

## SECTION 01 57 13

### EROSION AND SEDIMENT CONTROL GENERAL

#### 1.01 RELATED DOCUMENTS.

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and all Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. Work under this section shall include all labor, materials and equipment necessary to meet all applicable requirements and as specified in the contract.
- B. Section Includes:
  - 1. Installation and maintenance of both temporary and permanent soil erosion and sediment control measures
  - 2. Slope protection and stabilization practices.
  - 3. Implementation of the Stormwater Pollution Prevention Plan (SWPPP) to protect surface water quality.
- C. Related Sections:
  - 1. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
  - 2. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
  - 3. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

#### 1.03 UNIT PRICES

- A. Work in this Section is affected by unit prices for erosion and sediment control specified in Division 01 Section "Unit Prices."

#### 1.04 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
- B. Baffles: Porous barriers installed inside a temporary sediment trap, rock dam sediment trap, sediment basin, or skimmer sediment basin used to reduce velocity (turbulent flow) of the water flowing through the measure and facilitate the settling of sediment from the water before discharge.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill
- D. Check Dam: A small temporary stone dam constructed across a drainage way (such as a temporary diversion ditch) used to reduce erosion in the channel and trap sediment behind the dam.
- E. Construction Sequence: Schedule of work sequenced to control the timing of land disturbing activities and installation of erosion and sediment control measures.
- F. Excavation: Removal of material encountered above subgrade elevations and to the limits and dimensions indicated.
- G. Fill: Soil materials used to raise existing grades.
- H. Inlet Protection: A temporary measure used to prevent sediment from entering inlets and conduit systems during construction. Inlet protection allows protected early use of storm drainage system and provides sediment storage around inlets.
- I. Land Grading: Re-shaping the ground surface to designed proposed grades to accommodate development.
- J. Landscape Planting: Stabilizing disturbed areas by establishing vegetative cover with trees, shrubs, vines and/or ground cover.
- K. Level Spreader: A non-erosive outlet for concentrated runoff constructed to disperse flow uniformly over a long slope.
- L. Mulching: Application of a protective blanket of straw, wood chips, shredded bark, gravel or synthetic material to bare soil surface.

- M. Outlet Stabilization Structure (Riprap Apron): A structure designed to dissipate energy, reduce velocity and control erosion at the outlet of a pipe or channel.
- N. Permanent Seeding: Establishment of permanent perennial vegetative cover with seed to control runoff and minimize erosion.
- O. Rolled Erosion Control Products (RECP): Rolled erosion control products are manufactured or fabricated into rolls designed to reduce soil erosion and assist with the growth and establishment of vegetation. Products include mulch control netting, open weave textiles, erosion control blankets, and three dimensional turf reinforcement mats.
- P. Sediment (Silt) Fence: A temporary sediment control measure consisting of fabric buried at the bottom, stretched and supported by (sometimes wire and) posts. Measure retains sediment laden flow from small disturbed areas and allows sediment deposition.
- Q. Sediment Control Structure: A temporary (or permanent only when used in conjunction with a permanent detention or retention basin) structure used to detain sediment laden water, diminish turbulent flow, and allow sediment to settle. Retains sediment on construction site to prevent sedimentation in receiving waters.
- R. Skimmer (Skimmer Sediment Basin): An earthen embankment with a trapezoidal spillway lined with impermeable geotextile or laminated plastic membrane and equipped with a floating skimmer for dewatering. Skimmer basins are designed to provide an area for runoff to pool and settle
- S. Sodding: Establishing permanent cover by laying a continuous layer of grass sod.
- T. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- U. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk
- V. Surface Roughening: Roughening the soil surface on a slope with horizontal grooves cross-slope, stair stepping or tracking with construction equipment.
- W. Temporary Diversions: A temporary ridge or excavated channel, or both, constructed across sloping land on a pre-determined grade. Temporary Diversions must extend to sediment control structures.
- X. Temporary Gravel Construction Entrance/Exit: A graveled pad located at points where vehicles and equipment leave the construction site.
- Y. Temporary Seeding: Planting rapid-growing annual grasses, small grains, or legumes to provide initial, temporary cover for erosion control on disturbed areas.
- Z. Temporary Slope Drain: Flexible pipe extending from the top to the bottom of a cut or fill slope used to transport sediment laden water from a temporary diversion into a sediment control structure.
- AA. Temporary Sediment Trap: A small, temporary ponding basin, without a pipe outlet structure, formed by an embankment or excavation to capture sediment. Structure detains sediment laden runoff, reduces turbulent flow and allows sediment to drop out to protect receiving waters.
- BB. Temporary Sediment Basin: A larger temporary or part of a permanent system, including a controlled outlet structure, used to detain sediment laden water, diminish turbulent flow, and allow sediment to settle. Retains sediment on construction site to prevent sedimentation in receiving waters.
- CC. Top-soiling: Preserving and using topsoil to enhance final site stabilization with vegetation.
- DD. Tree Preservation: Practices used to preserve and protect trees from damage during construction.
- EE. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings

#### **1.05 SUBMITTALS**

- A. Qualification Data: For third party 'Qualified Inspector (Professional)' if not provided by the Owner.
- B. Off-site Soil Qualification: For each borrow or waste site for soil material proposed for fill and/or waste that is not permitted under the Project site NPDES coverage:
  1. Copy of the site's NPDES Notice of Coverage (or similar coverage/approval document)

2. Copy of the erosion and sediment control plan including best management practices and stabilization schedules to be used to include the site under the current NPDES Permit coverage.

#### **1.06 QUALITY ASSURANCE**

- A. Intent: The main concern associated with erosion and sedimentation on the site is movement of sediment to off-site and off-site receiving waters and its affect on water quality. The Owner's intent is that the Contractor install, inspect, maintain and modify sufficient erosion and sediment control practices to retain sediment within the boundaries of the site in addition to complying with all regulatory codes, laws, rules, and ordinances. All erosion and sediment control measures shall conform to the drawings and to the latest requirements imposed by federal, state and local authorities. The Contractor is responsible for any repair and damages and shall be financially responsible for any penalties imposed.
- B. Drawing Review: It is the Contractor's responsibility to review the erosion and sediment control drawings and the Storm Water Pollution Prevention Plan (SWPPP) prepared by the engineer prior to implementation. All measures shall be implemented in accordance with this specification, contract drawings and documents and all regulatory authorities having jurisdiction. Where conflicting requirements arise the more restrictive rules shall govern.
- C. Contractor Responsibility: Contractor is to provide all temporary and permanent non-structural and structural measures shown on the drawings, and as directed by the Owner or NPDES authority for the duration of the work. SWPPP and Erosion and Sediment Control drawings are guidelines, additional measures not specified may be necessary and shall be implemented to address conditions that may develop during the construction process. Additional measures needed but not specified in the SWPPP or on the drawings shall be at no additional cost to the Owner.
- D. Coordination: Temporary structural measures shall be coordinated with permanent measures to the extent practical to assure economical, effective and continuous erosion and sediment control throughout construction and a seamless transition between temporary and permanent post construction operation.
- E. Contractor Inspections: Contractor shall inspect all erosion and sediment control measures at least at the beginning and at the end of each day to ascertain all devices are functioning properly during construction. Contractor shall fully and completely inspect the entire site once every seven (7) calendar days and within 24 hours of 0.5 inches (12 mm) of rain or more per 24 hour period, or more often if required by the governing Construction General Permit; these inspection findings must be reported on Form C-1. Any measures found to be unsatisfactory during that inspection shall be corrected within 48 hours of the inspection. The Owner may suspend the performance of any or all other construction work until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for additional compensation nor for an extension of time to complete the work. Any Notices of Violations (NOV), fines or other corrective actions requested by authorities having jurisdiction or by the Owner shall be the sole responsibility of the Contractor.
- F. Contractor Response to Notice of Violation: Should the Contractor receive an inspection report or Notice of Violation from the regulatory authority (NPDES authority, Natural Resources Conservation Service, or other county or city authority) the report or notice shall immediately be forwarded to the Owner's representative. The Contractor shall **not** respond to an inspection or Notice of Violation without first gaining approval for the response from the Owner.
- G. Protect Adjacent Properties: Contractor is to protect adjacent properties, watercourses, threatened, endangered and protected species and critical habitats, any identified cultural, archeological or historic resources, and receiving water resources from erosion and sediment damage throughout the time of construction.
- H. SWPPP Pre-construction Meeting: Prior to beginning work, a pre-construction SWPPP meeting shall be held by the Owner and the site engineer. The General Contractor and its site work subcontractor must be present at this meeting.

