Practices for Sediment Control**
This section describes when and where specific structural sediment control practices are required. The practices include:

- check dam
- sediment trap
- sediment pond
- silt fence
- storm drain inlet protection
- filter strip
- stream crossing
- pump-around flow diversion
- construction dewatering
- concrete washouts
- directional drilling process water controls

**Check Dam**
Check dams must be installed in newly-constructed, vegetated, open channels, which drain 10 acres or less. Check dams must be constructed prior to the establishment of vegetation.

**Sediment Trap**
Sediment traps must be installed below all disturbed areas of less than 5 acres that do not drain to a sediment pond.

**Silt Fence**
Silt fence must be installed down-slope of areas to be disturbed prior to clearing and grading. Silt fence must be situated such that the total area draining to the fence is not greater than one-fourth acre per 100 feet of fence. Silt fence must be used for storm drain drop inlet protection and around soil stockpiles. Silt fence adjacent to greenways, floodplains, tree protection areas, retention ponds, and streams must be wire-reinforced silt fence.
**Storm Drain Inlet Protection**
Storm drain inlet protection must be used around drop inlets to trap sediment when the upslope area draining to the inlet has no other sediment control.

**Filter Strip**
Vegetated filter strips must be used on each side of permanent constructed channels.

**Stream Crossing**
Stream crossings must be used in cases where construction traffic, permanent traffic, or utilities must cross existing streams and post development floodplains. If the drainage area exceeds 1 square mile and a structure is necessary, the structure must be designed by a professional engineer licensed in Kentucky. Coverage under U.S. Army Corps of Engineers and the Kentucky Division of Water permits is usually required.

**Pump-Around Flow Diversion**
A pump-around flow diversion must be used to divert flow around construction activities occurring in a stream when those activities are reasonably expected to cause the erosion or deposition of sediment in the stream.

**Construction Dewatering**
Sediment-laden water must be pumped to a dewatering device or structure before it is discharged offsite.

**Concrete Washout Pits**
Concrete washout pits must be constructed and maintained throughout the construction phase of the project. Pits must be constructed as necessary, as determined by a professional engineer licensed in Kentucky.

**Directional Drilling Process Water**
Sediment laden process water from directional drilling operations must be drained to a holding pit to be sized by a professional engineer licensed in Kentucky. The collected process water must be pumped out of the pit and through a sediment filter bladder to sheet flow in an appropriate location.

**Good Housekeeping Management Measures**
The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to exposure to the weather and/or runoff:

- Solid waste will be placed in an appropriate container.
- Litter at the site should be picked up daily.
- All wastes will be disposed of properly, and in accordance with all applicable regulations.
- Concrete wash water will be discharged into an appropriate containment structure.
- Products and materials will be stored away from storm inlets and the surface drainage system.
- Materials stored onsite that may leach pollutants will be stored in a neat, orderly manner in their appropriate containers, under a roof, properly secured tarpaulin, or other enclosure.
• Products will be kept in their original containers with the original manufacturer’s label.
• Substances will not be mixed with one another unless recommended by the manufacturer.
• Whenever possible, all of the product will be used up before disposing of the container.
• Manufacturers’ recommendations for proper use and disposal will be followed.
• The site superintendent will inspect daily to ensure proper used and disposal of materials onsite.
• Dust will be controlled by water sprayed from a tanker truck as needed during dry weather.

**Hazardous Products**
These practices will be used to reduce the risks associated with any and all hazardous materials.

• Products will be kept in original containers unless they are not resealable.
• Products will be stored in a locked trailer on site.
• Original labels and material safety data sheets (MSDS) will be reviewed and retained.
• If surplus product must be disposed of, manufacturers’ or state/local recommended methods for proper disposal will be followed.

**Petroleum Products**
Petroleum products stored onsite (oil, gas for tamp and pump) will be stored away from storm drain inlets and the surface drainage system in tightly sealed containers, which are clearly labeled. Any asphalt or concrete products used onsite will be applied according to the manufacturer’s recommendations. Fueling will not occur near storm drains or the drainage system.

**Spill Control Practices**
In addition to the good housekeeping and material management practices previously discussed, the following practices will be followed for spill prevention and cleanup:

• Spill cleanup materials/equipment (e.g., brooms, dust pans, rags, gloves, kitty litter, sand, sawdust, plastic and metal containers) will be kept in the material storage area.
• All spills will be cleaned up immediately after discovery.
• Spill of toxic or hazardous material will be reported to the appropriate state/local agency.
• The SWPPP manager responsible for the day-to-day site operations will be the spill prevention and cleanup coordinator.

**Construction Specifications**
Linear project working footprints should be kept small to minimize erosion and sediment runoff problems. Stabilizing completed areas with mulch or seed as installation/construction proceeds will help to minimize challenges. Identifying and addressing concentrated flows (i.e., especially at “dips” or low areas along the project route) will prevent sediment discharges to surface waters. The following subsections provide details on the management practices needed to comply with the LFUCG Land Disturbance Permit.
Structural Soil Stabilization BMPs

Mulch

Spreading mulch is a temporary soil stabilization or erosion control practice where materials such as straw, wood chips, wood fibers, or rock are placed on the soil surface. Mulching prevents erosion by protecting the soil surface from raindrop impact and by reducing the velocity of overland flow. Mulch can also be used for dust control. When used with temporary or permanent seeding, mulch can aid in plant growth by holding the seeds, fertilizers, and topsoil in place, by helping to retain moisture, and by insulating against extreme temperatures. Mulch can also improve the aesthetics of the site. Organic mulch materials such as straw, wood chips, bark, recycled paper, and wood fiber are the most effective mulches.

Design Criteria

Straw is the mulch most commonly used in conjunction with seeding. The recommended straw should come from wheat, rye, or barley and may be spread by hand or machine. Straw must be anchored.

Wood chips are suitable for areas that will not be closely mowed, and around ornamental plantings. Chips decompose slowly and do not require tacking. Wood chips should be treated with 12 pounds slow-release nitrogen per ton to prevent nutrient deficiency in plants.

Bark chips and shredded bark are used in landscaped plantings. Bark is also suitable mulch for areas planted to grasses and not closely mowed. Bark is not usually toxic to grasses or legumes, and additional nitrogen fertilizer is not required.

Manufactured wood fiber and recycled paper sold as mulch materials are usually marketed to apply in a hydroteeder slurry with binder/tackifiers. Manufacturer’s recommendations must be followed during application.

A wide range of synthetic, spray-on materials is marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, asphalt, rubber, or other substances that are mixed with water and applied to the soil. They may be used to tack wood fiber hydromulches or straw, and they usually decompose in 60 to 90 days.

A variety of mulch nets and mats are available to use as mulching or to hold mulch in place. Netting, blankets, or mats must be used in critical areas such as waterways where concentrated flows are expected. Netting can help retain soil moisture or modify temperature. It stabilizes the soil surface while grasses are being established and is particularly useful in grassed waterways and on slopes. Lightweight netting may also be used to hold other mulches in place. Netting and erosion control blankets and turf reinforcement mats must be used in accordance with Figures 1 and 5 (see Appendix A).

Gravel or crushed stone can be used to provide a long-term protection against erosion, particularly on short slopes. Before the gravel or crushed stone is applied, it should be washed. Aggregate cover must only be used in relatively small areas and must be incorporated into an overall landscaping plan.
Material Specifications

Straw must be applied at two tons per acre or 90 pounds per 1,000 square feet. Straw must be free from weeds and coarse matter.

Wood chips must be applied at 40 cubic yards per acre or 1 cubic yard per 1,000 square feet and approximately 2 inches deep. Wood chips must be treated with 20 pounds of nitrogen per acre.

Recycled paper (newsprint) or wood fiber must be mixed at 50 pounds per 100 gallons of water and applied according to manufacturer’s recommendations and model of hydroseeder in use.

Bark chips or shredded bark must be applied at 70 cubic yards per acre or 1.5 to 2 cubic yards per 1,000 square feet and about one-half inch thick.

Liquid mulch binders/tackifiers may be asphalt, synthetic, or wood fiber slurries applied according to manufacturer’s recommendations.

Chemical soil stabilizers or soil binders/tackifiers/emulsions must not be used alone. These materials are useful to bind organic mulches together.

Construction Specifications

Seed must be applied prior to mulching except where seed is to be applied as part of a hydroseeder slurry containing mulch.

Lime and fertilizer must be incorporated and surface roughening accomplished as needed prior to mulching in accordance with applicable sections of this manual.

Mulch materials must be spread uniformly by hand or machine.

Mulch must be anchored during or immediately after spreading to prevent being blown by the wind. Mulch may be anchored using a mulch anchoring tool, a liquid binder/tackifier, or mulch nettings. Nets and mats must be installed to obtain firm, continuous contact between the material and the soil. Without such contact, the material is useless and erosion occurs.

A mulch anchoring tool is a tractor-drawn implement that is typically used for anchoring straw and is designed to punch mulch approximately two inches into the soil surface. Machinery must be operated on the contour and must not be used on slopes steeper than 3H:1V.

When using liquid mulch binders and tackifiers, application must be heaviest around edges of areas and at crests of ridges and banks to prevent wind blow. Remainder of area must have binders/tackifiers spread uniformly in accordance with manufacturer’s recommendations.

When using a mulch net, it must be used in conjunction with an organic mulch and must be installed immediately after the application and spreading of the mulch. Mulch net must be installed over the mulch except when the mulch manufacturer recommends otherwise.
Excelsior blankets and mats with mulch are considered protective mulches and may be used alone on erodible soils and during all times of year. Erosion control mats must be installed in accordance with manufacturer’s recommendations.

**Maintenance**

Mulched areas must be inspected at least weekly and after every rainfall of one-half inch or more. When mulch material is found to be loosened or removed, the mulch cover must be replaced within 48 hours.

