

R-2552AA/AB/B&C**Project Special Provisions
Erosion Control****Wake and
Johnston Counties****Seeding and Mulching:**

(East)

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined by the Engineer. All rates are in pounds per acre (kilograms per hectare).

All Roadway Areas:

March 1 - August 31

50# (55kg) Tall Fescue
5# (6kg) Centipede
25# (28kg) Bermudagrass (hulled)
500# (560kg) Fertilizer
4000# (4500kg) Limestone

September 1 - February 28

50# (55kg) Tall Fescue
5# (6kg) Centipede
35# (40kg) Bermudagrass (unhulled)
500# (560kg) Fertilizer
4000# (4500kg) Limestone

Waste and Borrow Locations:

January 1 - December 31

75# (85kg) Tall Fescue
25# (28kg) Bermudagrass (hulled)
500# (560kg) Fertilizer
4000# (4500kg) Limestone

75# (85kg) Tall Fescue
35# (40kg) Bermudagrass (unhulled)
500# (560kg) Fertilizer
4000# (4500kg) Limestone

Note: 50# (55 kg) of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars:

Adventure	Adventure II	Amigo	Anthem
Apache	Apache II	Arid	Austin
Brookstone	Bonanza	Bonanza II	Chapel Hill
Chesapeake	Chieftain	Coronado	Crossfire II
Debutante	Duster	Falcon	Falcon II
Finelawn Petite	Finelawn	Finelawn I	Genesis
Grande	Guardian	Houndog	Jaguar
Jaguar III	Kentucky 31	Kitty Hawk	Monarch
Montauk	Mustang	Olympic	Pacer
Phoenix	Pixie	Pyramid	Rebel
Rebel Jr.	Rebel II	Renegade	Safari
Shenandoah	Tempo	Titan	Tomahawk

Trailblazer
Wrangler

Tribute

Vegas

Wolfpack

On cut and fill slopes 2:1 or steeper add 20# (23kg) Sericea Lespedeza January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

All areas seeded and mulched shall be tacked with asphalt. Crimping of straw in lieu of asphalt tack shall not be allowed on this project.

Crimping Straw Mulch:

Crimping shall be required on this project adjacent to any section of roadway where traffic is to be maintained or allowed during construction. In areas within six feet (2 meters) of the edge of pavement, straw is to be applied and then crimped. After the crimping operation is complete, an additional application of straw shall be applied and immediately tacked with a sufficient amount of undiluted emulsified asphalt.

Straw mulch shall be of sufficient length and quality to withstand the crimping operation.

Crimping equipment including power source shall be subject to the approval of the Engineer providing that maximum spacing of crimper blades shall not exceed 8 inches (200 mm).

Native Grass Seeding And Mulching

Bermuda

Native Grass Seeding and Mulching shall be performed on the disturbed areas of wetlands, and adjacent to Stream Relocation construction within a 50 foot (16 meter) zone on both sides of the stream(or depression), measured from top of stream bank, (or center of depression). The stream bank of the Stream Relocation shall be seeded by hand, hydroseeder within permit compliance, and/or other method that does not alter the typical cross section of the stream bank. Native Grass Seeding and Mulching shall also be performed in the Permanent Soil Reinforcement Mat section of Preformed Scour Holes.

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined by the Engineer. All rates are in pounds per acre (kilograms per hectare).

March 1 - August 31

September 1 - February 28

25# (28kg) Bermudagrass (hulled)	35# (40kg) Bermudagrass (unhulled)
6# (7kg) Indiangrass	6# (7kg) Indiangrass
8# (9kg) Little Bluestem	8# (9kg) Little Bluestem
4# (5kg) Switchgrass	4# (5kg) Switchgrass
25# (28kg) Browntop Millet	35# (39kg) Rye Grain
500# (560kg) Fertilizer	500# (560kg) Fertilizer
4000# (4500kg) Limestone	4000# (4500kg) Limestone

Fertilizer shall be 10-20-20 analysis. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

Native Grass Seeding and Mulching shall be performed in accordance with Section 1660 of the Standard Specifications and vegetative cover sufficient to restrain erosion shall be installed immediately following grade establishment.

Temporary Seeding:

Fertilizer shall be the same analysis as specified for "Seeding and Mulching" and applied at the rate of 400 pounds (450 kilograms) and seeded at the rate of 50 pounds per acre (55kg per hectare). Sweet Sudan Grass, German Millet or Browntop Millet shall be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

Fertilizer Topdressing:

Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20 written approval of the Engineer, a different analysis of fertilizer may be used provided grade and shall be applied at the rate of 500 pounds per acre (560 kg per hectare). Upon the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre (560 kg per hectare). Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis.

Supplemental Seeding:

The kinds of seed and proportions shall be the same as specified for "Seeding and Mulching", with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre (28kg to 85kg per hectare). The actual rate per acre (hectare) will be determined by the Engineer prior to the time of topdressing and the Contractor will be

notified in writing of the rate per acre (hectare), total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

Mowing:

The minimum mowing height on this project shall be 4 inches (100 mm).

Seeding Equipment:

Seeding Equipment shall remain on site at all times. The equipment shall be in number that will allow all areas that require Seeding and Mulching to be accomplished.

Lawn Type Appearance

All areas adjacent to lawns must be hand finished as directed by the Engineer to give a "lawn type appearance". Remove all trash, debris, and stones 3/4 inch (19 mm) and larger in diameter or other obstructions that could interfere with providing a smooth "lawn type appearance". These areas shall be reseeded to match their original vegetative conditions, unless directed otherwise by the Field Operations Engineer.