#### **1.07 PROJECT CONDITIONS**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
1. Do not proceed with work on adjoining property until directed by Owner.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- D. Do not commence earth moving operations until all Phase I temporary sediment control measures are in place.
- E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.
- F. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Foot traffic.
  4. Erection of sheds or structures.
  5. Impoundment of water.
  6. Excavation or other digging unless otherwise indicated.
  7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

## **PART 2 - PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Riprap: ASTM D 4992-94 evaluation; ASTM D 6092-97e1 standard practice for size specification.
- C. Sand: ASTM C 33; fine aggregate.

### **2.02 GEOTEXTILES**

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 157 lbf (700 N); ASTM D 4632.
  3. Sewn Seam Strength: 142 lbf (630 N); ASTM D 4632.
  4. Tear Strength: 56 lbf (250 N); ASTM D 4533.
  5. Puncture Strength: 56 lbf (250 N); ASTM D 4833.
  6. Apparent Opening Size: No. 70 (0.212-mm) sieve, maximum; ASTM D 4751.
  7. Permittivity: 0.1 per second, minimum; ASTM D 4491.
  8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
  1. Survivability: Class 2; AASHTO M 288.
  2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
  3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
  4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
  5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
  6. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D 4751.
  7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
  8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

- C. Sediment Fence: Fabric with slit tape yarns in one direction (warp or fill) only. Fabric must have strong rot-proof synthetic fibers formed into either a woven or non-woven fabric.
1. Fabric may be manufactured with pockets for posts, hems with cord, or with posts pre-attached using staples or button head nails.
  2. Fabric to have manufacturer's mark, either with an approved color mark yarn in the fabric or the manufacturer's name and product trade name labeled on the fabric at a minimum of 100 ft (30 m) intervals.
  3. Fabric has no treatment or coating that might significantly alter its physical properties after installation.
  4. Contains stabilizers and/or inhibitors to make the filaments resistant to deterioration from sun or heat exposure.
  5. Makes a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain relative position with respect to each other under normal handling, installation, and service conditions.
  6. Has finished fabric edges to prevent the outer yarn from pulling away from the fabric.
  7. Have no defects or flaws that would significantly affect physical and/or functional properties.
  8. Has the following physical and dimensional requirements and properties:
    - a. Minimum tensile strength in pounds (Newtons): Warp 260 (1155), Fill 180 (800) ASTM D 4632.
    - b. Elongation: 40%, ASTM D4632
    - c. Apparent opening size (max. sieve size): No. 30 (600 um), ASTM D 4751
    - d. Flow rate in gallons per minute per square foot (L/min./m<sup>2</sup>): 70 (2850)
    - e. Ultraviolet stability (percent of required initial minimum tensile strength): 80% ASTM D4632 and ASTM D4355
    - f. Permittivity: 0.1 per second, minimum; ASTM D 4491.
    - g. Bursting strength, psi (kPa): 175 (1200), ASTM D 3786
    - h. Minimum fabric width: 36" (900 mm)
- D. RECP: Rolled Erosion Control Products, woven geo-textile fabric, manufactured for the establishment of vegetation for erosion control including:
1. Mulch Control Netting: Planar woven natural fiber or extruded geo-synthetic mesh used as a temporary degradable RECP to anchor loose fiber mulches. Maximum gradient for slope applications 5:1 ASTM D6459, maximum permissible shear stress channel applications is 0.25 lbs per square foot ASTM D6460, minimum tensile strength 5 lbs/ft ASTM D5035.
  2. Open Weave Textile: Temporary degradable RECP composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment. Maximum gradient for slope applications 3:1 ASTM D6459, maximum permissible shear stress channel applications is 1.50 lbs per square foot ASTM D6459, minimum tensile strength 50 lbs/ft ASTM D5035.
  3. Erosion Control Blanket: Temporary degradable RECP composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment. Maximum gradient for slope applications 2:1 ASTM D6459, maximum permissible shear stress channel applications is 1.75 lbs per square foot ASTM D6460, minimum tensile strength 75 lbs/ft ASTM D5035.
  4. Turf Reinforcement Mat: Long-term non-degradable RECP composed of UV stabilized, non-degradable, synthetic fibers, filaments, nettings, and/or wire mesh processed into three dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature, natural vegetation. TRM provide sufficient thickness, strength and void space to permit soil filling and/or retention and the development of vegetation within the matrix. Maximum gradient for slope applications 1:1 ASTM D6459, maximum permissible shear stress channel applications is 8.0 lbs per square foot ASTM D6460, minimum tensile strength 150 lbs/ft ASTM D5035, minimum thickness 0.25 inches (6.35 mm) ASTM D6525.