**Temporary Seed**

Temporary seeding stabilizes disturbed areas by the establishment of a temporary vegetative cover of rapidly growing plants on disturbed areas that are not at final grade. Temporary seeding reduces problems associated with mud or dust from bare soil surfaces during construction, reduces erosion and sediment runoff to downstream areas and/or groundwater basins, and improves the visual appearance of the construction area. Seed, fertilizer, and mulch specifications are listed in the *KY Erosion Prevention and Sediment Control Field Guide*.

**Construction Specifications**

The site must be graded as needed to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and anchoring.

The needed erosion control practices must be installed prior to seeding such as diversions, temporary waterways for diversion outlets, and sediment ponds.

Prior to seeding, work the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of two inches. On sloping areas, the final operation must be on the contour.

The seed must be applied uniformly with a cyclone seeder, drill, cultipacker, seeder, or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed no deeper than one-fourth inch to one-half inch.

When feasible, except where a cultipacker type seeder is used, the seedbed must be firmed following seeding operations with a cultipacker, roller, or light drag. On sloping land, seeding operations must be on the contour wherever possible.

Mulch must be applied, in the amounts described in the mulch practice in this plan, to protect the soil and provide a better environment for plant growth.

The mulch must be spread uniformly by hand or mechanically so the soil surface is covered. Following application, the mulch must be anchored or otherwise secured to the ground according to one of the following methods:
• **Mechanical** – Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil.

• **Mulch Tackifiers/Nettings/Emulsions** – Use according to the manufacturer’s recommendations. This is a superior method to hold mulch in place in areas of concentrated flow.

• **Wood Fiber** – Wood fiber hydroteeder slurries may be used to tack straw mulch. This combination treatment is well suited to steep slopes and critical areas, and severe climate conditions.

### Maintenance

New seed must have adequate water for growth, through either natural means or irrigation, until plants are firmly established.

Seeded areas must be inspected every two weeks after planting and after each rainfall of 0.5 inches or more. Areas requiring additional seed and mulch must be repaired within 48 hours. If vegetative cover is not established within 21 days, the area must be reseeded.

### Permanent Seed

Permanent seeding is the stabilization of disturbed areas with the establishment of permanent vegetation by planting seed. The primary purpose of permanent seeding is to permanently stabilize disturbed areas in a manner that is economical, adaptable to site conditions, and allows selection of the most appropriate plant materials. Permanent seeding also reduces the erosion and sediment yield from disturbed areas while the vegetation is becoming established.

### Design Criteria

Permanent seeding must be used on disturbed areas where permanent, long-lived vegetative cover is needed to stabilize the soil and on rough graded areas that will not be brought to final grade for one year or more.

The area to be seeded must be protected from excess runoff as necessary with diversions, grassed waterways, terraces, or sediment ponds.

Plant species must be selected on the basis of timing of establishment, planned use of the area, and the amount or degree of maintenance that can be devoted to the area in the future.

Vegetative cover alone must not be used to provide erosion control cover and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.

### Material Specifications

Seed must be applied in a mixture based upon the season and ultimate use of the site. Erosion and sediment control plans submitted to LFUCG must include seed mixtures, rates, and planting dates selected for permanent seeding. Permanent seeding may be done at any time except December through February. Seed, fertilizer, and mulch specifications are listed in the *KY Erosion Prevention and Sediment Control Field Guide*. 
Soil material must be capable of supporting permanent vegetation and have at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of sand will not consistently provide sufficient moisture for good growth regardless of other soil factors.

**Construction Specifications**

During site preparation, topsoil must be stockpiled for use in establishing permanent vegetation.

The site must be graded as needed to permit the use of conventional equipment for seedbed preparation, seeding, mulch application, and anchoring.

The needed erosion control practices must be installed prior to seeding such as diversions, temporary waterways for diversion outlets, and sediment ponds.

Prior to seeding, work the lime and fertilizer into the soil with a disk harrow, springtooth harrow, or similar tools to a depth of four inches. On sloping areas, the final operation must be on the contour.

Where compacted soils occur, they should be broken up sufficiently to create a favorable rooting depth of six to eight inches.

The seed must be applied uniformly with a cyclone seeder, drill, cultipacker, seeder, or hydroseeder (slurry may include seed and fertilizer) preferably on a firm, moist seedbed. Seed no deeper than one-fourth inch to one-half inch.

When feasible, except where a cultipacker type seeder is used, the seedbed must be firmed following seeding operations with a cultipacker, roller, or light drag.

On sloping land, seeding operations must be on the contour wherever possible.

Mulch, erosion control blankets, or turf reinforcement mats must be used to protect the soil and provide a better environment for plant growth.

The mulch or other covering must be applied uniformly so the soil surface is covered. Following application, the mulch/blanket/mat must be anchored or otherwise secured to the ground according to one of the following methods:

- **Staking** – Use stakes or staples to secure erosion control blankets or turf reinforcement mats.
- **Mechanical** – Use a disk, crimper, or similar type tool set straight to punch or anchor the mulch material into the soil.
- **Mulch Tackifiers/Nettings/Emulsions** – Use according to the manufacturer’s recommendations. This is a superior method in areas of water concentration to hold mulch in place.
- **Wood Fiber** – Wood fiber hydroseeder slurries may be used to tack straw mulch. This combination treatment is well suited to steep slopes and critical areas, and severe climate conditions.
**Maintenance**

New seed must have adequate water for growth, through either natural means or irrigation, until plants are firmly established. Seeded areas must be inspected every two weeks after planting and after each rainfall of 0.5 inches or more. Areas requiring additional seed and mulch must be repaired within 48 hours. If vegetative cover is not established within 21 days, the area must be reseeded. If less than 70 percent groundcover is established, seed and fertilize, using half of rates originally applied, and mulch. If less than 40 percent groundcover occurs, follow original seedbed preparation methods, seeding and mulching recommendations, and apply lime and fertilizer as needed according to soil tests.

**Sod**

Sod is used to stabilize fine-graded disturbed areas by establishing permanent grass stands. Sod has several purposes or applications including:

- establishment of permanent turf immediately
- prevention of erosion and damage from sediment and runoff by stabilization of the soil surface
- reduction of dust and mud associated with bare soil surfaces
- stabilization of drainageways where concentrated overland flow will occur

**Design Criteria**

Sodding must be used for disturbed areas that require immediate vegetative cover. Locations particularly suited to stabilization with sod include waterways carrying intermittent flow and the area around drop inlets in grassed waterways.

The species of sod selected must be based on soil type, planned use of the area, and the amount of maintenance that can be devoted to the area in the future.

Sod must not be used to provide erosion control and prevent soil slippage on a soil that is not stable due to its structure, water movement, or excessive slope.

Sod must be installed within 36 hours of digging and removal from the field. Sod should not be used on slopes steeper than 2H:1V. If it is to be mowed, installation should be on slopes no greater than 3H:1V.

**Material Specifications**

Soil material must be capable of supporting permanent vegetation and must consist of at least 25 percent silt and clay to provide an adequate amount of moisture holding capacity. An excessive amount of sand will not consistently provide sufficient moisture for the sod regardless of other soil factors.

Fertilizer must be applied at a rate of 1,000 pounds per acre of 10-10-10 analysis or equivalent, unless soil test results indicate a different rate is appropriate. Lime must be applied at a rate of 100 pounds per 1,000 square feet or two tons per acre of agricultural ground limestone, unless soil test results indicate differently. Do not use fertilizer in sodded ditches or channels.
The sod must consist of strips of live, vigorously growing grasses. The sod must be free of noxious and secondary noxious weeds and must be obtained from good, solid, thick-growing stands. The sod must be cut and transferred to the job in the largest continuous pieces that will hold together and are practical to handle.

The sod must be cut with smooth clean edges and square ends to facilitate laying and fitting. The sod must be cut to a uniform thickness of not less than three-fourth inch measured from the crown of the plants to the bottom of the sod strips for all grasses except bluegrass. Bluegrass sod must be cut to a uniform thickness of not less than one and one-half inches.

The sod must be mowed to a height of not less than two inches and no more than four inches prior to cutting.

The sod must be kept moist and covered during hauling and preparation for placement on the sodbed.

**Construction Specifications**

The area to be sodded must be protected from excess runoff, as necessary, with appropriate BMPs.

Lime and fertilizer must be worked into the soil with a disk harrow, springtooth harrow, or other suitable field equipment to a depth of four inches.

Prior to sodding, the soil surface must be cleared of all trash, debris, and stones larger than one and one-half inches in diameter, and of all roots, brush, wire, and other objects that would interfere with the placing of the sod.

Compacted soils must be broken up sufficiently to create a favorable rooting depth of six to eight inches.

After the lime and fertilizer have been applied and just prior to the laying of the sod, the soil in the area to be sodded must be loosened to a depth of one inch. The soil must be thoroughly dampened immediately after the sod is laid if it is not already in a moist condition.

No sod must be placed when the temperature is below 32°F. No frozen sod must be placed nor must any sod be placed on frozen soil.

When sod is placed during the periods of June 15 to September 1 or October 15 to March 1, it must be covered immediately with a uniform layer of straw mulch approximately one-half inch thick or so the green sod is barely visible through the mulch.

Sod must be carefully placed and pressed together so it will be continuous without any voids between the pieces. Joints between the ends of strips must be staggered.

On gutter and channel sodding, the sod should be carefully placed on rows or strips at right angles to the centerline of the channel (i.e., at right angles to the direction of flow). The edge of the sod at the outer edges of all gutters must be sufficiently deep so that surface water will flow over onto the top of the sod.
On steep graded channels, each strip of sod must be staked with at least two stakes not more than 18 inches apart.

Sod must be tamped or rolled after placing and then watered. Watering must consist of a thorough soaking of the sod and of the sodbed to a depth of at least 4 inches. The sod should be maintained in a moist condition by watering for a period of 30 days.