Specialized Hand Mowing:

The work covered by this section consists of specialized hand mowing around or under fixed objects, including but not limited to guardrails, signs, barriers and slopes in a method acceptable to the Engineer.

The work of specialized hand mowing shall be completed with mechanically powered trimmers, string trimmers, hand operated rotary mowers, or self-propelled mowers of sufficient size and quality to perform the work timely and efficiently.

The quantity of mowing to be performed will be affected by the actual conditions which occur during the construction of the project. The quantity of mowing may be increased, decreased or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

The quantity of specialized hand mowing to be paid for will be the actual number of man hours worked while hand mowing along the surface of the ground, at the direction of the Engineer. Where an area has been mowed more than once, at the direction of the Engineer, separate measurement will be made each time the area is mowed.

Payment will be made under:

Specialized Hand MowingHR

Environmentally Sensitive Areas:

This project is located in an “Environmentally Sensitive Area”. This designation requires special procedures to be used for clearing and grubbing, temporary stream crossings, and grading operations within the project. This also requires special procedures to be used for seeding and mulching and staged seeding within the project.

Clearing and Grubbing:

THE ENGINEER WILL CONDUCT A MEETING ONSITE WITH THE CONTRACTOR TO ENSURE THAT CLEARING LIMITS HAVE BEEN PROPERLY IDENTIFIED AND THAT ENVIRONMENTALLY SENSITIVE AREAS AND PERMITTED AREAS ARE PROTECTED WITH HIGHLY VISIBLE FENCING PRIOR TO CLEARING AND GRUBBING OPERATIONS.

In areas identified throughout the project as “Environmentally Sensitive Areas” or “Permitted Areas”, the Contractor may NOT perform clearing and grubbing operations, until immediately prior to beginning grading operations as described in Section 200, Article 200-1, in the Standard Specifications. The “Environmentally Sensitive Area” shall be defined as a 50-foot (16-meter) buffer zone on both sides of the stream (or depression), measured from top of streambank, (or center of depression). The “Permitted Areas” shall be identified on the erosion control plans or in the permit drawings, where the permit drawings and any modifications to the permit drawings shall represent the actual “Permitted Areas”. Only clearing operations (not grubbing) shall be allowed in these zones until immediately prior to beginning grading operations. Erosion control devices shall be installed immediately following the clearing operation. All activities in “Permitted Areas” must conform to the permit conditions. THE CONTRACTOR SHALL NOT ENTER ANY NON-PERMITTED STREAMS, BUFFER ZONES, OR WETLANDS.

Grading:

Once grading operations begin in identified “Environmentally Sensitive Areas” or “Permitted Areas”, work will progress in a continuous manner until complete. All construction within these areas must progress in a continuous manner such that each phase is complete and areas permanently stabilized prior to beginning of next phase. Failure on the part of the Contractor to complete any phase of construction in a continuous manner in “Environmentally Sensitive Areas” or “Permitted Areas” as specified will be just cause for the Engineer to direct the suspension of work in accordance with Section 108-7 of the Standard Specifications.

Temporary Stream Crossings:

Any crossing of streams within the limits of this project must be accomplished in accordance with Section 107-13(b) of the Standard Specifications.

Seeding and Mulching:

Seeding and mulching shall be performed in accordance with Section 1660 of the Standard Specifications and vegetative cover sufficient to restrain erosion shall be installed following grade establishment.

Seeding and mulching shall be performed on the areas disturbed by construction following final grade establishment. No appreciable time shall lapse into the contract time without stabilization of slopes, ditches and other areas within the project limits that drain directly to "Environmentally Sensitive Areas", "Permitted Areas", and "Non-permitted Areas".

Stage Seeding:

The work covered by this section shall consist of the establishment of a vegetative cover on cut and fill slopes as grading progresses. Seeding and mulching shall be done in stages on cut and fill slopes which are greater than 20 feet (6 meters) in height or greater than 2 acres (0.8 hectares) in area. Each stage shall not exceed the limits stated above.

All work described above will be paid for at the contract unit prices established in the contract for the work involved. Additional payments will not be made for the requirements of this section as the cost for this work should be included in the contract unit prices for the work involved.

Minimize Removal Of Vegetation:

The Contractor shall minimize removal of vegetation at stream banks and disturbed areas within the project limits as directed by the Engineer.

Stockpile Areas:

The Contractor shall install and maintain erosion control devices sufficient to contain sediment around any erodible material stockpile areas as directed by the Engineer.

Reforestation:

Reforestation will be planted within interchanges and along the outside borders of the road, in areas designated by the Engineer. Reforestation is not shown on the plan sheets. See the reforestation detail sheet.

Seasonal limitations: Seedlings shall be planted from November 15 through March 15.

Seedlings shall be planted as soon as practical following permanent Seeding and Mulching. Seedlings shall be planted in a 16 ft. (5 meters) wide swath adjacent to mowing pattern line.

Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay ("kaolin") or a superabsorbent that is made to be used as a bare root dip.

The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval. With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Streambank Reforestation:

Streambank reforestation will be planted in areas designated on the plans and as directed by the Engineer. See the streambank reforestation detail sheet.

Type I Streambank Reforestation shall be live stakes, planted along both streambanks.

Coir fiber mat shall be installed on the streambanks where live staking is to be planted as shown on the streambank reforestation detail sheet and in locations as directed by the Engineer. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat.