## 2.03 SEDIMENT FABRIC FENCING

- A. Woven wire fabric fencing to be used with sediment fabric:
1. Ensure wire fence fabric is at least 32 inches (810 mm) high with at least 6 horizontal wires.

2. Ensure the vertical wires have maximum spacing of 6 inches (78 mm)
  3. Ensure the top and bottom wires are at least 10 gauge (2.49 mm) and all other wires are at least 14 gauge (3.48 mm).
- B. Posts: Use post sizes and types as determined by the type of fence being installed. Hardwood posts are limited to ash, hickory, or oak, or other approved hardwood or softwood.
1. Wood Posts: At least 2" (50 mm) in diameter or 2" x 2" (50 x 50 mm) 5 feet (1.5 m) long, and straight enough to provide a fence without a noticeable misalignment. Wood shall be commercial quality lumber of size and shape indicated. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
  2. Steel posts to be "U", "T", or "C" shaped with a minimum weight of 1.15 pounds per foot (1.7 kg/m), 5 feet (1.5m) long, and have projections for fastening the fence to the posts.
  3. Fasteners for Wood Posts: Wire staples that are at least 17 gauge (1.37 mm), legs at least ½ inch (13 mm) long, and a crown of at least ¾ inch (19 mm) wide.
  4. Nails for Wood Posts: Use nails that are at least 14 gauge (2.03 mm), 1 inch (25 mm) long, with button heads of at least ¾ inch (19 mm).

#### **2.04 SKIMMER**

- A. Skimmer: The Skimmer is a dewatering device used to slowly dewater sediment basins from the top of the water column. Manufactured by J.W. Faircloth & Son, Post Office Box 757, Hillsborough, NC, 27278. Telephone (919) 732-1244, or approved equal.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL REQUIREMENTS**

- A. The Contractor shall comply with and fully implement the Stormwater Pollution Prevention Plan (SWPPP) provided in the contract documents.
- B. Prior to beginning work, review erosion and sediment control drawings as they apply to the current site conditions. Any deviation from the drawings shall be submitted to the Owner and site engineer at least 72 hours prior to commencing that work.
- C. Hold a SWPPP pre-construction meeting prior to beginning work.
- D. Where required by the governing Construction General Permit, the General Contractor is to notify NPDES authority, in writing (or as required by local regulations) prior to initial land disturbance.

#### **3.02 PREPARATION**

- A. Sequence of Construction: The approved construction sequence, as permitted and approved shall be adhered to during the execution of the work. All grading, drainage, best management practices (BMPs) for erosion and sediment control and all stabilization measures shall be constructed in the order presented in the Sequence of Construction. Modifications to the Sequence of Construction may occur only as approved by the Owner (and authority having jurisdiction when required).
1. PHASE ONE Erosion and Sediment Control: All Phase One erosion and sediment control measures including but not limited to the required NPDES postings at the construction entrance/exit, construction of the temporary gravel construction entrance/exit, installation of perimeter sediment fence, temporary sediment basins and traps, and temporary diversion channels to sediment control structures shall be completed prior to any major land disturbing activity, including grubbing. Land disturbing activity during Phase One will be limited to the areas necessary to install Phase One best management practices only.
  2. PHASE TWO Erosion and Sediment Control: Grading (and mass grading) activity shall commence in Phase Two and includes additional erosion and sediment control measures as indicated on the drawings Contractor is to provide inspection, maintenance and recordkeeping throughout Phase One until Final Stabilization.
  3. PHASE THREE Erosion and Sediment Control: When complexity of project requires additional phases, they shall commence and be adhered to in the order presented on the drawings and in the SWPPP unless modified and approved by the Owner (and authority having jurisdiction when required).