On slopes 3H:1V or steeper, or where drainage into a sod gutter or channel is one-half acre or larger, the sod must be rolled or tamped and then chicken wire, jute, or other netting pegged over the sod for protection in the critical areas. The netting and sod must be staked with at least two stakes not more than 18 inches apart. The netting must be stapled on the side of each stake within two inches of the top of the stake. The stake should then be driven flush with the top of the sod.

When stakes are required, the stakes must be wood and must be approximately ½ inch by ¾ inch by 12 inches. They must be driven flush with the top of the sod with the flat side against the slope and on an angle toward the slope.

**Maintenance**

In the absence of adequate rainfall, watering must be performed daily or as often as necessary during the first week to maintain moist soil to a depth of 4 inches. Watering must be done during the heat of the day to prevent wilting. After the first week, sod must be watered as necessary to maintain adequate moisture content.

The first mowing of sod must not be attempted until the sod is firmly rooted. No more than one-third of the grass leaf must be removed by the initial and subsequent cuttings. Grass height must be maintained between 2 inches and 3 inches.

Where sod does not establish properly, the sod should be replaced immediately. Areas requiring resodding should be prepared in the same manner as the original installation.

**Road/Parking Stabilization**

Road/parking stabilization refers to the stabilization of access roads, subdivision roads, parking areas, and other on-site vehicle routes with stone immediately after grading. The primary purpose of road/parking stabilization is to reduce erosion from roadbeds caused by construction traffic during wet weather. Stabilization also reduces regrading needed for permanent roadbeds by reducing erosion between the time of initial grading and final stabilization.

**Design Criteria**

Road/parking stabilization must be used wherever roads or parking areas are constructed, whether permanent or temporary, for use by construction traffic.
Stabilization must be accomplished with a minimum depth of six inches of crushed stone. Stabilized construction roadbeds must be at least 14 feet wide for one-way traffic and at least 20 feet wide for two-way traffic. Figure 2 illustrates road/parking stabilization.

Temporary roads must follow the contour of the natural terrain to the extent possible. Slopes must not exceed 10 percent.

Temporary parking areas must be located on naturally flat areas to minimize grading. Grades must be sufficient to provide drainage but must not exceed 4 percent.

All cuts and fills must be 2H:1V or flatter.

Drainage ditches must be provided as needed.

**Material Specifications**

Crushed stone must be KYTC aggregate No. 2 (1.5 to 3 inches in diameter), or equivalent.

**Construction Specifications**

The roadbed or parking surface must be cleared of all vegetation, roots, and other objectionable material.

All roadside ditches, cuts, fills, and disturbed areas adjacent to parking areas and roads must be stabilized with appropriate temporary or permanent vegetation according to the applicable standards and specifications contained in this manual.

Geotextile filter fabric may be applied beneath the stone for additional stability in accordance with fabric manufacturer’s specifications.

Both temporary and permanent roads and parking areas may require periodic top dressing with new gravel. Seeded areas adjacent to the roads and parking areas must be checked regularly to ensure that a vigorous stand of vegetation is maintained. Roadside ditches and other drainage structures must be checked once each week to ensure that they do not have silt or other debris that reduces their effectiveness.

**Construction Entrance**

A stabilized construction entrance is a portion of the construction road that is constructed with filter fabric and large stone. The primary purpose of a stabilized construction entrance is to reduce the amount of soil tracked off of the construction site by vehicles leaving the site. The stabilized entrance will also reduce erosion and rutting on that portion of the road where it is installed.

**Design Criteria**

A stabilized construction entrance must be constructed in the following locations:
wherever vehicles are leaving a construction site and enter onto a public road
at any unpaved entrance/exit location where there is risk of transporting mud or sediment onto paved roads

A stabilized construction entrance must be constructed of crushed stone a minimum of 6 inches thick laid over geotextile (filter fabric).

The width must be at least 20 feet and as wide as the entire width of the access. At sites where traffic volume is high, the entrance must be wide enough for two vehicles to pass safely. The length must be at least 50 feet, and where practical, must be extended to 100 feet. The entrance must be flared where it meets the existing road to provide a turning radius. A standard drawing for a stabilized construction entrance is provided in Figure 3 (see Appendix A), with notes provided in Figure 4 (see Appendix A).

Stormwater and wash water runoff from a stabilized construction entrance must drain to a sediment trap or sediment pond. If conditions on the site are such that the majority of the mud is not removed by the vehicles traveling over the gravel, then the tires of the vehicles must be washed before entering a public road.

Pipe placed under the entrance to handle runoff must be protected with a mountable berm.

**Material Specifications**
Crushed stone must be KYTC aggregate No. 2 (1.5 to 3 inches in diameter), or equivalent.

Geotextile filter fabric must be KYTC Type III.

**Construction Specifications**
Vegetation, roots, and all other obstructions must be cleared in preparation for grading. Prior to placing geotextile (filter fabric), the entrance must be graded and compacted to 80% of standard proctor density.

To reduce maintenance and loss of aggregate, the geotextile must be placed over the existing ground before placing the stone for the entrance. Stone must be placed to depth of 6 inches or greater for the entire width and length of the stabilized construction entrance.

If wash racks are used, they must be installed according to manufacturer’s specifications.

**Maintenance**
The stabilized construction entrance must be inspected once each week and after there has been a high volume of traffic or a storm event greater than 0.2 inches.

The entrance must be maintained in a condition that will prevent tracking or flow of sediments onto public rights-of-way. This may require periodic top dressing with additional stone, as conditions demand, and repair and/or cleanout of any structures used to trap sediment.
All materials spilled, dropped, washed, or tracked from vehicles onto roadways or into storm drains must be removed immediately.

*Dust Control*

Dust control is the reducing of surface and air movement of dust during land disturbing, demolition and other construction activities. The purpose of dust control is to prevent the air movement of sediments to off-site areas or other on-site areas without sediment control where they could subsequently be washed into surface waters. Dust control must be planned in association with earthmoving/site grading activities and areas with frequent construction traffic.

*Design Criteria*

Construction activities must be phased to minimize the total area unstabilized at any given time, thereby reducing erosion due to air and water movement. Plans submitted to LFUCG must illustrate construction phasing and describe dust and erosion control measures to be implemented at each phase.

Construction roads must be watered as needed to minimize dust.

Existing trees, shrubs, and ground cover must be retained as long as possible during the construction. Initial land clearing should be conducted only in those areas to be regraded or where construction is to occur. Areas to be cleared only for new vegetation or landscaping must be stabilized with seed and mulch immediately following clearing.

Vegetative cover is the most effective means of dust and erosion control, when appropriate. See sections on Temporary Seed, Permanent Seed, Mulch, and Sod in this manual.

When areas have been regraded and brought to final grade, they must be stabilized using temporary or permanent seed and mulch or other measures.

Mulch with mulch binders may be used as an interim dust control measure in areas where vegetation may not be appropriate.

*Material Specifications*

See sections on Temporary Seed, Permanent Seed, Sod, Mulch, Construction Road/Parking Stabilization, and Construction Entrance.

*Construction Specifications*

See sections referenced in Material Specifications above.

When construction is active on the site, dust control must be implemented as needed.

When using tillage as a dust control measure, begin plowing on windward side of area. Chisel-type plows spaced about 12 inches apart, spring-toothed harrow, and similar plows are examples of equipment that may produce the desired effect.
**Maintenance**

The site must be observed daily for evidence of windblown dust and reasonable steps must be taken to reduce dust whenever possible. When construction on a site is inactive for a period, the site must be inspected at least weekly for evidence of dust emissions or previously windblown sediments. Dust control measures must be implemented or upgraded if the site inspection shows evidence of wind erosion.

**Nets, Blankets, and Mats**

Mulch netting, erosion control blankets, and turf reinforcement matting (TRM) make up a group of materials that are used to stabilize mulch and soil in order to prevent erosion and aid in the establishment of vegetative cover.

Some of these products are manufactured by weaving or bonding fibers made from synthetic materials such as polypropylene, polyester, polyethylene, nylon, polyvinyl chloride, glass, and various mixtures of these. These materials are intended to be longer lasting or even permanent in certain applications.

Blankets and mats can be formed of biodegradable materials such as jute, coconut, or other wood fibers that have been formed into sheets of mulch that are more stable than loose mulch. Netting is typically made from jute, other wood fiber, plastic, paper, or cotton and can be used to hold the mulching and matting to the ground. Netting can also be used alone to stabilize soils while the plants are growing; however, it does not retain moisture or temperature well.

**Design Criteria**

Erosion control blankets and turf reinforcement mats can be used to stabilize channels and swales and on recently planted slopes to protect seedlings until they become established. Refer to Figure 1 (see Appendix A) for guidance on using matting on slopes.

Effective netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

**Material Specifications**

Nets, blankets, and mats must be suitable for their intended purpose. With the wide variety of materials available, the product used should be determined by the designer according to its application.

**Construction Specifications**

Nets, blankets, and mats must be installed according to the manufacturer’s recommendations. In the event that the manufacturer’s recommendations conflict with any requirement of this manual, the most conservative requirement, in terms of protection of public health and the environment, must govern. See Appendix A for Figures 1, 5, 6, and 7 for details on the placement of nets, blankets, and mats.
**Gabion Mattress**

Gabion mattresses are acceptable when used as water energy dissipating devices placed at the outlets of pipes or paved channel sections. Gabion mattresses are also known as Reno mattresses. The purpose of gabion mattresses is to prevent scour at stormwater outlets and to minimize the potential for downstream erosion by reducing the velocity of concentrated stormwater flows.

**Design Criteria**

Gabion mattresses must be used at the outlets of all pipes, box culverts, stilling basins, and paved ditch sections.

For outlets of 36 inches (width or diameter) or less, the length of the gabion mattress must be 12 feet. For outlets greater than 36 inches, the gabion mattress length must be 4 times the width or height of the outlet, whichever is greater. See Figure 8 in Appendix A.

If the pipe discharges directly into a well-defined channel, the mattress must extend across the channel bottom and up the channel banks to an elevation 1 foot above the maximum tailwater depth or to the top of the bank (whichever is less). See Figure 9 in Appendix A. The side slopes of the channel must not be steeper than 2:1 (Horizontal:Vertical).