Provide matting to meet the following requirements:

- 100 % coconut fiber (coir) twine woven into a high strength matrix.
- Thickness - 0.30 in. minimum. (7.6 mm)
- Tensile Strength - 1348 x 626 lb/ft minimum (1650.5 x 766.5 kg/m)
- Elongation - 34% x 38% maximum
- Flexibility (mg-cm)- 65030 x 29590
- Flow Velocity- Observed 11 ft/sec (3.35 m/s)
- Weight - 20 oz/SY (678 g/SM)
- Size - 6.6 x 164 ft (120 SY) or (100 SM)
- "C" Factor - 0.002
- Open Area (measured) - 50%

Provide wooden stakes 12 in. (300 mm) in length with a notch cut 1 in. (25 mm) from top.

Place the matting immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris which will prevent the contact of the matting with the soil. Take care to preserve the required line, grade, and cross section of the area covered.

Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Bury the top slope end of each piece of matting in a narrow trench at least 6 in. (150 mm) deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. (150 mm) overlap. Construct check trenches at least 12 in. (0.3 m) deep every 50 ft. (16 m) longitudinally along the edges of the matting or as directed by the Engineer. Fold over and bury matting to the full depth of the trench, close and tamp firmly. Overlap matting at least 6 in. (150 mm) where 2 or more widths of matting are installed side by side.

Place stakes across the matting at ends, junctions, and check trenches approximately 1 ft. (0.3 m) apart with notch facing upslope.

Place stakes along the outer edges and down the center of each strip of matting 3 feet (1 meter) apart. Place stakes along all lapped edges 1 ft. (0.3 m) apart. Refer to details in the plan sheets.

The Engineer may require adjustments in the trenching or staking requirements to fit individual site conditions.

Live staking plant material shall consist of a random mix made up of 50% Black Willow (*Salix nigra*), 50% Silky Dogwood (*Cornus amomum*). Other species may be substituted upon approval of Engineer.

All plant material shall be harvested locally (within the same physiographic ecoregion and plant hardiness zone) or purchased from a local nursery, with the approval of the Engineer. All live stakes shall be dormant at time of acquisition and planting.

Live stakes shall be 1/2-2 inches (12-50 mm) in diameter. Stakes shall also be 2-3 feet (0.6-1 meter) in length.

During preparation, the basal ends of the live stakes shall be cleanly cut at an angle to facilitate easy insertion into the soil, while the tops shall be cut square or blunt for tamping. All limbs shall be removed from the sides of the live cutting prior to installation.

Live stakes shall be installed within 48 hours of cutting. Outside storage locations should be continually shaded and protected from wind and direct sunlight. Live cut plant material shall remain moist at all times before planting.

Install live stakes according to the streambank reforestation detail sheet.

Tamp live stakes perpendicularly into the finished bank slope with a dead blow hammer, with buds oriented in an upward direction. Stakes should be tamped until approximately 3/4 of the stake length is within the ground.

The area around each live stake shall be compacted by foot after the live stake has been installed.

Stakes shall be spaced approximately 4 feet (1.2 meters) on center. Live stakes should be installed according to the configuration presented in the details of the plan sheets.

One to two inches shall be cut cleanly off of the top of each live stake (with loppers) at an angle of approximately 15 degrees following installation.

Any stakes that are split or damaged during installation shall be removed and replaced.

Type II Streambank Reforestation shall be bare root seedlings. The seedlings shall be planted as soon as practical following permanent seeding and mulching. The seedlings shall be planted from top of bank out, along both sides of stream, as designated on the plans.

Seedlings shall be 12–18 inches (300-460mm) tall.

Root dip: The roots of reforestation seedlings shall be coated with a slurry of water, and either a fine clay ("kaolin") or a superabsorbent that is made to be used as a bare root dip. The type, mixture ratio, method of application, and the time of application shall be submitted to the Engineer for approval.

With the approval of the Engineer, seedlings may be coated before delivery to the job or at the time of planting, but at no time shall the roots of the seedlings be allowed to dry out. The roots shall be moistened immediately prior to planting.

Seasonal Limitations: Streambank reforestation shall be planted from November 15 through March 15.

Measurement:

The quantity of streambank reforestation to be paid for will be the actual number of acres (hectares) of land, measured along of the surface of ground, which has been acceptably planted with seedlings in accordance with these specifications.

Payment:

The quantity of streambank reforestation will be paid for at the contract unit price per acre (hectare) for "Streambank Reforestation".

Payment will be made under:

Streambank Reforestation..... ACR (HA)

Such price and payment will be full compensation for all work covered by this provision, including but not limited to, furnishing all materials, installation of the coir fiber mat, and planting of the live stakes and the bare root seedlings.

Waste Areas And Borrow Sources:

Payment for temporary erosion control measures, except those made necessary by the Contractor's own negligence or for his own convenience, will be paid for at the appropriate contract unit price for the devices or measures utilized in borrow sources and waste areas.

No additional payment will be made for erosion control devices or permanent seeding and mulching in any commercial borrow or waste pit. All erosion and sediment control

practices which may be required on a commercial borrow or waste site will be done at the Contractor's expense.

Temporary Diversion:

The work by this section for installation, maintenance, and cleanout of temporary diversions shall be in accordance with Section 1630. The quantity of excavation for installation and cleanout measured as provided in Article 1630-4 will be paid for at the contract unit price per cubic yard (cubic meter) as provided in Article 1630-5 for "Silt Excavation".

Safety Fence:

Description:

The work of "Safety Fence" shall consist of furnishing, installing and maintaining polyethylene or polypropylene fence along the outside riparian buffer, wetland, or water boundary located within the construction corridor to mark the areas that have been approved to infringe within the buffer, wetland or water, and as directed by the Engineer in accordance with the special provisions included herein. The fence shall be installed prior to any land disturbing activities.