- B. Temporary Construction Entrance/Exit and Lay Down Area:
1. Temporary construction entrance/exit shall be installed and maintained as shown on the drawings. In addition to the entrance/exit shown on the drawings, a temporary gravel construction entrance/exit shall be installed and maintained at any point where construction vehicles enter a public right-of-way, street or parking area, or exit the site. The pad shall be used to reduce mud tracked from construction vehicles onto public streets. The entrance/exit pad shall be constructed as shown on the drawings. Any sediment tracked onto the public street shall be cleaned immediately.
  2. A 30,000 square foot, 6" thick stone base lay down area shall be established at grade and as located on the drawings or as directed by the Owner. A 24 foot gravel drive shall connect the temporary gravel construction entrance/exit and the lay down area, and the lay down area and the building pad. When the job nears completion, this stone may be incorporated into the pavement section provided it is in place and any overlying contaminated material has been removed.

### **3.03 DRAWING INTENT**

- A. Implementation of the erosion and sediment control measures shown on the drawings include but may not be limited to the approved measures. Contractor is responsible for providing all measures necessary that may be additional to accomplish the intent of the drawings. The quantity of best management practices shown on the drawings may be affected by actual conditions that occur during construction of the project. Additional sediment fence, diversion channels, sediment traps, inlet protection, and any other measure shown on the drawing may be necessary to provide adequate sediment control.

### **3.04 DEWATERING**

- A. Discharge from dewatering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment from the water. The Contractor shall obtain any required permits associated with dewatering activities.

### **3.05 STABILIZATION**

- A. Limit Disturbed Area: Contractor to limit disturbed earthwork operations to the area commensurate with the Contractor's capability in keeping finished grading, seeding, mulching, stone base, and other control measures current and in accordance with the Schedule of Construction Activity. Should seasonal limitations make such coordination unrealistic, as determined by the Owner, temporary erosion control measures (stabilization) shall be provided immediately by the Contractor at no expense to the Owner.
- B. Temporary Stabilization: The Contractor shall incorporate all permanent erosion control measures into the project at the earliest practical time to minimize the need for temporary stabilization. Temporary stabilization shall be used where stabilization is needed or required prior to installation of permanent measures due to seasonal concern or NPDES stabilization requirements.
- C. Ground Cover Sufficient to Restrain Erosion: Any disturbed area where grading activities have temporarily or permanently ceased for more than 14 days (or a shorter time required by the local NPDES authority) shall be seeded, mulched and watered. Permanent stabilization consists of permanent seeding and landscaping per specification or stone base for paving or building construction. Temporary stabilization may include temporary seeding, mulch, stone base, mulch fiber matrix, or other methods.
- D. Slopes: Slopes shall be permanently seeded and mulched as excavation or fill proceeds to the extent possible. Slopes shall be temporarily seeded and mulched as necessary. Any graded slopes steeper than 3:1 shall be protected with erosion control blanket (RECP) as indicated on the drawings.

### **3.06 OWNER INSPECTION**

- A. The Owner's representative shall inspect the site and recordkeeping materials at least once per month.

- B. If Owner determines that the site is out of compliance with the governing NPDES Permit, the Contractor will have 24 hours to initiate and 48 hours to complete corrective action.
- C. The Owner's NPDES Compliance Manager shall visit the site periodically.
- D. If the Owner's Compliance Manager determines the site is out of compliance, the Contractor shall make corrective actions within 48 hours and produce any follow-up information requested by the Compliance Manager within the number of days specified in the Compliance Manager's report.

**3.07 STORAGE OF SOIL MATERIALS**

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
  - 2. Provide temporary cover for soil stockpiles if not active for more than 14 days.
  - 3. Provide perimeter protection (sediment fence, wattle, or as shown on the drawings) around stockpile to prevent sediment from leaving the area.

**3.08 STORM DRAINAGE**

- A. Inlets: All inlets are to be provided with inlet protection as indicated on the drawings immediately upon construction.
- B. Outlets: All storm drainage outlets must be stabilized (velocity dissipation) as shown on the drawings before discharge becomes operational.

**END OF SECTION 015713**