If the pipe discharges onto a flat area with no defined channel, the width of the apron must be in accordance with Figures 10 and 11 (see Appendix A).

The mattress must be constructed with no slope along its length (0.0 percent grade). The invert elevation of the downstream end of the mattress must be equal to the invert elevation of the receiving channel. There must be no overfall at the end of the mattress.

Where the outlet structure is supported by a concrete foundation, the first 3 feet of the mattress must extend the depth of the foundation.

For calculated outlet velocities of 5 to 10 feet per second when flowing full, the depth of the gabion mattress must be at least 12 inches.

For calculated outlet velocities of greater than 10 feet per second when flowing full, the depth of the gabion mattress must be at least 18 inches, except when an impact stilling basin is used. In that instance, a minimum depth of 12 inches is required.

When the mattress is placed on grades of 5% or greater, #8 reinforcing bar anchors at 18 inches on centers must be installed.

Gabion mattresses must be secured together in accordance with manufacturer’s recommendations.

The mattress must be located so that there are no bends in the horizontal alignment.
For paved channel outlets, the end of the paved channel must merge smoothly with the gabion mattress in the receiving channel section. There must be no overfall at the end of the paved section.

Where the bottom width of the paved channel is narrower than the bottom width of the receiving channel, a paved transition section must be provided.

**Material Specifications**

The gabion mattress must be manufactured from galvanized wire with a minimum tensile strength of 40,000 psi.

The stone to be used must be quarry run crushed limestone 3-6 inches in size.

Filter fabric placed below the gabion mattress must have the minimum material specifications of the geotextile described in the material specifications for a construction entrance.

**Construction Specifications**

The subgrade for the mattress must be prepared to the required lines and grades. Any fill required in the subgrade must be compacted to a density approximately that of the surrounding undisturbed material. Brush, trees, stumps, and other objectionable material must be removed.

Placement of the mattress and the fill rock must follow immediately after subgrade preparation and be in accordance with methods recommended by the manufacturer.

The anchors must be 3 feet long and driven or pushed into the subgrade. Where rock is encountered, the anchors must be cut off even with the mattress.

Filter fabric must be placed between the mattress and the subgrade.

**Maintenance**

Outlets must be inspected at least weekly during the construction process and after every storm of one-half inch or more. If the mattress is damaged or displaced, it must be repaired immediately.

**Temporary Diversion Ditch**

A temporary diversion ditch is an earth channel with a supporting ridge or berm on the lower side constructed across the slope. See Figure 12 in Appendix A for an illustration. Temporary diversion ditches usually have a life expectancy of one year or less with a low failure hazard. Diversions can be constructed for various purposes including:

- to divert storm runoff away from unprotected slopes to a stabilized outlet
- to divert sediment-laden runoff from a disturbed area to a sediment pond,
- to shorten the flow length within a long, sloping drainage area
**Design Criteria**

Temporary diversion ditches must have stable outlets. The combination of conditions of site, slopes, and soils should be so that the ditch can be maintained throughout its planned life.

Temporary diversion ditches must not be constructed below high sediment-producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversion.

Temporary diversion ditches must be designed for the 10-year, 24-hour storm in accordance with methods given in the next section for permanent constructed channels. Ditches subject to significant erosion should be stabilized with rock, vegetation, blankets, mats, or through other means.

A typical diversion cross section consists of a channel and a supporting ridge. In the case of an excavated-type diversion, the natural ground serves as the diversion ridge. Diversion cross sections must be adapted to the equipment that will be used for their construction and maintenance.

The channel may be parabolic or trapezoidal in shape. V-shaped ditches must not be constructed.

A diversion’s location will be dictated by outlet condition, topography, land use, soil type, and length of slope. Diversions must be located so that water will empty onto an established area such as a stable watercourse, waterway, or structure.

The channel grade for diversions may be uniform or variable. The permissible velocity for the soil type and vegetative cover will determine the maximum grade. The grade should be such as to minimize standing water and wetness problems.

Level diversions with blocked ends may be used when an adequate underground outlet is provided.

Any high sediment-producing area above a diversion should be controlled by good land use management or by structural measures to prevent excessive sediment accumulation in the diversion channel. If movement of sediment into the diversion channel cannot be controlled, one of the following measures should be used:

Design the channel to include extra capacity for the storage of sediment, keep the velocity of flow for the design storm greater than 1.5 feet per second, and provide for clean out of the diversion channel when the sediment storage capacity has been depleted.

Provide a minimum 15-foot wide filter strip of close-growing sod adjacent to the diversion channel and remove excessive accumulations of sediment to maintain a vigorous growth.

Temporary diversions above steep slopes or across graded rights-of-way must have a berm with a minimum top width of 2 feet, side slopes of 2:1 or flatter and a minimum height of 18 inches measured from the channel bottom.

Diversions installed to intercept flow on graded rights-of-way must be spaced 200 to 300 feet apart.
A level lip spreader must be used at diversion outlets discharging onto areas already stabilized by vegetation.

*Construction Specifications*

All dead furrows, ditches or other depressions to be crossed must be filled before construction begins or as part of construction, and the earth fill used to fill the depressions will be compacted using the treads of the construction equipment. All old terraces, fencerows, or other obstructions that will interfere with the successful operation of the diversion must be removed.

The base for the diversion ridge is to be prepared so that a good bond is obtained between the original ground and the fill material. Vegetation is to be removed and the base thoroughly disked prior to placement of fill.

The earth materials used to construct the earth fill portions of the diversions must be obtained from the diversion channel or other approved source.

The earth fill materials used to construct diversions must be compacted by running the construction equipment over the fill in such a manner that the entire surface of the fill will be traversed by not less than one tread track of the equipment.

When an excess of earth material results from cutting the channel cross section and grade, it must be deposited adjacent to the supporting ridge unless otherwise directed.

The completed diversion must conform to the cross section and grade shown on the design.

Temporary or permanent seeding and mulch must be applied to the berm or ditch immediately following its construction. Triple-seed areas below the flow line, and use erosion control blankets or turf reinforcement mats as needed.

*Maintenance*

Bare and vegetated diversion channels must be inspected regularly to check for points of scour or bank failure; rubbish or channel obstruction; rodent holes, breaching, or settling of the ridge; and excessive wear from pedestrian or construction traffic.

Damaged channels or ridges must be repaired at the time damage is detected. Sediment deposits must be removed from diversion channels and adjoining vegetative filter strips regularly.

Diversions must be reseeded and fertilized as needed to establish vegetative cover.

*Level Spreader*

Level spreaders are storm flow outlet devices constructed at zero grade across the slope whereby concentrated runoff may be discharged at non-erosive velocities onto undisturbed areas stabilized by existing vegetation. A level spreader is illustrated in Figure 13 (see Appendix A).
Level spreaders dissipate storm flow energy at the outlet by converting storm runoff into sheet flow and discharging it onto areas stabilized by existing vegetation without causing erosion.

Level spreaders are used at diversion outlets and other locations where sediment free storm runoff is intercepted and diverted from graded areas onto undisturbed stabilized areas. The practice applies only in those situations where the spreader can be constructed on undisturbed soil and where the area directly below the level spreader is stabilized by existing vegetation. The water must not be allowed to reconcentrate below the point of discharge.

**Design Criteria**

The length of the level spreader must be based on the peak flow from the 100-year storm in accordance with the following table.

<table>
<thead>
<tr>
<th>100-year Peak Flow (cfs)</th>
<th>Minimum Length (ft)</th>
</tr>
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<tbody>
<tr>
<td>Up to 10</td>
<td>15</td>
</tr>
<tr>
<td>11 to 20</td>
<td>20</td>
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<tr>
<td>21 to 30</td>
<td>30</td>
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<tr>
<td>31 to 40</td>
<td>40</td>
</tr>
<tr>
<td>41 to 50</td>
<td>50</td>
</tr>
</tbody>
</table>

**Construction Specifications**

The minimum acceptable width must be 6 feet. The depth of the level spreader as measured from the lip must be at least 6 inches and the depth must be uniform across the entire length of the measure.

The grade of the channel for the last 15 feet entering the level spreader must be less than or equal to 1%.

The level lip of the spreader must be constructed on zero percent grade to insure uniform conversion of channel flow to sheet flow.

Level spreaders must be constructed on undisturbed soil.

The entrance to the spreader must be graded in a manner to insure that runoff enters directly onto the zero percent graded channel.

Storm runoff converted to sheet flow must discharge onto undisturbed areas stabilized with vegetation.
All disturbed areas must be stabilized immediately after construction is completed in accordance with the mulching and vegetation requirements of this manual.

**Maintenance**

The level spreader must be inspected after each storm event and at least once each week. Any observed damage must be repaired immediately.

**Pipe Slope Drains**

Pipe slope drains are made of flexible pipe and reduce the risk of erosion on slopes by discharging runoff to stabilized areas. See Figures 14 and 15 in Appendix A. They carry concentrated runoff from the top to the bottom of a slope that has already been damaged by erosion or is at high risk for erosion. They are also used to drain saturated slopes that have the potential for soil slides. Pipe slope drains can be either temporary or permanent depending on the method of installation and material used.

Pipe slope drains must be used whenever it is necessary to convey water down a slope that is steep or otherwise prone to erosion. Pipe slope drains may be used with other devices, including diversion dikes or swales, sediment traps, and level spreaders (used to spread out stormwater runoff uniformly over the surface of the ground).

**Design Criteria**

Use a 10-inch diameter pipe or larger to convey runoff from areas up to one-third acre; 12-inch or larger pipe for up to half-acre drainage areas, and 18-inch pipe for areas up to one acre. Multiple pipes are often required for large areas, spaced as needed.

The pipe slope drain must be designed to handle the peak runoff for the 10-year, 24-hour storm.