Materials:

Fence Material:

Polyethylene or polypropylene fence shall be a preconstructed safety fence approved by the Engineer.

Posts:

Either wood posts or steel posts may be used. Wood posts shall be nominal 2" x 4" (51 mm x 102 mm) or 4" x 4" (102 mm x 102 mm), lengths as required, structural light framing, grade No. 2, Southern Pine. Steel posts shall be at least 5 feet (1.6 m) in length, approximately 1 3/8" (35 mm) wide measured parallel to the fence, and have a minimum weight of 1.25 lb./ft. (1.9 kg/m) of length. The steel post shall be equipped with an anchor plate having a minimum area of 14 square inches (90 square centimeters).

Clearing and Grading:

No additional clearing and grubbing is anticipated for the installation of this fence; however, if any clearing and grubbing is required, it will be the minimum required for the installation of the safety fence. Such clearing shall include satisfactory removal and disposal of all trees, brush, stumps and other objectionable material.

The fence shall be erected to conform to the general contour of the ground. When determined necessary by the Engineer, minor grading along the fence line shall be done to meet this requirement provided no obstructions to proper drainage are created.

Installation:

Posts shall be set and maintained in a vertical position and may be hand set or set with a post driver. If hand set, all backfill material shall be thoroughly tamped. If power driven, wood posts may be sharpened to a dull point. Posts damaged by power driving shall be removed and replaced prior to final acceptance. The tops of all wood posts shall be cut at a 30 degree angle. The wood posts may, at the option of the Contractor, be cut at this angle either before or after the posts are erected.

The fence fabric shall be attached to the wood posts with one 2" (51 mm) galvanized wire staple across each cable or to the steel posts with wire or other acceptable means.

The Contractor shall be required to maintain the safety fence in a satisfactory condition for the duration of the project as determined by the Engineer.

Method of Measurement:

The quantity of safety fence to be paid for shall be the actual number of linear feet (meter) of "Safety Fence", installed in place and accepted. No direct payment will be made for post and post bracing. Cost shall be included in the cost of the fence per linear foot (meter).

Basis of Payment:

The quantity of safety fence measured as provided above will be paid for at the contract unit price per linear foot (meter) of safety fence. Such payment will be full compensation for the work as described in the above paragraphs, including but not limited to clearing and grading, furnishing and installing fence fabric with necessary posts and post bracing, staples, tie wires, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Safety Fence.....LF (M)

Gravel Construction Entrance:

Description:

The work covered by this section consists of furnishing, installing, and maintaining and removing any and all material required for the construction of a Gravel Construction Entrance.

Materials:

The filter fabric shall meet the requirements of Section 1056 for Type 2 Fabric.

Stone shall be Class A Stone and shall meet the requirements of Section 1042 for Stone for Erosion Control, Class A.

Construction:

The Contractor shall install a Gravel Construction Entrance in accordance with the details in the plans and at locations as directed by the Engineer.

Method Of Measurement:

Gravel Construction Entrance will not be measured for payment under this section.

Basis Of Payment:

Payment for installation of Filter Fabric shall be paid for at the contract unit price per square yard (square meter) "Filter Fabric for Drainage".

Payment for installation of Class A Stone shall be paid for at the contract unit price per ton (metric ton) "Stone for Erosion Control, Class A".

Such price and payment shall be considered full compensation for all work covered by this provision including all materials, construction, maintenance, and removal of Gravel Construction Entrance as directed by the Engineer.

Special Stilling Basin(s):**Description:**

The work covered by this section consists of furnishing, placing, and removing a special stilling basin(s) as directed by the Engineer. The special stilling basin(s) shall be used to filter pumped water during construction of drilled piers.

Materials:

The filter fabric shall meet the requirements of Section 1056 for Type 2 Fabric. Sediment control stone shall meet the requirements of Section 1005. Install stone according to the detail shown on the plans.

The special stilling basin(s) shall be a water permeable fabric bag that traps sand, silt, and fines as sediment laden water is pumped into it. This device shall be constructed such that it is portable and can be used adjacent to each drilled pier.

The special stilling basin(s) shall be a bag constructed to a minimum size of 10' x 15' made from a nonwoven fabric. It shall have a sewn-in 8 in. (maximum) spout for receiving pump discharge. The bag seams shall be sewn with a double needle machine using a high strength thread. The seams shall have a minimum wide width strength as follows:

Test Method	Minimum Specifications
ASTM D-4884	60 lb/in

The fabric used to construct the bag shall be stabilized to provide resistance to ultra-violet degradation and meet the following specifications for flow rates, strength, and permeability:

Property	Test Method	Units	Minimum Specifications
Weight	ASTM D-3776	oz/yd	8.0
Grab tensile	ASTM D-4632	lb	200.0
Puncture	ASTM D-4833	lb	130.0
Flow rate	ASTM D-4491	gal/min/sf	80.0
Permittivity	ASTM D-4991	1/sec	1.5
UV Resistance	ASTM D-4355	%	70.0

Construction:

The Contractor shall install the special stilling basin in accordance with the details in the plans and at locations as directed by the Engineer.

The special stilling basin(s) shall be placed so the incoming water flows into and through the bag without causing erosion. The neck or spout of the bag shall be tied off tightly to stop the water from flowing out of the bag without going through the walls.

The special stilling basin(s) shall be replaced and disposed of when it is 3/4 full of sediment or when it is impractical for the bag to filter the sediment out at a reasonable flow rate. Prior approval from the Engineer must be received before removal and replacement.