**Material Specifications**

The pipe must be heavy duty flexible tubing designed for this purpose, e.g., nonperforated, corrugated plastic pipe, or specially designed flexible tubing.

A standard flared end section or a standard T-section fitting secured with a watertight fitting must be used for the inlet.

Extension collars must be 12-inch long sections of corrugated pipe. All fittings must be watertight.

**Construction Specifications**

The pipe slope drain must be placed on undisturbed or well-compacted soil.

Soil around and under the entrance section must be hand-tamped in 4-inch to 8-inch lifts to the top of the dike to prevent piping failure around the inlet.
Filter cloth must be placed under the inlet and extended 5 feet in front of the inlet and be keyed in 6 inches on all sides to prevent erosion.

Backfilling around and under the pipe with stable soil material hand compacted in lifts of 4 inches to 8 inches must be done to ensure firm contact between the pipe and the soil at all points.

The pipe slope drain must be securely staked to the slope using grommets provided for this purpose at intervals of 10 feet or less.

All slope drain sections must be securely fastened together and have watertight fittings.

The pipe must be extended beyond the toe of the slope and discharged at a non-erosive velocity into a stabilized area (e.g., gabion mattress) or to a sediment trap or pond.

The pipe slope drain must have a minimum slope of 3 percent or steeper.

The height at the centerline of the earth dike must range from a minimum of 1.0 foot over the pipe to twice the diameter of the pipe measured from the invert of the pipe. It must also be at least 6 inches higher than the adjoining ridge on either side. At no point along the dike will the elevation of the top of the dike be less than 6 inches higher than the top of the pipe.

All areas disturbed by installation or removal of the pipe slope drain must be immediately stabilized.

**Maintenance**

The pipe slope drain must be inspected after every rainfall and at least weekly. Any necessary repairs must be made immediately.

Check to see that water is not bypassing the inlet and undercutting the inlet or pipe. If necessary, install headwall or sandbags.

Check for erosion at the outlet point and check the pipe for breaks or clogs. Install additional outlet protection if needed and immediately repair the breaks and clean any clogs.

Do not allow construction traffic to cross the pipe slope drain and do not place any material on it.

If a sediment trap has been provided, it must be cleaned out when the sediment level reaches 1/3 the design volume.

The pipe slope drain must remain in place until the slope has been completely stabilized or up to 30 days after permanent slope stabilization.

**Impact Stilling Basin**

Impact stilling basins are concrete structures placed at the outlets of culverts and storm sewer pipes with calculated exit velocities greater than 15 feet per second. The purpose of an impact stilling basin is to dissipate energy at a high velocity outlet to protect the receiving channel.
Design Criteria

Impact stilling basins must be designed in accordance with LFUCG Division of Engineering Standard Drawings and the Stormwater Manual.

Construction Specifications

Construction specifications for impact stilling basins are provided in the Standard Drawings.

Structural Sediment Control BMPs

Check Dam

A check dam is a small temporary dam constructed across a swale or drainage ditch. The purpose of a check dam is to reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch. This practice also traps small amounts of sediment generated in the ditch itself. However, this is not a sediment-trapping practice and should not be used as such.

Design Criteria

Check dams must be limited to use in small, open channels that drain 10 acres or less.

Check dams must not be used in perennial or intermittent streams.

Check dams are especially applicable where the gradient of waterways is close to the maximum for a grass lining.

Check dams can be constructed of stones, coir logs, or wood fiber logs. See Figures 16 and 17 in Appendix A.

The maximum height of a check dam must be three feet above the ground on which the rock is placed.

The center of the portion of the check dam above the flat portion of the channel must be at least 1 foot lower than the outer edges. The outer edges of the check dam must extend up the side slopes of the channel to a point 3 feet in elevation above the center portion of the check dam or to the top of the side slopes.

The maximum spacing between rock check dams in a ditch should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

The spacing of coir and wood fiber check dams is one log every 100 feet for velocities of 5 fps, 50 feet for velocities between 5 and 7.5 fps, and 25 feet for velocities greater than 10 fps.
**Material Specifications**

Stone check dams must be constructed of KYTC Class II channel lining.

Coir log or wood fiber log check dams must be constructed of a single log with a diameter of at least 20 inches.

**Construction Specifications**

Stone must be placed by hand or mechanically as necessary to achieve complete coverage of the ditch and to ensure that the center of the dam is at least 1 foot lower than the outer edges. Stone must also be placed to extend 3 feet in elevation above the center portion of the check dam or to the top of the channel side slopes.

Coir and wood fiber logs must be laid on the channel bottom.

Check dams must be removed when their useful life has been completed. In temporary ditches and swales, check dams must be removed and the ditch filled in when it is no longer needed. In permanent channels, check dams must be removed when a permanent lining can be installed. In the case of grass-lined ditches, check dams must be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the check dams must be seeded and mulched or sodded (depending upon velocity) immediately after check dams are removed.

If stone check dams are used in grass-lined channels that will be mowed, care must be taken to remove all stone from the channel when the dam is removed. This must include any stone that has washed downstream.

**Maintenance**

Regular inspections must be made to ensure that the measure is in good working order and the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam must be corrected immediately, and the dam must be extended beyond the repaired area.

Check dams must be checked for sediment accumulation after each rainfall. Sediment must be removed when it reaches one-third of the original height or before.

Check dams must remain in place and operational until the drainage area and channel are completely stabilized or up to 30 days after the permanent site stabilization is achieved.

**Sediment Trap**

A sediment trap is formed by an excavation of an area in a suitable location to retain sediment and other waterborne debris. Sediment traps are considered temporary structures.

This standard establishes minimum acceptable criteria for the design and construction of sediment traps formed by excavation. This standard is limited to sites where the drainage area is less than 5 acres.
Sediment traps must be used where physical site conditions or other restrictions prevent other erosion control measures from adequately controlling erosion and sedimentation. Sediment traps may be used down slope from construction operations that expose areas to erosion. Sediment traps must be removed after the exposed areas are adequately protected against erosion by vegetative or mechanical means.

**General Design Criteria**

Erosion control practices such as seeding, mulching, sodding, diversion dikes, etc., must be used in conjunction with sediment traps to reduce the amount of sediment flowing into the trap.

The amount of sediment entering a trap can be reduced by the use of stabilized diversion dikes and ditches. The trap must not be located in a stream. It must be located to trap sediment-laden runoff before it enters the stream.

The minimum capacity of the sediment trap to the elevation of the crest of the spillway must be the runoff volume from the 2-year, 24-hour storm of 3.0 inches.

The trap dimensions necessary to determine the designed sediment volume must be clearly shown on the plans to facilitate plan review, construction, operation, and maintenance. Trap depth must be at least 2 feet at the inlet and 4 feet at the outlet. Effective trap width must be at least 10 feet and trap length must be at least 30 feet. See Figure 18 in Appendix A.

The erosion and sediment control plan must indicate the final disposition of the sediment trap after the upstream drainage area is stabilized. The plans must indicate methods for the removal of excess water lying over the sediment, stabilization of the pond site, and the disposal of any excess material.

**Construction Specifications**

The area to be excavated must be cleared of all trees, stumps, roots, brush boulders, sod, and debris. All channel banks and sharp breaks must be sloped to no steeper than 1:1. All topsoil containing excessive amounts of organic matter must be removed.

Seeding, fertilizing, and mulching of the material taken from the excavation must comply with the applicable soil stabilization sections of this manual.

Any material excavated from the trap must be placed in one of the following ways so that it will not be washed back into the pond by rainfall:

- uniformly spread to a depth not exceeding 3 feet and graded to a continuous slope away from the trap
- uniformly placed or shaped reasonably well with side slopes assuming the natural angle of repose for the excavated material behind a berm width not less than 12 feet
**Maintenance**

Sediment must be removed from the trap when the capacity is reduced to one third of the design volume. Plans for the sediment trap must indicate the methods for disposing of sediment removed from the pond.

**Silt Fence**

Silt fence is a temporary barrier to trap sediment that consists of a filter fabric stretched between supporting posts, with the bottom entrenched in the soil and with a wire support fence. The purpose of a silt fence is to intercept and detain water allowing the settling of small amounts of sediment from disturbed areas during construction operations to prevent sediment from leaving the site and entering streams or sinkholes.

**Design Criteria**

Silt fences are appropriate where the size of the drainage area is no more than one-fourth acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2H:1V). Silt fences can be used at the toe of stockpiles where the slope exceeds 2H:1V, but in that case, the slope length should not exceed 20 feet.

Silt fences can be used in minor swales or ditch lines where the maximum contributing drainage area is no greater than 2 acres.

Under no circumstances must silt fences be constructed in streams or in swales or ditch lines where flows are likely to exceed 1 cubic foot per second (cfs).

Silt fences composed of synthetic fabric have an expected usable life of 6 months.

Wire reinforced silt fence must be used adjacent to greenways, floodplains, tree protection areas, retention ponds, and streams.

**Material Specifications**

Synthetic filter fabric must be a pervious sheet of propylene, nylon, and polyester or ethylene yarn and must be certified by the manufacturer or supplier as conforming to the following requirements:

<table>
<thead>
<tr>
<th>PHYSICAL PROPERTY</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtering Efficiency</td>
<td>80% (minimum)</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>at 20% 50 lbs./linear inch (minimum)</td>
</tr>
<tr>
<td>Flow Rate</td>
<td>0.3 gal./ sq. ft/min. (minimum)</td>
</tr>
</tbody>
</table>

Synthetic filter fabric must contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0°F to 120°F.
Posts for synthetic fabric silt fences must be either 2-inch by 2-inch wood or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts must have projections for fastening wire to them.

Wire fence reinforcement for silt fences must be a minimum of 36 inches in height, a minimum of 14 gauge and must have a mesh spacing of no greater than 6 inches.

**Construction Specifications**

This section provides construction specifications for silt fences using synthetic fabric. See Figure 19 and 20 in Appendix A for an illustration and general notes.