The Contractor shall be responsible for providing a sufficient quantity of bags to contain silt from pumped effluent during construction of drilled piers.

Method Of Measurement:

The quantity of special stilling basin(s) to be paid for will be the actual number of bags used during drilled pier construction as specified and accepted by the Engineer.

Measurement of filter fabric will be made by the number of square yards (square meters) as measured over the surface of the ground over which filter fabric has been acceptably placed.

The quantity of sediment control stone will be measured according to Article 1610-4.

Basis Of Payment:

Payment for special stilling basin will be as follows:

Filter Fabric for Drainage	SY(SM)
Sediment Control Stone	TON (MT)
Special Stilling Basin	EA

Such price and payment will be full compensation for all work covered by this provision, including but not limited to, furnishing all materials, placing and maintaining the special stilling basin(s), and removal and disposal of silt accumulations and bag.

Culvert Diversion Channel:

Description:

Provide a culvert diversion channel to detour existing stream around the culvert construction site at locations shown on the plans. Work includes constructing diversion channel, disposing of excess materials, providing and placing filter fabric liner, maintaining diversion area in an acceptable condition, removing filter fabric liner, backfilling diversion channel area with suitable material and providing proper drainage when diversion channel area is abandoned.

Material:

Use local material or material specified on plans.

Provide filter fabric to meet requirements of Section 1056 for Type 2 fabric.

Construction requirements:

Grade channel according to plan with channel surface free of obstructions, debris, and pockets of low density material.

Utilize suitable material and provide disposal area for unsuitable material.

Line channel with fabric unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury top of slope fabric edge in a trench at least five inches (125mm) deep and tamp.

Make vertical overlaps a minimum of eighteen inches (450mm) with upstream fabric overlapping the downstream fabric.

Secure fabric with eleven gauge (3.05mm) wire staples shaped into a "u" shape with a length of not less than six inches (150mm) and a throat not less than one inch (25mm) in

width. Place staples along outer edges and throughout the fabric a maximum of three feet (one meter) horizontally and vertically.

Method of Measurement:

Measurement of excavation will be made by the cubic yard (cubic meter) of excavation as calculated from the typical section throughout the length of the diversion channel as shown on the final approved plans.

Measurement of filter fabric will be made by the number of square yards (square meters) as measured over the surface of the ground over which filter fabric has been acceptably placed.

No measurement will be made for other items or for over excavation or stockpiling.

Basis of Payment:

Payment will be made for the quantities as measured above under the items listed below:

Culvert Diversion Channel CY (M3)

Filter Fabric for Drainage SY (M2)

Impervious Dike:

The work covered by this section consists of furnishing, installing, maintaining, and removing an impervious dike for the purpose of diverting normal stream flow around the construction site. The Contractor shall construct an impervious dike in such a manner approved by the Engineer. The impervious dike shall not permit seepage of water into the construction site or contribute to siltation of the stream. The impervious dike shall be constructed of an acceptable material in the locations noted on the plans or as directed by the Engineer.

Acceptable materials shall include but not be limited to sheet piles, sandbags, and/or the placement of an acceptable size stone lined with polypropylene or other impervious fabric.

Earth material shall not be used to construct an impervious dike when it is in direct contact with the stream unless vegetation can be established before contact with the stream takes place.

The quantity of impervious dike to be paid for will be the actual number of linear feet (meters) of impervious dike(s) constructed, measured in place from end to end of each separate installation which has been completed and accepted.

The quantity of impervious dikes measured as provided above will be paid for at the contract unit price per linear foot (meter) for "Impervious Dike".

The above prices and payments will be full compensation for all work covered by this section including but not limited to furnishing all of the materials in the impervious dike, construction, maintenance, and removal of the impervious dike.

Temporary Pipe For Culvert Construction:

The work covered by this section consists of furnishing, installing, maintaining and removing any and all temporary pipe used on this project in conjunction with the culvert construction. The Contractor shall install temporary pipe in locations shown on the plans in such a manner approved by the Engineer. The temporary pipe shall provide a passage-way for the stream through the work-site. The minimum size requirements will be as stated on the Erosion and Sediment Control plans.

The quantity of temporary pipe to be paid for will be the actual number of linear feet (meters) of temporary pipe approved by the Engineer and measured in place from end to end.

The quantity of temporary pipe measured as provided above will be paid for at the contract unit price per linear foot (meter) for "___ inch (mm) Temporary Pipe".

The above prices and payments will be full compensation for all work covered by this section including but not limited to furnishing all materials required for installation, construction, maintenance, and removal of temporary pipe.

Special Sediment Control Fence:**Description:**

The work covered by this section consists of the construction, maintenance, and removal of special sediment control fence. Place special sediment control fence as shown on the plans or as directed by the Engineer.

Materials:**(A) Posts:**

Either wood or steel posts may be used. Wood posts shall be a minimum of 6 feet long (1.8 m), at least 3 inches (75 mm) in diameter, and straight enough to provide a fence without noticeable misalignment. Steel posts shall be at least 5 feet (1.5 m) in length, approximately 1 3/8 inches (35 mm) wide measured parallel to the fence, and have a minimum weight of 1.25 lb/ft (1.86 kg/m) of length. The post shall be equipped with an anchor plate having a minimum area of 14.0 square inches (9000 square millimeters), and shall have a means of retaining wire in the desired position without displacement.

(B) 1/4 inch (6.4mm) Hardware Cloth:

Hardware cloth shall have 1/4 inch (6.4mm) openings constructed from #24 gauge wire. Install hardware cloth according to the detail shown on the plans.