Posts must be spaced a maximum of 6 feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When necessary because of rapid runoff, post spacing must not exceed 6 feet.

A trench must be excavated at least 6 inches wide and 6 inches deep along the line of posts and upslope from the barrier.

Where applicable, a wire mesh support fence must be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires or hog rings. The wire must extend into the trench a minimum of 2 inches and must not extend more than 36 inches above the original ground surface.

The filter fabric must be stapled or wired to the fence, and 12 inches of the fabric must be extended into the trench. The fabric must not extend more than 30 inches above the original ground surface. Filter fabric must not be stapled to existing trees.

At joints, filter fabric should be lapped with terminating posts with a minimum overlap of 3 feet.

The trench must be backfilled and soil compacted over the filter fabric.

Silt fences must be removed when they have served their useful purpose, but not before the upslope area has been permanently stabilized.

**Maintenance**

Silt fences and filter barriers must be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs must be made immediately. Knocked down fences must be repaired at the end of each day.

Should the fabric on a silt fence or filter barrier decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, the fabric must be replaced promptly.

Sediment deposits must be removed after each storm event or when deposits reach approximately one-third the height of the barrier.
Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required must be dressed to conform with the existing grade, prepared, and seeded.

Silt fences must be replaced every 12 months.

**Storm Drain Inlet Protection**

A sediment filter installed around a storm drain drop inlet or curb inlet is referred to as storm drain inlet protection. Its purpose is to prevent sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area. This practice should be used when storm drain inlets are to be operational before permanent stabilization of disturbed areas in the watershed. Curb inlet protection is not required if other soil stabilization and sediment control measures are in place to prevent sediment from entering the street.

**Design Criteria**

The drainage area must be no greater than 1 acre.

The inlet protection device must be constructed in a manner that will facilitate cleanout and disposal of trapped sediment and minimize interference with construction activities.

Inlet protection devices must be constructed in such a manner that any resultant ponding of stormwater will not cause excessive inconvenience or damage to adjacent areas or structures.

**Specifications-Drop Inlet Filters**

For silt fence inlet protection (illustrated in Figures 21 and 22 in Appendix A), the following specifications apply:

- For stakes, use 2 x 4-inch wood (preferred) or equivalent metal with a minimum length of 3 feet.
- Space stakes evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely drive them into the ground, approximately 18 inches deep.
- To provide needed stability to the installation, frame with 2 x 4-inch wood strips around the crest of the overflow area at a maximum of 1.5 feet above the drop inlet crest and brace diagonally.
- Place the bottom 12 inches of the fabric in a trench and backfill the trench with at least 4 inches of crushed stone or 12 inches of compacted soil.
- Fasten fabric securely to the stakes and frame. Joints must be overlapped to the next stake.

For sod drop inlet protection, sod must be placed to form a turf mat covering the soil for a distance of 4 feet from each side of the inlet structure. Soil preparation and sod placement must be in accordance with the section entitled Sodding.

**Specifications-Curb Inlet Filters**

The specifications for curb inlet filters can be found in Figure 22 in Appendix A. Other inlet protection products, such as rock bags, are also acceptable.
**Maintenance**

The structure must be inspected after each rain, and repairs made as needed.

Sediment shall be removed as necessary to ensure the filter functions properly. Removed sediment shall be deposited in a suitable area and in such a manner that it will not erode.

Structures shall be removed after the drainage area has been properly stabilized.

Curb inlet filters shall be replaced every six months.

**Filter Strips**

A filter strip is a strip of vegetation for removing sediment and related pollutants from runoff. Filter strips are also called vegetative filters. This practice uses infiltration, deposition, absorption, and decomposition to reduce pollution in runoff. Filter strips are applicable to land undergoing development where this practice can reduce sediment damage to adjacent property, streams, wetlands, or sinkholes.

**Design Criteria**

Filter strips must only be used to remove sediment from overland flow. Filter strips are not effective in removing sediment from concentrated flows.

Vegetative filters cannot be expected to remove all sediment or adequately protect adjacent areas from sediment damage when used alone. Vegetative filters should only be considered as one component of the erosion and sediment control system.

If vegetative filters are proposed as a sediment control device and they do not already exist, they must be planned and established prior to initiating land disturbing activities.

Minimum filter strip width must be 50 feet for streams, wetlands, and sinkholes. The minimum filter strip width must be ten feet for constructed waterways. See Figure 23 in Appendix A.

Where a post development floodplain or wet weather conveyance is being protected, filter strips must be provided on each side. When a wetland or sinkhole is being protected, filter strips must be provided around the perimeter.

Plans must show the location, width, and length of filter strips. The type of vegetation and specifications for soil preparation and seeding must be included. If existing vegetation is to be used, plans for protecting or improving it must be provided.

**Material Specifications**

Existing grass or grass/legume mixtures used as filter strips must be dense and well established, with no bare spots. When establishing new seeding, consideration must be given to wildlife needs and soil
conditions on the site. The following chart provides a list of alternative grass and grass/legume mixtures:

**SEEDING MIXTURE AND SITE SUITABILITY CHART**

<table>
<thead>
<tr>
<th>Seeding Mixture</th>
<th>Rate Lbs./Acre</th>
<th>Soil Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Alfalfa</td>
<td>10</td>
<td>Well Drained</td>
</tr>
<tr>
<td>or Red Clover</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Plus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timothy</td>
<td>4</td>
<td>Well Drained</td>
</tr>
<tr>
<td>or Orchardgrass</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>or Bromegrass</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2. Landino Clover</td>
<td>1/2</td>
<td>Wet or Well Drained</td>
</tr>
<tr>
<td>Plus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Timothy</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>or Orchardgrass</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>or Bromegrass</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1.) All seeding must be in accordance with the seeding sections of this manual
2.) Well drained sites include sites that are drained with tile as well as naturally well drained and droughty sites. Wet sites include sites that are excessively wet only a portion of the growing season.

**Construction Specifications**

When planting filter strips, prepare seedbed, incorporate fertilizer, and apply mulch consistent with the seeding sections of this manual. Filter strips using areas of existing vegetation must be over seeded, as necessary, with the above mixtures to obtain an equivalent density of vegetation. The over seeding must be accomplished prior to the land disturbing activity.

**Maintenance**

Filter strips must be inspected regularly to ensure that a healthy vegetative growth is maintained. Any bare spots or spots where sediment deposition could lead to the destruction of vegetation must be repaired.

Filter strips must be fertilized once each year in the fall. Irrigation must be used as necessary to maintain the growth of the vegetation in the filter strip.

Sediment must be removed when it becomes visible in the filter.

Construction traffic must not be permitted to drive upon filter strips.
**Temporary Stream Crossing**

A temporary stream crossing is a temporary structural span installed across a flowing water course for use by construction traffic. Structures may include bridges, round pipes, or pipe arches. The purpose of a temporary stream crossing is to provide a means for construction traffic to cross flowing streams without damaging the channel or banks and to keep sediment generated by construction traffic out of the stream.

**Design Criteria**

Temporary stream crossings are applicable to flowing streams with drainage areas less than one square mile. Structures that must handle flow from larger drainage areas must be designed as permanent structures by a professional engineer.

Temporary stream crossings must be planned to be in service for the shortest practical period of time and to be removed as soon as their function is completed.

Such structures are subject to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (404 permits) and the Kentucky Natural Resources and Environmental Protection Cabinet, Division of Water (401 certification).

The span must be designed to withstand the expected loads from heavy construction equipment that will cross the structure.

The structure must be large enough to convey the peak flow expected from a 2-year storm without appreciably altering the stream flow characteristics. The structure may be a span, a culvert, or multiple culverts.

The minimum-sized culvert must be 18 inches.

Where culverts are installed, compacted soil or rock must be used to form the crossing. The depth of soil or rock cover over the culvert must be equal to one-half the diameter of the culvert or 12 inches, whichever is greater. The sides of the fill must be protected from erosion using the mulching and seeding erosion control measures specified in this manual.

The slope of the culvert must be at least 0.25 inches per foot.

**Material Specifications**

When using a culvert crossing, the top of a compacted earth fill must be covered with six inches of KTC No. 57 stone.

No. 57 stone must also be used for the stone pads forming the crossing approaches.
Construction Specifications

Clearing and excavation of the streambed and banks must be kept to a minimum.

The structure must be removed as soon as it is no longer necessary for project construction.

Upon removal of the structure, the stream must immediately be reshaped to its original cross section and properly stabilized.

The approaches to the structure must consist of stone pads with a minimum thickness of 6 inches, a minimum width equal to the width of the structure, and a minimum approach length of 25 feet on each side.

Maintenance

The structure must be inspected after every rainfall and at least once a week and all damages repaired immediately.

Pump-Around Flow Diversion

Pump-around flow diversions must be used to divert flow during excavation operations in streams. Pump-around flow diversions provide dry working conditions during construction in streams. Diverting stream flow around the work area prevents suspension of sediment in stream flow by construction activities. See Figure 24 in Appendix A for an illustration of a pump-around flow diversion.

Design Criteria

Size the diversion pump based on normal stream flow. Dewatering pump should be sized based on the size of the work area, the time allowed for dewatering, and the expected rate of groundwater flow into the excavation.

The check dams to form the diversion must span the banks of the stream. Maintain 1-foot freeboard (minimum) on the upstream and downstream checks.

Check dams may be constructed of sandbags or may be a water-filled bladder such as an Aqua-Barrier.

The dewatering flow from the work area must be treated in a sediment-trapping device prior to discharge to the stream.

Material Specifications

Sandbags must be woven polypropylene bags with approximate dimensions of 18-1/2 inches by 28 inches. Tie the ends of filled bags closed using either draw strings or wire ties.
**Construction Procedures and Specifications**

Schedule operations such that diversion installation, in-stream excavation, in-stream construction, stream restoration, and diversion removal are completed as quickly as possible. Do not construct in a stream when rainfall is expected during the time excavation will be occurring in the stream.