(C) Sediment Control Stone:

Sediment control stone shall meet the requirements of Section 1005. Install stone according to the detail shown on the plans.

Maintenance and Removal:

The Contractor shall maintain the special sediment control fence until the project is accepted or until the fence is removed, and shall remove and dispose of silt accumulations at the fence when so directed by the Engineer in accordance with Section 1630.

Method of Measurement:

The quantity of 1/4 inch (6.4mm) hardware cloth to be paid for will be the actual number of linear feet (meters) measured along the ground, which has been completed and accepted.

The quantity of sediment control stone will be measured according to Article 1610-4.

Basis of Payment:

Payment for special sediment control fence will be as follows:

1/4 inch (6.4mm) Hardware Cloth.....	LF (M)
Sediment Control Stone	TON (MT)

Permanent Soil Reinforcement Mat:

General:

This work shall consist of furnishing and placing "Permanent Soil Reinforcement Mat", of the type specified, over previously prepared areas as directed by the Engineer.

Materials:

The product shall be permanent erosion control reinforcement mat and shall be constructed of 100% coconut fiber stitch bonded between a heavy duty UV stabilized cusped (crimped) netting overlaid with a heavy duty UV stabilized top net. The three nettings shall be stitched together on 1.5 inch (38 mm) centers UV stabilized polyester thread to form a permanent three dimensional structure. The mat shall have the following physical properties:

Property	Test Method	Value	Unit
Ground Cover	Image Analysis	93	%
Thickness	ASTM D1777	0.63 (16)	in (mm)
Mass Per Unit Area	ASTM D3776	0.92 (0.50)	lb/sy (kg/m ²)
Tensile Strength	ASTM D5035	480 (714.2)	lb/ft (kg/m)
Elongation	ASTM D5035	49	%
Tensile Strength	ASTM D5035	960 (1428.5)	lb/ft (kg/m)
Elongation	ASTM D5035	31	%
Tensile Strength	ASTM D1682	177 (80.3)	lbs (kg)
Elongation	ASTM D1682	22	%
Resiliency	ASTM D1777	>80	%
UV Stability *	ASTM D4355	151 (68.5)	lbs (kg)
Color(Permanent Net)		UV Black	
Porosity (Permanent Net)	Calculated	>95	%
Minimum Filament Diameter (permanent net)	Measured	0.03 (0.8)	in (mm)

*ASTM D1682 Tensile Strength and % strength retention of material after 1000 hours of exposure in a Xenon-arc weatherometer.

A certification (Type 1, 2, or 3) from the manufacturer showing:

- 1) the chemical and physical properties of the mat used, and
- 2) conformance of the mat with this specification will be required.

Matting shall be installed according to section 1060-8 of the Standard Specifications.

Soil Preparation:

All areas to be protected with the mat shall be brought to final grade and seeded in accordance with Section 1660. The surface of the soil shall be smooth, firm, stable and free of rocks, clods, roots or other obstructions which would prevent the mat from lying in direct contact with the soil surface. Areas where the mat is to be placed will not need to be mulched.

Measurement:

The quantity of "Permanent Soil Reinforcement Mat" to be paid for shall be the actual number of square yards (square meters), surface measure, completed, and accepted. Overlaps will not be included in the measurement, and will be considered as incidental to the work.

Basis of Payment:

This work will be paid for at the contract unit price per square yard (square meter) for "Permanent Soil Reinforcement Mat" of the type specified, complete in place and accepted. Such payment shall be full compensation for furnishing and installing the mat in accordance with this specification, and for all required maintenance.

Payment will be made under:

Permanent Soil Reinforcement Mat..... SY (M2)

Stream Channel Relocation Limitations:

The following sequence of construction must be followed in the areas designated on the plans as stream relocation. Failure on the part of the Contractor to follow this sequence, and complete each step prior to proceeding in this area as specified, will be just cause for the Engineer to direct the suspension of work in accordance with Section 108-7 of the Standard Specifications.

1. Clear, but do not grub area within the Environmentally Sensitive Area on the existing stream to be relocated.
2. Construct and stabilize, with vegetation or erosion control materials sufficient to restrain erosion, the proposed stream channel relocation as shown on the plans.
3. Divert water into newly constructed channel only after it has been stabilized and approved.
4. Begin grubbing and/or grading within Environmentally Sensitive Area of existing stream.

The contractor shall perform seeding and mulching and install erosion control matting to all cut/fill slopes adjacent to stream relocations in accordance with the provision contained in this contract and in accordance with Section 1631 of the Standards and Specification Manual.

The above requirements apply to the stream channels being constructed at the following stations:

Approx. Sta. 25+15 to 25+90 -L- Lt.

Approx. Sta. 82+77 to 83+77 -L- Lt.

Coir Fiber Mat:

Description:

Furnish material, install and maintain coir fiber mat in locations shown on the plans or in locations as directed by the engineer. Work includes providing all materials, excavating and backfilling, and placing and securing Coir Fiber Matting.

Materials:**(A) Matting:**

Provide matting to meet the following requirements:

100 % coconut fiber (coir) twine woven into a high strength matrix.
Thickness - 0.30 in. minimum. (7.6 mm)
Tensile Strength - 1348 x 626 lb/ft minimum (1650.5 x 766.5 kg/m)
Elongation - 34% x 38% maximum
Flexibility (mg-cm)- 65030 x 29590
Flow Velocity- Observed 11 ft/sec (3.35 m/s)
Weight - 20 oz/SY (678 g/SM)
Size - 6.6 x 164 ft (120 SY) or (100 SM)
“C” Factor - 0.002
Open Area (measured) - 50%

(B) Staples:

Provide staples made of 0.125 in. (3.05 mm) diameter new steel wire formed into a “U” shape not less than 12 in. (300) mm in length with a throat of 1 in. (25 mm) in width.