Install check dams across the stream during low flow conditions.

Pump stream flow around the check dams. Install outlet protection as required at the discharge.

Dewater the work area and pump into a sediment trapping device.

Complete construction activities across the stream.

Restore the streambed and banks.

Remove sandbags and shut down pumping operation. (Salvage sandbags for future use if multiple stream crossings are required on the project.) Remove all sandbags from the stream, including damaged and empty bags.

Pumps must be manned around-the-clock when the pump-around diversion is in the stream.

**Maintenance**

This control provides short-term diversion of stream flow (typically 1 day to 3 days). Additional sandbags or pumps may be required to maintain 1-foot freeboard on the sandbag checks if flow conditions change.

Add sandbags as required to seal leaks in checks.

**Construction Dewatering**

Dewatering is the pumping of stormwater or groundwater from excavation pits or trenches. The sediment-laden water must be pumped to a dewatering structure before it is discharged offsite. The purpose of a dewatering structure is to remove sediment from the water before it is discharged.

**Design Criteria**

There are several types of dewatering structures that may be used. A well-stabilized vegetated area may serve as a filtering structure if it can withstand the velocity of the discharged water. The minimum filter length must be at least 75 feet.

Other methods that may be used include a sediment trap/basin, portable sediment tank, a straw bale/silt fence pit, or a commercial sediment filter bag. The structure must be sized to allow pumped water to flow through the structure without overtopping.
**Construction Specifications**

See the specifications in this manual for sediment traps and basins. The manufacturer’s recommendations should be followed for commercial products.

**Maintenance**

The dewatering structure should be inspected frequently to ensure it is functioning properly and not overtopping. Accumulated sediment should be spread out on site and stabilized, or disposed of offsite.

**Concrete Washout Pits**

Concrete washout facilities must be used to minimize the discharge of pollutants into streams, groundwater, and storm sewers. All concrete waste and washout material must be captured and contained in an approved prefabricated or constructed washout facility. The location of washout pits must be shown on the Stormwater Pollution Prevention Plan and the Erosion and Sediment Control Plan.

**Design Criteria**

Washout facilities must be leakproof, and sized to fully contain wash water and concrete waste. Where used, plastic liners must be at least 10 mils thick (one-hundredth of an inch, or about three sheets of paper). Design volume shall be sufficient to contain the washwater generated at the site. Additional washouts must be added as necessary.

**Construction Specifications**

Prefabricated washouts may be used as long as they meet the volume and other requirements above. Nonprefabricated washout facilities can be constructed of straw bales, wood, or earthen pits/berms with plastic liner(s) totaling at least 10 mils thickness. Where multiple liners are used to meet the 10 mil thickness requirement, all seams within the basin must be folded and joined with an appropriate sealer. Non-inflatable plastic pools meeting the 10 mil thickness and volume requirements (e.g., 8 feet diameter x 1.5 feet deep) may be used for short term applications where centralized washouts are not appropriate. Washout facilities must be sited outside of the right-of-way in a location convenient to the pour site, at least 25 feet from storm drains and 50 feet from water bodies. Each washout in unpaved areas must have a minimum 6 inches thick, 15 feet wide #2 stone construction entrance leading up to each washout facility. Manufactured signage must be installed and maintained throughout the construction site directing concrete truck drivers to the location of the washout area(s).

**Maintenance**

Washout facilities and signage shall be maintained in good working order while in use. No discharges will be made to them 1) if they are compromised structurally; 2) if they are leaking; or 3) when less than 10 percent of the total containment depth remains (e.g., no discharges after a 30-inch deep structure is filled to within 3 inches of the top). Leaks and overflows must be cleaned up within 3 calendar days.
Concrete trucks that are leaking waste, oil, or water must not be operated on paved public roads. Washouts may be broken up and disposed of after all liquids have evaporated or solidified. Washouts that are no longer functional or have reached full capacity must be removed and properly disposed of within 14 calendar days of termination of use. All washouts must be removed prior to job completion and closeout.

**Self-Inspection**

All construction sites must be inspected once per week and after rainfall events equal to or greater than 0.50”. The purpose of such inspections will be to determine the overall effectiveness of the erosion control plan and the need for maintenance and/or additional control measures. Records shall be maintained of each inspection that include:

- The date of the inspection
- The name of the inspector
- The findings from the inspection
- Any actions taken as a result of the inspection

See Appendix B for the inspection form. Completed inspection reports shall be kept on site during construction and retained for 180 days following termination of the permit after project completion and shall be available for inspection consistent with LFUCG ordinances.
APPENDIX A

Construction Detail Drawings
Figure 1

SLOPE PROTECTION GUIDANCE

(October 1, 2016)
Figure 2
ROAD/PARKING STABILIZATION
(OCTOBER 1, 2016)

CROSS SECTION

PLAN VIEW

W = 14' MIN. FOR ONE WAY TRAFFIC
   20' MIN. FOR TWO WAY TRAFFIC
Figure 3
CONSTRUCTION ENTRANCE
(October 1, 2016)
## SPECIFICATIONS FOR GEOTEXTILE FABRIC

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirement</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grab Tensile Strength</td>
<td>220 LBS. (MIN.)</td>
<td>ASTM D1682</td>
</tr>
<tr>
<td>Elongation Failure</td>
<td>80% (MIN.)</td>
<td>ASTM D1682</td>
</tr>
<tr>
<td>Mullen Burst Strength</td>
<td>430 LBS. (MIN.)</td>
<td>ASTM D3768</td>
</tr>
<tr>
<td>Puncture Strength</td>
<td>125 LBS. (MIN.)</td>
<td>ASTM D751</td>
</tr>
<tr>
<td>Equivalent Opening</td>
<td>Size 40–80</td>
<td>US Std. Sieve</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CW-02215</td>
</tr>
</tbody>
</table>

### NOTES

1. A STABILIZED ENTRANCE PAD OF CRUSHED STONE SHALL BE LOCATED WHERE TRAFFIC WILL ENTER OR LEAVE THE CONSTRUCTION SITE ONTO A PUBLIC STREET.

2. SOIL STABILIZATION FABRIC SHALL BE USED AS A BASE FOR THE CONSTRUCTION ENTRANCE.

3. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC STREETS OR EXISTING PAVEMENT. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS WARRANT AND REPAIR OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.

4. ANY SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PUBLIC STREETS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.

5. WHEN APPROPRIATE, WHEELS MUST BE CLEARED TO REMOVE SEDIMENT PRIOR TO ENTERING A PUBLIC STREET. WHEN WASHING IS REQUIRED, IT SHALL BE DONE IN AN AREA STABILIZED WITH CRUSHED STONE WHICH DRAINS INTO AN APPROVED SEDIMENT BASIN.
SLOPES UP TO 1.5H:1V

- INSTALL BLANKET VERTICALLY OR HORIZONTALLY
- USE 12" STEEL SPACING ON STARTER ROW.

COHESIVE SOILS:

- NO OVERLAP REQUIRED ON SIDE SEAMS
- USE 6" STAPLE LENGTH

NON-COHESIVE SOILS:

- USE 6" SIDE SEAM OVERLAP
- USE 8" STAPLE LENGTH
- USE 6" ANCHOR TRENCH AT TOP OF SLOPE

1.5-2.0 STAPLES/SQ YD

CHANNELS IN COHESIVE SOILS

- USE 6" SIDE SEAM OVERLAP
- USE 6" STAPLE LENGTH
- USE 6" TRANSVERSE ANCHOR TRENCH AT 100-FT. INTERVALS

- USE 12" STEEL SPACING ON STARTER ROW
- UPSTREAM BLANKET SHOULD OVERLAP DOWNSTREAM BLANKET A DISTANCE OF 12" IN A "SHINGLE" FASHION AND BURY THE FINISHED TOE AT LEAST 6".

2.5-3.0 STAPLES/SQ YD

CHANNELS IN NON-COHESIVE SOILS

- USE 6" SIDE SEAM OVERLAP
- USE 8" STAPLE LENGTH
- USE 6" TRANSVERSE ANCHOR TRENCH AT 50-FT. INTERVALS

- USE 12" STEEL SPACING ON STARTER ROW
- UPSTREAM BLANKET SHOULD OVERLAP DOWNSTREAM BLANKET A DISTANCE OF 12" IN A "SHINGLE" FASHION AND BURY THE Finished TOE AT LEAST 6".

3.5-4.0 STAPLES/SQ YD
Figure 6
PLACEMENT OF TRM IN CHANNEL

(OCTOBER 1, 2016)

DIRECTION OF FLOW WATER

UPSTREAM AND DOWNSTREAM ANCHOR SLOTS
BURY TRM TO 12" DEPTH TO PREVENT "UNDER FLOW" AT UPPER END AND "WATERFALL" EFFECT AT LOWER END.
See Figure 11–7

SIDE SLOPE SHELF
TRM STAKED AT 3–5' INTERVALS ON 4" SHELF. BACK FILL AND TAMPER TO PREVENT UNDER WASHING. WATER RUN-OFF ENTERS ONTO TRM LINING — NOT UNDER IT.

CHECK SLOT
6"–12" DEEP TRANSVERSE TRENCH AT 25' INTERVALS. STAKE AT OVERLAP AND AT CENTER OF EACH MAT STRIP.

OVERLAP IN A SHINGLED FASHION
4" OVERLAP STAKED AT 3–5' INTERVALS

WHEN ROLL TERMINATES, IT IS STAKED OVER THE ROLL WHICH EXTENDS DOWNSTREAM IN A SHINGLED FASHION WITH A 36" OVERLAP.