Construction Methods:

Place the matting immediately upon final grading. Provide a smooth soil surface free from stones, clods, or debris which will prevent the contact of the matting with the soil. Take care to preserve the required line, grade, and cross section of the area covered.

Unroll the matting and apply without stretching such that it will lie smoothly but loosely on the soil surface. Bury the top slope end of each piece of matting in a narrow trench at least 6 in. (150 mm) deep and tamp firmly. Where one roll of matting ends and a second roll begins, overlap the end of the upper roll over the buried end of the second roll so there is a 6 in. (150 mm) overlap. Construct check trenches at least 12 in. (0.3 m) deep every 50 ft. (16 m) longitudinally along the edges of the matting or as directed by the Engineer. Fold over and bury matting to the full depth of the trench, close and tamp firmly. Overlap matting at least 6 in. (150 mm) where 2 or more widths of matting are installed side by side.

Place staples across the matting at ends, junctions, and check trenches approximately 1 ft. (0.3 m) apart.

Place staples along the outer edges and down the center of each strip of matting 3 feet (1 meter) apart. Place staples along all lapped edges 1 ft. (0.3 m) apart. Refer to details in the plan sheets.

The Engineer may require adjustments in the trenching or stapling requirements to fit individual site conditions.

Method of Measurement:

The quantity of coir fiber matting measured will be paid for according to the actual number of square yards (square meters) measured along the surface of the ground over which coir fiber matting is installed and accepted.

Basis of Payment:

The quantity of Coir Fiber Matting, measured as provided above, will be paid for at the contract unit price per square yards (square meters) for "Coir Fiber Matting." Payment will be made under:

Coir Fiber Mat..... Square Yards (Square Meters)

Skimmer Basin with Baffles:

Description:

Provide a skimmer basin to remove sediment from construction site runoff at locations shown on the plans. Work includes constructing sediment basin, installation of coir fiber baffle, installation of Faircloth Skimmer, disposing of excess materials, providing and placing filter fabric emergency spillway liner, removing filter fabric liner and skimmer, backfilling basin area with suitable material and providing proper drainage when basin area is abandoned.

Material:

- Coir Fiber Mat for Baffles shall meet specifications of Special Provisions.
- Steel Posts for Coir Fiber Baffles shall meet requirements of Section 1605 for Temporary Silt Fence.
- Use local material or material specified on plans.
- Provide filter fabric to meet requirements of Section 1056 for Type 2 fabric.
- Use appropriately sized Faircloth skimmer.

Construction Requirements:

Excavate basin according to Erosion Control plans with basin surface free of obstructions, debris, and pockets of low-density material. Construct Coir Fiber Baffles and emergency spillways according to Skimmer Basin with Baffles Detail.

Install Steel Posts for Coir Fiber Baffle according Standard Drawing No. 1605.01 for Temporary Silt Fence and according to Skimmer Basin with Baffles Detail.

Secure Coir Fiber Mat to Steel Posts with metal fasteners and staple the mat into the side slopes of the Skimmer Basin. The height of the Coir Fiber Baffle shall be 3 feet (1 meter).

Install Faircloth skimmer according to manufacturer recommendations. These recommendations can be obtained by contacting the manufacturer as follows:

J. W. Faircloth & Son, Inc.
412A Buttonwood Drive
P. O. Box 757
Hillsborough, NC 27278
Telephone/Fax: (919) 732-1244
Email: jwfaircloth@earthlink.net
www.fairclothskimmer.com

Utilize suitable material and provide disposal area for unsuitable material.

Line emergency spillway with fabric unrolled in the direction of flow and lay smoothly but loosely on soil surface without creases. Bury edges of fabric in a trench at least five inches (125mm) deep and tamp.

Make vertical overlaps a minimum of eighteen inches (450mm) with upstream fabric overlapping the downstream fabric.
Secure fabric with eleven gauge (3.05mm) wire staples shaped into a "u" shape with a length of not less than six inches (150mm) and a throat not less than one inch (25mm) in width. Place staples along outer edges and throughout the fabric a maximum of three feet (one meter) horizontally and vertically.

Method of Measurement:

Measurement of excavation will be made by the cubic yard (cubic meter) of excavation as calculated from the typical section throughout the length of the basin as shown on the final approved plans.

Measurement of the Coir Fiber Mat will be made by the number of square yards (square meters) as measured across each baffle section of the Skimmer Basin.
Measurement of filter fabric will be made by the number of square yards (square meters) as measured over the surface of the ground over which filter fabric has been acceptably placed.

Measurement of skimmer will be made by the number of skimmers used.

No measurement will be made for other items or for over excavation or stockpiling.

Basis of Payment:

Payment will be made for the quantities as measured above under the items listed below:

Silt Excavation.....	CY (CM)
Coir Fiber Mat.....	SY (SM)
Filter Fabric for Drainage	SY (SM)
Faircloth Skimmer.....	EA

Response for Research:

Description:

The Department, in conjunction with N. C. State University, will utilize silt detention devices constructed by the Contractor to conduct erosion and sediment control research. The Contractor shall cooperate with and allow the researchers access to the work sites. The Contractor shall use every reasonable precaution necessary to prevent damage or injury to devices installed by the researchers.

When requested by the Engineer, the Contractor shall respond within 24 hours with adequate equipment, personnel, and supplies to construct and maintain silt detention devices to facilitate the erosion and sediment control research.

Method of Measurement:

The quantity of Response for Research to be paid for will be the actual number of times the Engineer request that the Contractor mobilize forces to construct and maintain silt detention devices to facilitate the erosion and sediment control research; and the Contractor has responded within 24 hours as requested with adequate equipment, personnel, and supplies to perform the work requested.

Basis of Payment:

Payment for construction, maintenance and removal of the silt detention devices will be made at the various contract prices for the work performed. The quantity of responses for research, measured as provided above, will be paid at the contract unit price per each for "Response for Research".

Payment will be made under:

Response for Research.....	Each
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Description:

The work covered by this section consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to direct the stream flow (thalweg) toward the center of the channel and to provide grade control.

The quantity of rock cross vanes to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of rock cross vanes may be increased, decreased, or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials:

No. 57 stoneSection 1005

Header and footer rock shall meet the requirements of Structure Stone, Boulder-Header/Footer. See special provision.

Plain rip rap, Class A Article 1042-1

Filter fabric for drainage, Type 2Section 1056

Construction Methods:

Rock cross vanes shall be constructed according to the Rock Cross Vane Detail shown on the plans or as directed by the Engineer. Two vanes each approximately 1/3 of the stream channel's bankfull width will form a 20 –30 ° angle out from the streambank toward upstream. The top elevation of both vanes will decrease from bankfull elevation toward the center of the channel at a slope of 4 to 20 percent. A vane running perpendicular to the stream's flow will connect the two outside vanes on the upstream end. Install header and footer rocks according to the detail and plate the upstream side with Type 2 filter fabric and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A stone at the direction of the Engineer. Footer rocks shall be placed such that the header rock is at streambed elevation. The rock cross vane shall be keyed into the bank at the downstream end as shown on the Rock Cross Vane Detail.

Method of Measurement:

The quantity of Boulder-Header/Footer will be paid for as provided in the special provision for Structure Stone.

The quantity of No. 57 stone to be paid for will be the actual number of tons (metric tons) of No. 57 stone which has been incorporated into the work, or has been delivered to and stockpiled on the project as directed by the Engineer. No. 57 stone that has been stockpiled will not be measured a second time. No. 57 stone will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

Plain rip rap, Class A will be measured according to Article 876-5(B).

Filter fabric will be measured according to Article 876-5(C).

Basis of Payment:

Such price and payment will be full compensation for all work covered by this special provision, including, but not limited to, furnishing all materials, labor, equipment and incidentals necessary to construct the rock cross vanes.

Payment will be made under:

Boulder Header/Footer	Tons (Metric Tons)
No. 57 stone	Tons (Metric Tons)
Plain rip rap, Class A	Tons (Metric Tons)
Filter fabric for drainage, Type 2	SY (SM)

STRUCTURE STONE**Description:**

The work covered by this section consists of furnishing, stockpiling, placing and maintaining approved stone to be utilized to construct rock cross-vanes, rock vanes, j-hook vanes, w-rock cross vanes, log vanes, root wad/log vanes, log cross vanes, root wad structures, rock cross vanes for step pools, channel blocks, double wing deflectors, single wing deflectors, stream crossings, rock energy dissipators, constructed riffles, and for use in other locations as directed by the Engineer.

The quantity of stone to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of stone may be increased, decreased, or eliminated entirely at the direction of the Engineer. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

Materials:

Stone for "Plain rip rap, Class A", "Plain rip rap, Class B", "Boulder-Header/Footer" shall consist of blasted stone or other stone approved by the Engineer. The stone shall be sound, tough, dense, resistant to the action of air and water, and suitable in all other respects for the purpose intended.

All stone shall meet the approval of the Engineer. While no specific gradation is required, the various sizes of the stone shall be equally distributed within the required size range. The size of an individual stone particle will be determined by measuring its long dimension.

Acceptance Criteria for Stone

CLASS	REQUIRED STONE SIZES (INCHES (MM))		
	Minimum	Average	Maximum
A	2 (51)	4 (102)	6 (152)
B	5 (127)	8 (203)	12 (305)
Boulder- Header/Footer 48" x 36" x 24" (1219.2mm x 914.4mm x 609.6mm)	24 (610)	36 (914)	48 (1219)

No more than 5% of the material furnished can be less than the minimum size specified.
No more than 10% of the material can exceed the maximum size specified.

Boulders of approximate dimension 48x36x24 inches (1219mm x 914mm x 610mm) shall be individually picked for use in the structures. Boulders shall be relatively flat on either side in the same dimension, preferably the long dimension.

Construction:

The Contractor shall place stone, in locations shown on the construction plans to the thickness, widths, and lengths as shown on the construction plans or directed by the Engineer. All stone shall be placed to form a sediment and erosion control device, an in-stream structure or a channel lining neatly and uniformly with an even surface in accordance with the construction plans and special provisions, and shall meet the approval of the Engineer.

Method of Measurement:

The quantity of stone to be paid for will be the actual number of tons of stone that has been incorporated into the work, or has been delivered to and stockpiled on the project as directed by the Engineer. Stone that has been stockpiled will not be measured a second time. The stone will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

Basis of Payment:

Such price and payment will be full compensation for all work covered by this section, including but not limited to furnishing, weighing, stockpiling, re-handling, placing, and maintaining the stone and disposal of any materials not incorporated into the project if directed by the Engineer.

Payment will be made under:

Plain rip rap, Class A	Tons (Metric Tons)
Plain rip rap, Class B	Tons (Metric Tons)
Boulder-Header/Footer	Tons (Metric Tons)