CHECK SLOT DETAIL
STAKE AND BACK FILL IN CHECK SLOT BEFORE CONTINUING TO PLACE UPSLOPE


**Figure 8**

**CROSS SECTION AT GABION MATTRESS OUTLET PROTECTION**

(OCTOBER 1, 2016)

---

**OUTLET STRUCTURE**

**OUTLET PIPE**

**GABION MATTRESSES**

\[ T_1 = \text{THICKNESS OF FIRST 3 FEET OF GABION MATTRESS TO MATCH DEPTH OF OUTLET STRUCTURE FOUNDATION} \]

\[ T_2 = \text{THICKNESS OF REMAINING GABION MATTRESS, 12 INCHES MINIMUM AND 18 INCHES MINIMUM FOR CALCULATED OUTLET VELOCITIES OF 10 TO 15 FEET PER SECOND.} \]

For \( d < 36 \) INCHES, \( L = 12 \) FEET

For \( d > 36 \) INCHES, \( L = 4 \times d \) FEET

\( d = \text{HEIGHT OR WIDTH OF OUTLET, WHICHEVER IS GREATER} \).
Figure 9

GABION MATTRESS AT OUTLET INTO WELL-DEFINED CHANNEL

(OCTOBER 1, 2016)

EXTEND GABION MATTRESS UP SIDE SLOPE OF CHANNEL TO TOP OF BANK OR 1' HIGHER THAN MAXIMUM TAILWATER DEPTH, WHICHEVER IS LESS

SIDE SLOPE SHALL NOT EXCEED 2H:1V
Figure 10

PLAN VIEW OF GABION MATTRESS AT OUTLET INTO FLAT AREA

(OCTOBER 1, 2016)

D = HEIGHT OR WIDTH OF OUTLET, WHICHEVER IS GREATER

FOR D ≤ 36 INCHES:

L = 12 FEET MINIMUM

W = (18 + D) FEET MINIMUM

FOR D > 36 INCHES:

L = 4 × D FEET MINIMUM

W = (2L + D) FEET MINIMUM
Figure 11
EXAMPLE PLAN VIEW LAYOUTS OF GABION MATTRESS FOR OUTLET ONTO FLAT AREAS

(October 1, 2016)
Figure 12
TEMPORARY DIVERSION DITCH

(October 1, 2016)

FILL SLOPE

2' MIN.

COMPACTED BERM
2' MIN. TOP WIDTH

MAX. SIDE SLOPE OF 2:1

WIDTH AND DEPTH TO BE DETERMINED BY ENGINEER (18' MIN.)

NATURAL GROUND
Figure 13
LEVEL SPREADER

STABLE UNDISTURBED OUTLET AREA (MAXIMUM SLOPE = 10%)

PERSPECTIVE

LEVEL LIP OF SPREADER
WATER LEVEL

6" MINIMUM DEPTH

SECTION A-A
Figure 14
FLEXIBLE PIPE SLOPE DRAIN
(October 1, 2016)
Figure 16
ROCK CHECK DAM

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

LONGITUDINAL SECTION SHOWING SPACING BETWEEN CHECK DAMS

SECTION ACROSS CHANNEL
Figure 17

FIBER LOG CHECK DAM

(October 1, 2016)

SECTION ACROSS CHANNEL

20" DIA. FIBER LOG OF COIR OR WOOD FIBER

42" LONG DEAD STOUT STAKES DRIVEN AT LEAST 18" INTO GROUND OR STEEL REBAR DRIVEN AT LEAST 12"

STAKES SHALL BE SPACED NO FURTHER THAN 24" AND SHALL BE DRIVEN AT EACH SIGNIFICANT SLOPE BREAK AND WITHIN 6" OF EACH END.

LONGITUDINAL SECTION

L = DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION
Figure 18
SEDIMENT TRAP

10' MIN.

40' MIN.

DITCH

PLAN VIEW

4' MIN.

2' MIN.

DITCH INVERT

SECTION A-A

NOTES:

1) THE SIZE, SHAPE AND LOCATION OF TRAP MAY BE ADJUSTED FROM THAT SHOWN IN THE CONSTRUCTION PLANS, AS DIRECTED BY THE ENGINEER.

2) THE SEDIMENT TRAP MAY BE CONSTRUCTED AS DIRECTED BY THE ENGINEER AS LONG AS THE AREA AND DEPTH IS AT LEAST AS THAT INDICATED ON THE PLANS.

3) SEDIMENT TRAP SHALL BE CONSTRUCTED BY EXCAVATING THE BASIN IN NATURAL OR EXCAVATED CHANNELS. SEDIMENT DEPOSITS IN TRAP SHALL BE REMOVED EACH TIME THE TRAP IS APPROXIMATELY 50 PERCENT FILLED. WHEN THEIR USEFULNESS HAS ENDED, THE TRAPS SHALL BE REMOVED, SURPLUS MATERIAL DISPOSED OF AND THE ENTIRE DISTURBED AREA SHALL BE SEEDED AND PROTECTED, OR SODDED, AS DIRECTED. SEDIMENT TRAPS MAY REMAIN IN PLACE UPON COMPLETION OF THE PROJECT ONLY WHEN PERMITTED BY THE ENGINEER OR THE PLANS.
Figure 19
TEMPORARY SILT FENCE

STORMWATER MANUAL

(October 1, 2016)
GENERAL NOTES

1. FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL AND CUT TO THE LENGTH OF THE BARRIER. WHEN JOINTS CANNOT BE AVOIDED, FILTER FABRIC SHALL BE SPICED TOGETHER ONLY AT A POST WITH 3 FOOT MIN. OVERLAP, AND SECURELY SEALED.

2. POSTS SHALL BE SPACED AT 6 FOOT INTERVALS IN AREAS OF RAPID RUNOFF.

3. POSTS SHALL BE AT LEAST 5 FEET IN LENGTH.

4. STEEL POSTS SHALL HAVE PROJECTIONS FOR FASTENING WIRE AND FABRIC.

5. WOOD POSTS SHALL BE 2 INCHES BY 2 INCHES OR EQUIVALENT. STEEL POSTS SHALL BE 1.33 LBS PER LINEAR FOOT.

6. A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH IN LENGTH, WIRE TIES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2 INCHES AND SHALL NOT EXTEND MORE THAN 36 INCHES ABOVE THE ORIGINAL GROUND SURFACE.

7. WASHED STONE SHALL BE USED TO BURY SKIRT WHEN SILT FENCE IS USED ADJACENT TO A CHANNEL, CREEK, OR POND.

8. TURN SILT FENCE UP SLOPE AT ENDS.
Figure 21
DROP INLET PROTECTION USING SILT FENCE
(October 1, 2016)

ISOMETRIC VIEW OF 2X4 WOOD FRAME

CROSS SECTION VIEW
CATCH BASIN INLET PROTECTION DETAIL

FOUR 6" PVC SLEEVES, 4" LONG TO PREVENT PERF. PIPE FROM FALLING INTO BASIN. BASINS IN SAGS SHALL HAVE 8" PVC SLEEVES.

FLOWLINE OF GUTTER

CATCH BASIN

EXTEND 18" PAST OPENING

SIDE VIEW

6" PVC SLEEVE

4" PERFORATED PIPE W/ CLOTH SLEEVE

#57 STONE

CATCH BASIN

4" PERFORATED PVC W/ CLOTH SLEEVE AND FILLED WITH #57 STONE
Figure 24
PUMP-AROUND FLOW DIVERSION

(October 1, 2016)

Plan

Section A-A

Section B-B
APPENDIX B

Erosion and Sediment Control Inspection Form
# Soil Erosion and Sediment Control Inspection Report

**Project Name or Address:**

**Grading/Building Permit #:**

**Type of Operator (Check one):**
- Contractor
- Developer
- Builder
- Name:

**Inspection Date:**

**Time:**

**Inspected by (Initials):**

## Compliance Level

<table>
<thead>
<tr>
<th>Compliance Level</th>
<th>Reason for Inspection (Check one):</th>
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<tbody>
<tr>
<td>Compliant</td>
<td>Initial ESC Targeted</td>
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<tr>
<td>Non-Compliant</td>
<td>2nd Targeted</td>
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<tr>
<td>N/A</td>
<td>Verbal Follow-up</td>
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<td></td>
<td>NOV Follow-up</td>
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<tr>
<td></td>
<td>Complaint</td>
</tr>
<tr>
<td></td>
<td>Other:</td>
</tr>
</tbody>
</table>

1. Engineer’s Erosion and Sediment Control Plan is on site and is being followed
2. Written, signed weekly inspection reports by permittee are on site
3. Environmentally Sensitive Areas are marked with orange fence, undisturbed and protected from sediment
4. Floodplain is free of grading, stockpiling and activity except as shown on ESC Plan
5. 25 Foot Buffer strip along streams, sinkholes, and wetlands is marked and is free of construction activity
6. Maximum area exposed without mulch is 25 acres
7. Disturbed areas inactive for 14 days are stabilized with appropriate materials
8. Construction entrance and parking areas (where provided) are properly sized and stabilized with No. 2 stone
9. Diversion channels are installed and stabilized
10. Silt fence is installed, properly trenched in, and maintained down slope of bare areas
11. Sediment ponds are installed and maintained
12. Sediment traps are installed below areas that do not drain into sediment ponds
13. Stormwater pipe inlets and curb/drop inlets and outlets are properly protected
14. Check dams are installed and maintained
15. Impact settling basins are installed and properly stabilized
16. Soil stockpiles are mulched or seeded and protected with perimeter silt fence
17. Erosion control blanket or turf mat is installed and maintained
18. Channels/ditches are stabilized immediately with sod (or seed with blanket/mat)
19. Stream crossings are installed with rock driveaway, mulched slopes, and maintained
20. Dewatering discharge is filtered/infiltrated with no muddy discharge to streams/inlets
21. Pump around flow diversions are in operation
22. Soil and mud is being kept off streets
23. Soil and mud is being kept out of ditches, streams, and other waters
24. Trash, debris, fuel, and other materials are properly stored/maintained
25. Concrete washout site is installed and properly maintained
26. Dust Controls are properly implemented and maintained

## Comments:

- Verbal Warning Issued (Date:_______)
- NOV Issued (Date:_______) 

Signature: