

Town of Sparta Skyline Wetland Enhancement Project

Erosion Control Narrative & Technical Specifications

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Prepared for:

Town of Sparta




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1 EROSION CONTROL NARRATIVE

1.1 INTRODUCTION

This narrative is submitted as part of the proposed Town of Sparta Skyline Wetland Enhancement Project. This project will involve the enhancement of an existing wetland that has been historically altered to treat a combined runoff area of 27.14 acres.

The total disturbed area along the project reach is approximately 1.33 acres and was calculated using the area of the limits of disturbance shown on the plans.

A 401/404 permitting application has been submitted to the United States Army Corps of Engineers (USACE) and to the North Carolina Division of Water Quality (NCDWQ). Once the certifications have been issued, Michael Baker Engineering, Inc., will send a copy to North Carolina Division of Land Quality.

1.2 PROJECT DESCRIPTION

The United States Department of Agriculture (USDA) has awarded a grant to the Town of Sparta (Town) to implement a wetland enhancement project within the town limits for the purpose improving water quality of the storm water discharged into Bledsoe Creek from the most highly urbanized area within the Bledsoe Creek Drainage. The wetland enhancement site is located on an open piece of fallow land that has been donated to the Town by Skyline Telephone Membership Corporation. Stormwater from a school complex including many buildings, parking lots and athletic fields, drains directly into the proposed wetland enhancement site. This site was selected based on its location, ability to provide water quality treatment for a large drainage area, and ability to provide stormwater peak flow attenuation where high energy flows have caused large problems in the past. The wetland has been designed to treat the first flush (1-inch) of stormwater from within the drainage area to reduce discharge quantities and velocities and allow for the uptake of pollutants by wetland vegetation prior to discharge entering Bledsoe Creek.

To access the Skyline Wetland Enhancement Project site, turn onto Grayson Street off of State Highway 18 north prior to going through the center of Sparta. The site is located behind the Skyline Telephone Membership Corporation building at 199 Grayson Street. The construction access will be off of Poplar Street through a temporary easement granted by New Sparta LLC (See Appendix).

The project site is located in Sparta, NC. The Project lies in the New River Basin within North Carolina Division of Water Quality sub-basin 05-07-03 and United States Geologic Survey (USGS) hydrologic unit 05050001030020. The stormwater outflow from this project flows into an unnamed tributary to Bledsoe Creek. NCDWQ classifies Bledsoe Creek as C; Tr. See figures for site location and watershed boundary information.

1.3 EROSION AND SEDIMENTATION CONTROL MEASURES

Erosion control methods to be used on-site include silt fence, temporary gravel construction entrance, mulch, temporary seeding, permanent seeding, temporary rock dam, and a dewatering operation if needed. All sediment and erosion control measures are to be built according to the plans and specifications.

Silt fence will be used to prevent erosion of the stockpiles and any disturbed ground toward any open channels on site.

Dewatering pump operations will be utilized if the constructed cells contain water prior to being graded to finish elevations or planted.

1.4 DESIGN STANDARDS

Standard erosion control practices, methods, and procedures described in these plans and specifications are based on those presented in the North Carolina Erosion and Sediment Control Planning and Design Manual (March 2009).

1.5 MAINTENANCE PLAN

Qualified personnel on a daily basis will evaluate all temporary erosion and sediment control practices for stability and operation. Weekly inspections will be performed and logs kept. A rain gage will also be kept on site and rainfall amounts recorded. Any repairs needed, will be performed immediately to maintain all practices as designed. The Contractor will be responsible for the maintenance of temporary on-site erosion control measures. The Contractor will be responsible for implementing and following the approved Sediment and Erosion Control Plan.

1.6 CONTACTS

Project Contacts:
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1.7 STORMWATER CALCULATIONS

All runoff enters the site as surface flow. The combined volume of all three wetland cells is capable of treating the estimated runoff from the first one inch of any storm event. The cells will hold the treatment volume and drawdown this volume within 24 hours. The pre and post peak discharge and runoff volumes entering into the BMP area will be the same but detention time and storage volume will be greatly increased, improving water quality in Bledsoe Creek by

reducing stormwater velocities and removal of sediment and other pollutants prior to entering Bledsoe Creek.

The rainfall intensity (I) is found using the calculated time of concentration and 10 year rainfall intensity data (from NOAA) for the Town of Sparta, NC. The time of concentration was found using methods described by the NRCS including the Manning kinematic equation for sheet flow, NRCS equations for paved and unpaved shallow concentrated flow and Manning's equation for open channel or pipe flow. See Appendix for calculations.

2 TECHNICAL SPECIFICATIONS

A. MOBILIZATION AND DEMOBILIZATION

Description

The work shall consist of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the contract. This work shall not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling requirement for commencement of work.

Materials and Methods

Mobilization shall include all activities and costs for transportation of personnel, equipment, and operating supplies to the site; necessary facilities for the Contractor's operations at the site; premiums paid for performance and payment bonds, including coinsurance and reinsurance agreements as applicable; and other items as specified in this specification.

Demobilization shall include all activities and costs for transportation of personnel, equipment, and supplies not included in the contract from the site; including the disassembly, removal and site clean up/ repair of offices, buildings, and other facilities assembled on the site for this contract.

This work includes mobilization and demobilization required by the contract at the time of the award. If additional mobilization and demobilization activities and costs are required during the performance of the contract as a result of the changed, deleted, or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the item or items of work changed or added.

The Contractor shall provide and pay all the cost for toilet facilities for all workmen, as required by local ordinances for complete and adequate sanitary arrangements. Sanitary facilities and the surrounding area shall be kept clean and neat at all times. They shall be located on the project site as approved by the Engineer.

Measurement

The work specified under this Section shall be measured at the contract lump sum price in accordance with a schedule agreed upon by the Contractor and the Town of Sparta.

Payment

Payment shall be made under:

MOBILIZATION AND DEMOBILIZATION.....LS

B. CLEARING AND GRUBBING

Description

The work of clearing and grubbing shall consist of the cutting, removal, and satisfactory disposal of all vegetation including trees, root mass, underbrush, shrubs, and multi-trunk trees with a caliper of less than 12” (measured 48” above the adjacent ground), and debris, both natural and man-made.

Materials and Methods

Clearing and grubbing on this project shall be performed only to the extent necessary to install the measures as shown on the plans. The Contractor shall obtain approval of clearing limits from Engineer prior to commencing clearing.

The quantity of clearing and grubbing shall be limited to that needed for progress of daily construction unless otherwise directed by the Engineer. All debris resulting from clearing and grubbing activities not otherwise suitable for backfill or other project applications (excavated soil stockpile site) becomes the property of the Contractor and is to be satisfactorily disposed of off-site in a lawful manner at least once per week. No on-site burning or burial will be allowed.

Measurement

The quantity of Clearing and Grubbing which has been completed and accepted will be paid in one lump sum.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

CLEARING AND GRUBBING.....LS

C. SURVEY AND LAYOUT

Description

The survey layout shall be conducted in accordance with Section 801 of the 2006 NCDOT Standard Specifications and shall include but is not limited to all surveying, stakeout, construction layouts, and engineering necessary for the proper control of construction operations in accordance with the plans and as directed by the Engineer.

The Engineer will provide stakeout information, including any existing benchmark and monument locations. Surveying will be conducted by a professional licensed surveyor in the State of North Carolina.

Methods and Materials

The work to be performed under this Section consists of furnishing all labor, materials and equipment necessary to perform the survey work required for the execution of the Project and survey measurement of quantities for payment as reviewed and approved by the Engineer, all as indicated in the Contract documents.

The Contractor shall hire a qualified licensed land surveyor, acceptable to the Contractor and the Engineer.

The Engineer will provide initial controls (horizontal and vertical) as shown on the drawings. The Contractor shall use these to establish their own construction controls for the Project.

The Contractor shall transfer the line and grade from the controls shown on the plans as is necessary to do the work. She/He shall also be responsible for the preservation of all stakes and marks, as previously established by the Engineer. Any and all alterations of previous established survey shall be replaced, as before, solely at the Contractor's expense. As it is the Contractor's responsibility to perform the work from the basic control, the Contractor shall, before performing the work, satisfy him/herself that s/he has adequate control to lay out the work for line and grade, and that s/he fully understands the control as set, in order to insure the completion of the Project as per the plans. If there are any questions or discrepancies pertaining to the survey work, the Contractor shall immediately notify the Engineer for clarification, or for additional control, prior to doing the construction work. For the Contractor to do the work implies that s/he has complied with this requirement, and if s/he has not, the work done shall be at the Contractor's risk. The Contractor shall furnish all stakes, templates, straightedges, and other devices necessary for checking, marking, and maintaining points, lines and grades. All surveys made by the Contractor, as provided above, shall be properly recorded in duplicate field notebooks satisfactory to the Engineer. All pages for a ring binder shall be furnished to the Engineer at the intervals requested. When each bound notebook is filled or completed, it shall be furnished to the Engineer. The instruments and other equipment used in surveying by the Contractor, as provided in this Section, shall be suitable and maintained in proper condition and adjustment for such use. Such surveying shall be performed by personnel qualified and experienced in such work and under the direct supervision of a qualified surveyor.

Tolerances in setting survey stakes shall not exceed those stated below:

SURVEY STAKE OR MARK TOLERANCE OF ERROR IN ALIGNMENT:

	Distance Ratio	Feet (100 ft)	Tolerance (feet)
Marks or control hubs and monuments on centerlines and offset centerlines	1:5,000	0.02	+ 0.01
Intermediate stakes or marks on centerline and offset centerlines	1:2,500	0.04	+ 0.02
Rough excavation and embankment for roads, sidewalks and other work not otherwise provided	1:500	0.20	+ 0.10
Trimming or preparation of earth sub grade and roadways, sidewalks, pipe bedding and	1:2,500	0.04	+ 0.02

concrete foundations			
Trimming of excavation and embankment, unless otherwise provided	1:1,000	0.10	+ 0.05
Roadway subbase and base, and water mains and other work not otherwise provided for	1:2,000	0.05	+0.025
Roadway surfacing, steel reinforcement, sewers and formed concrete	1:5,000	0.20	+ 0.01

GRADE STAKES OR ELEVATIONS FOR:

	Elevation of (ft)
Rough excavation and embankment for roads and other work not otherwise provided for	+ 0.01
Trimming of excavation and embankment unless otherwise provided	+ 0.05
Trimming and preparation for earth subgrade for roadways, pipe bedding and concrete foundations	+ 0.02
Roadway surfacing, steel reinforcement, sewers and formed concrete	+ 0.01

The Engineer shall not be responsible for transferring grade from controls to locate the elevation of the work. The Contractor shall submit a certificate to the Engineer signed by licensed engineer or licensed surveyor certifying that elevations and locations of improvements are in conformance, or non conformance, with the contract documents.

Measurement

Survey layout will be measured for payment as a lump sum item which will include all labor, equipment and related expenses.

Payment

Survey Layout.....LS

D. EARTHWORK

Description

Earthwork shall be performed to the lines and grades indicated on the plans or established by the Engineer. The tolerance for earthwork shall be +/- 0.1 foot. All grading and excavation shall be conducted within the Limits of Disturbance as shown on the Drawings. The work shall include excavation, grading, hauling of excess material, plugging ditches, and placement and compaction or satisfactory

disposal of all materials encountered within the limits of the work necessary for the construction of the project. Removal of material, regardless of its nature or composition, encountered above the sub-grade elevations is considered Earthwork and may include rock, soil materials and obstructions. No changes in the contract sum or the contract time will be authorized for rock excavation or removal of obstructions.

Methods and Materials

All excavated topsoil shall be stripped to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials. The excavated materials will be used within the immediate work area to achieve final grades, hauled to another Project area for use, or hauled to a disposal area. Topsoil will be stockpiled separately from other materials. Excavated topsoil shall be used to achieve final grades on all stormwater wetlands. Topsoil shall be placed and spread evenly to a depth of at least 6 inches on top of subsoil materials to achieve final grades on all stormwater wetlands. Soil backfill used in areas to meet finished grade shall be relatively clean soil free of debris. Soil backfill shall be compacted in horizontal lifts not exceeding 8" and placed at a 0% slope. Each lift should be uniformly compacted to a dry density of at least 95% of the material's maximum dry density per ASTM D 698 (Standard Proctor).

Ditch plug areas will be constructed according to the detail located in the plans. Fill material used for ditch plugs shall be free of debris, rocks, trash, etc. and shall consist of compactable soil material. Fill shall be placed in the ditch plugs areas and compacted in lifts of no more than 8 inches per lift. The completed ditch plugs shall be free of voids and shall be impermeable to water flow through the block.

All banks shall be graded evenly and smoothly at the slopes and elevations indicated on the drawings. The Contractor shall carry the top of embankments to the surrounding grade so that upon compaction and subsequent settlement, the grade will be at a proper elevation represented in the plan set

The Contractor shall at all times, protect adjacent properties from damage due to trenching and backfilling. Damage to adjacent properties due to operations by the Contractor shall be repaired at the Contractor's expense to the satisfaction of the Owner.

Any movement of utilities including but not limited to power poles, telephone poles, underground utilities etc. will be covered under this section. The contractor shall be responsible for contacting utilities companies to remove or relocate any utility on the project site that will interfere with the design.

The Contractor shall use all precautions necessary to prevent damage or interruptions of services of any utility and shall be responsible for any and all damage to existing trees, structures, utilities, etc., from operations under the contract. The Contractor shall notify all utilities existing in the area.

The Contractor shall employ barricades and lanterns, erect and maintain temporary fences and guardrails and other provisions necessary for the safe and expeditious progress of the work and to safeguard against any damage to life and/or property.

At the end of each workday, each disturbed area must have protection measures installed as called for on the plans or as directed by the Engineer. As grading is completed, the slopes shall be stabilized as specified on the plans.

On-site soil shall be tested by an independent testing service to determine the potential dry density compaction. If it is determined that the existing soil is unsuitable for embankment construction, suitable material shall be obtained off-site. The off-site material shall also be tested. All testing and, if necessary, additional soil material (including all materials, equipment, and labor necessary to excavate, haul, place and compact additional soil material) shall be the responsibility of the Contractor and considered incidental to the Earthwork bid item. All testing shall be conducted under the responsible charge of a licensed geotechnical engineer.

Measurement

The quantity of Earthwork will be measured for payment as a lump sum item which will include all material, labor and associated expenses.

Payment

Earthwork.....LS

E. DEWATERING PUMP OPERATIONS

Description

A pump shall be used to dewater the work area during construction as needed.

Methods and Materials

The work area shall be dewatered as shown in the plans. The size of the pump used shall be determined by the onsite Contractor with approval from the project Engineer. The pump includes temporary flexible hose in sufficient length to pump the water from the work area to the special stilling basin. The special stilling basins shall be a water permeable fabric bag that traps sand, silt, and fines as sediment laden water is pumped into it. The filter fabric shall meet the requirements of Section 1056 for Type 2 Fabric. The special stilling basin shall be a bag constructed to a minimum size of 10' x 15' (3m x 4.6m) made from a nonwoven fabric. It shall have a sewn-in 8 in. (20.3cm) (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 minimum wide width strength as follows:

Test Method	Minimum Specifications
ASTM D4884	60 lb/in (10.7 kg/cm)

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	Minimum Specifications	
		English	Metric
Weight	ASTM D3776	8.0 oz/yd	248.03 g/m
Grab Tensile	ASTM D4632	200.0 lb	90.72 kg
Puncture	ASTM D4833	130.0 lb	58.97 kg
Flow Rate	ASTM D4491	80.0 gal/min	0.47 l/s/sm
Permittivity	ASTM D4491		1.51 l/sec
UV Resistance	ASTM D4355		70%

The special stilling basins shall be placed so the incoming water flows into and through the bag without causing erosion. The bag will sit on a 2 inch thick layer of #57 stone on top of Nonwoven Type 2 filter fabric. The contractor will grade the bed to ensure that the filtered water will exit at the desired location. The exit location shall be chosen to prevent 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 basins shall be replaced and disposed of when it is ¾ full of sediment, when it is impractical for the bag to filter the sediment out at a reasonable flow rate, or when it becomes punctured or torn. 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. The contractor shall provide and use as many bags as is necessary to complete all dewatering activities.

Measurement

The quantity of Earthwork will be measured for payment as a lump sum item which will include all material, labor and associated expenses.

Payment

Earthwork.....LS

F. FILTER FABRIC

Work under this section consists of furnishing all labor, materials, equipment, supplies, supervision and tools, and performing all work necessary for installation of filter fabric as shown on the plans and details.

Methods and Materials

The fabric shall meet the material requirements indicated in NCDOT Specifications Section 1056 – for Type 2 Filter Fabric. Filter fabric shall be at least 75 mils thick with a minimum weight of 6oz/sq yd. Materials also include all necessary hardware to properly secure fabric per manufacturer's recommendations. Work under this section shall be installed per plans and details.

Measurement

Filter fabric shall be considered incidental.

G. STONE

Description

The work covered by this section consists of furnishing, stockpiling, placing and maintaining an approved stone to be utilized to construct forebay structures, emergency spillways, and sediment and erosion control structures and for use in other locations as directed by the Engineer. This work includes all labor, materials, equipment, supplies, supervision and tools necessary for the installation of stone as shown on the plans and details.

Methods and Materials

Stone for “#57 Stone”, “Class A”, “Class B” and “Class II”, shall consist of blasted granite quarry stone stockpiled on-site and 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. The stone shall be native to the area and of approved color.

All stone shall meet the approval of the Engineer. The size of an individual stone particle will be determined by measuring its long dimension.

Class	Required Stone Size (inches)		
	Minimum	Average	Maximum
#57	0.25	0.5	1.5
Class A	2	4	6
Class B	5	8	12
Class II	6	10	14

No more than 5.0% of the material furnished can be less than the minimum size specified. No more than 10.0% of the material can exceed the maximum size specified. The Contractor shall place stone in locations shown on the plans or as directed by the Engineer, to the thickness, widths, and lengths as shown on the plans and described in the specifications and details, or directed by the Engineer. All stone shall be placed in accordance with the plans, neatly and uniformly, and shall meet the approval of the Engineer.

Measurement

The quantity of all stone to be paid for will be the actual number of tons that has been delivered, stockpiled and installed on the project. 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.

Stone used in the temporary construction entrance, temporary rock check dam and dewatering pump operation shall be considered incidental.

The quantity of stone properly placed and accepted by the Engineer and measured as provided above will be paid for at the contract unit prices per ton for "Class B".

The Contractor will be responsible for providing written certification ("truck tickets") that the delivered stone weight and gradation for each truck load meets the requirements as stated in this specification.

Payment

The quantity of Stone installed will be paid for at the contract unit price per ton.

Stone.....Ton

H. EROSION CONTROL MATTING

Description

This work consists of furnishing and installing erosion control matting on the finished grade, as designated on the plans and details, or as directed by the Engineer.

Methods and Materials

Ecostakes: Provide ecostakes made from wood not less than 12 in. (300 mm) in length with a notch cut 1 in. (25 mm) from the top. These stakes shall be used to stake the matting along the slopes and spaced approximately 1 foot apart.

Large wooden stakes: Provide large hardwood stakes to be used to secure the matting at the toe of slope, seams and in the center of the matting. The large

wooden stakes shall have a minimum 1.5-inch by 1.5-inch cross-section and shall taper to a point. These stakes shall have a 2.5 inch galvanized roofing nail driven through the square end of the stake so that 0.5 inches of nail is extruding from both sides of the stake. The nail is to be installed in the large stakes so the matting will not slide past the exposed end of the stake. Large stakes shall be spaced a minimum of 18 inches apart

Matting: Provide coir fiber matting to meet the specifications of the C-7.

The erosion control blanket/channel lining shall be a machine-produced mat of 100% coconut fiber with the following properties:

Matrix	100% Coconut Fiber
Weight	20 oz/SY (678 gm/m ²)
Tensile Strength	1348 x 626 lb/ft minimum (1650.5 x 766.5 kg/m)
Elongation	34% x 38%
Open Area (measured)	50%
Thickness	0.30 in minimum (7.6 mm)
Flexibility	65030 x 29590
Recommended Flow	11 feet/second (3.35 m/s)
Size	6.6 x 164 ft (120 SY) or (100 SM)
"C" Factor	0.002

Property	Test Method	Typical
Thickness	ASTM D5199/ECTC	0.236 in. (6.60 mm)
Resiliency	ECTC Guidelines	85%
Mass per Unit Area	ASTM D5261	10.72 oz/yd ² (360 g/m ²)
Water Absorption	ASTM D1117/ECTC	155%
Swell	ECTC Guidelines	40%
Stiffness/Flexibility	ASTM D1388/ECTC	0.11 oz-in (1,218 mg-cm)
Light Penetration	ECTC Guidelines	16.40%

MD Tensile Strength	ASTM D5035	342.00 lbs/ft (4.98 kN/m)
MD Elongation	ASTM D5035	7.60%
TD Tensile Strength	ASTM D5035	211.00 lbs/ft (3.08 kN/m)
TD Elongation	ASTM D5035	11.10%

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

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

Place large stakes along the toe and down the center of each strip of matting 18 inches 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.

Measurement

This item will be measured by each square yard furnished, installed and accepted by the Engineer, including all materials, labor, machinery, maintenance, hauling, preparing, and installing of the item to complete the work in an acceptable manner.

Payment

The quantity of Erosion Control Matting installation will be paid for at the contract unit price per square yard. Stakes and nails shall be considered incidental to the coir fiber matting.

Coir Fiber Matting.....SY

I. WETLAND VEGETATION

Description

This work shall consist of furnishing and installing trees, and herbaceous plugs in the constructed wetland areas as indicated on the plans or as directed by the Engineer.

Prior to start of work, the Contractor shall submit a proposed planting schedule, including source of plant material, to the Engineer for review. No work shall be performed until the Engineer approves this schedule.

In order to verify planting density, the Engineer may request the Contractor to stake the location of individual plants within the approved Planting Zones.

Materials

The species shown in the plans shall be used. Alternate species may be used upon approval by the Engineer.

Methods

All wetland vegetation shall be installed by a certified landscape professional or an individual with a B.S. in Biology. Spacing of herbaceous plug vegetation shall be 3' on center for low and high marsh zones and 4' on center for deep pool zones. 2" caliper trees shall be planted in a location specified by the engineer.

Herbaceous plug vegetation shall be planted between April 1st and September 30. 2" caliper trees may be planted at any time during the year. No planting shall be done when the temperature is below 32°F, when soil to be excavated for the plant hole is frozen, when the sides or bottom of the plant hole are frozen, or when the soil to be used for backfilling is frozen. Herbaceous plug vegetation shall be a minimum of 2" in diameter and 5" in length.

Immediately following delivery to the project site, if not promptly planted, herbaceous plug vegetation shall be heeled-in, in constantly moist soil or sawdust in an acceptable manner corresponding to generally accepted horticultural practices and as shown in the plan set. While plugs are being transported to and from heeling-in beds, or are being distributed in planting beds, or are awaiting planting after distribution, the Contractor shall protect the plants from drying out by means of wet canvas, burlap, or straw, or by other means acceptable to Engineer and appropriate to weather conditions and the length of time the roots will remain out of the ground.

Herbaceous plugs shall be installed by the "Dibble Planting Method". The planting trench or hole shall be deep and wide enough to permit the roots to spread out and down without J-rooting. The plant stem shall remain upright. Soil shall be replaced around the transplanted vegetation and tamped around the tree firmly to eliminate air pockets.

2" caliper trees shall be planted by the "Pit Method". The pit shall be partially filled with topsoil and compacted enough to hold the ball firmly.

Vegetation shall be watered daily while the Contractor's crew is on site. Bare areas shall be raked to break up soil.

The Contractor shall ensure a survivability of 80% of all planted wetland vegetation for successful completion of this work. The Contractor will add soil amendments, irrigate and re-plant as necessary in order to achieve this criteria. The Engineer will determine the survivability of wetland vegetation. Re-planting, soil amendments and irrigation will be considered incidental to this task.

Measurement

The quantity of Wetland Vegetation which has been installed as directed and accepted will be paid in one lump sum.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

WETLAND VEGETATION.....LS

J. PERMANENT SEEDING AND MULCHING

Description

This work shall consist of furnishing growing and establishing all herbaceous seed for the planting zones as indicated on the plans, or as directed by the Engineer.

Prior to start of work on this item, the Contractor shall submit a proposed seeding schedule, including the source and content of the seed mix, to the Engineer for review. No work shall be performed until the Engineer approves this schedule.

Materials

Seed: Seed shall consist of seed varieties specified in the composition and planting schedules on the plans for the "Permanent Riparian Seed Mix" planting zones.

Seed shall be certified that the Pure Live Seed (PLS) percentage is equal to or greater than that which is specified on the Plant Schedules. If the PLS is less than specified, the Contractor shall increase the seeding rate to compensate for the PLS difference at his/her own expense.

All seed and seed varieties shall be free from State and Federal prohibited noxious weed seeds and the following:

Annual bluegrass

Corn cockle

Spurred anoda

Bermuda grass	Dodder	Wild garlic
Bindweed	Giant foxtail	Wild onion
Cocklebur	Horse nettle	

Mulch: Seed mulch shall consist of clean, dry, mildew and seed free, threshed straw of wheat mulch. Mulch shall be applied at a rate of 130 bales per acre.

Water: Water used in the establishment or caring of plants and seed shall be free from any substance that is injurious to plant life.

Fertilizer: The Contractor shall use organic fertilizers in lieu of petroleum-based fertilizers. Suitable products that are commercially available are marketed and certified as 'organic' or 'natural' fertilizers. Organic materials shall include such items as sea grasses/kelp, rock powder, bone meal, whey, bean meal, blood meal, composted manure, etc. Product nutrient content shall be identified in the standard form of Nitrogen (N), Phosphorous (P) and Potassium (K) ratios. Fertilizer nutrient content shall be 20-10-5. The application rate shall be equivalent to a 5-gram tablet per bare root plant. The Engineer must approve any proposed substitution to this nutrient content. Application rates of fertilizers shall be 800-1200 lb/acre of 10-10-10 (or the equivalent).

Limestone: Application rates of limestone shall be 1-1½ tons/acre.

Methods

The seed mixes are specified on the planting plan. Areas not disturbed shall not be seeded. Permanent seeding shall be applied at the rate of 30 lbs/acre.

All areas to be seeded shall conform to the finished grades as specified on the plans and be free of all weeds, trash, debris, brush, clods, loose rocks and other foreign materials larger than 3" in diameter or length that would interfere with seeding. All gullies, washes or disturbed areas that develop subsequent to final dressing shall be repaired prior to seeding.

No seeding shall be performed on frozen ground or when the temperature is 32°F/0°C or lower.

Seeding shall be accomplished by using a broadcast spreader, or as indicated by the Engineer. The Engineer, prior to Bid Submittal, must approve any alternative seeding method. All seeding equipment shall be calibrated before application to the satisfaction of the Engineer so that the material is applied accurately and evenly to avoid misses and overlaps. Seed installed by a broadcast spreader shall be capable of placing seed at the specified rate.

Seed shall be applied within the top ¼ inch of the soil in two different directions. The Contractor shall maximize the seed/soil contact by firming soil around the seed with a cultipacker, other similar equipment, or by hand raking.

Immediately after seeding, the site shall be watered lightly but thoroughly so that the top 4" of soil is saturated. The Contractor shall mulch all seeded areas within

24 hours after seeding. Seeded areas shall be watered by the contractor daily while the crew is on site or as determined by site conditions and the Engineer.

Soil amendments, seed and mulch shall be applied prior to installing erosion control matting on all berm slopes.

The Contractor is required to have 80% ground cover from established herbaceous vegetation. The Contractor will add soil amendments, irrigate and re-seed and mulch as necessary in order to achieve this criteria. The Engineer will determine the amount of ground cover established. Re-seeding and mulching, soil amendments and irrigation will be considered incidental to this task.

Final cleanup shall be the responsibility of the Contractor and consist of removing all trash and materials incidental to the project and disposing of them off-site.

Measurement

The quantity of Permanent Seeding which has been planted as directed and accepted will be paid in one lump sum.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

PERMANENT SEEDING.....LS

K. TEMPORARY SEEDING AND MULCHING

Description

This work shall consist of furnishing growing and establishing all temporary herbaceous seed and mulch for all areas disturbed by construction as directed by the Engineer. Temporary seeding shall be completed within 24 hours of completion of grading activities in any work area. Temporary seed shall be spread with permanent riparian seed in most areas.

Materials

Seed: Apply the following vegetation at the listed rates.

Fall, Winter, Spring Seeding (September - March):

Rye grain 1 lb per 1,000 sq feet or 45 lbs per acre

Summer Seeding (April - August):

Browntop Millet 3 lb per 1,000 sq ft or 15 lbs per acre

Mulch: Mulch shall consist of clean, dry, mildew and seed free, threshed straw of wheat mulch. Mulch shall be applied at a rate of 130 bales per acre.

Methods

All disturbed ground, haul roads and construction staging areas shall receive temporary seed and mulch. Areas not disturbed shall not be seeded.

All areas to be seeded shall conform to the finished grades as specified on the plans and be free of all weeds, trash, debris, brush, clods, loose rocks and other foreign materials larger than 3" in diameter or length that would interfere with seeding. All gullies, washes or disturbed areas that develop subsequent to final dressing shall be repaired prior to seeding. No seeding shall be performed on frozen ground or when the temperature is 32 deg. F/0 deg. C or lower.

Seeding shall be accomplished by using a broadcast spreader, or as directed by the Engineer. The Engineer, prior to Bid Submittal, must approve any alternative seeding method. All seeding equipment shall be calibrated before application to the satisfaction of the Engineer so that the material is applied accurately and evenly to avoid misses and overlaps. Seed installed by a broadcast spreader shall be capable of placing seed at the specified rate.

Seed shall be applied within the top ¼ inch of the soil in two different directions. The Contractor shall maximize the seed/soil contact by firming soil around the seed with a cultipacker, other similar equipment, hand raking or by dragging the surface with chain link fence.

Mulch shall be applied to all disturbed areas where temporary seed is applied, except for areas within the wetland cells. These areas will be protected with erosion control matting.

The Contractor is required to have 80% ground cover from established temporary vegetation. The Contractor will add soil amendments, irrigate and re-seed and mulch as necessary in order to achieve this criteria. The Engineer will determine the amount of ground cover established. Re-seeding and mulching, soil amendments and irrigation will be considered incidental to this task.

Final cleanup shall be the responsibility of the Contractor and consist of removing all trash and materials incidental to the project and disposing of them off-site in a manner as to not cause pollution.

Measurement

The quantity of temporary seeding and mulching which has been installed as directed and accepted will be paid in one lump sum.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

Temporary Seeding and Mulching.....LS

L. RISER OUTLET STRUCTURE

Description

Riser outlet structures shall be installed for the constructed wetland cells as shown in the plan set and in accordance with the details. These structures are designed to detain stormwater and control the discharge rate to meet requirements set forth in the North Carolina Department of Environment and Natural Resources (NCDENR) Stormwater Best Management Practices Manual.

Materials

The outlet structures consist of the following components; 60" corrugated aluminum riser pipe, 42" corrugated aluminum barrel, concrete anti-flotation pad with ¼" steel flange set 6" in the concrete as shown in the details, conical trash rack with an anti-vortex baffle, water quality orifice, and one anti-seep collar for each outlet pipe installed in the locations shown.

Riser and Barrel: The riser and barrel shall be constructed of 3"x1" or 5"x1" corrugated aluminum. The riser and barrel pipe shall conform to the requirements of ASSHTO Specification M-196 or M-211. Aluminum surfaces that are to be in contact with concrete shall be painted with one coat of zinc chromate primer or two coats of asphalt.

Concrete Anti-Floatation Pad: The anti-floatation pad shall be made of 3,600 psi concrete and reinforced with #3 rebar spaced 6" in both directions. The flange located at the bottom of the riser structures shall be mounted in the concrete to a depth of 6" as shown in the details.

Anti-Seep Collar: The anti-seep collar shall be constructed as shown in the details. Coupling bands, anti-seep collars end sections etc. must be composed of corrugated aluminum. Anti-seep collars shall be connected to the pipe in such a manner as to be completely water tight. Dimple bands are not considered watertight.

The water quality orifice shall be constructed of schedule 40, 3 inch PVC pipe and fittings as shown in the details. **Methods of attaching and sealing the water quality orifice to the riser shall be submitted to the Engineer for approval prior to installation.**

The conical trash rack and anti vortex baffle shall be constructed of aluminum and as shown in the details.

The Contractor shall provide shop drawings of the "Riser Outlet Structure" for approval by the Engineer prior to installation.

Methods

Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.

Hand trim excavations to required elevations as required. Correct over excavation with coarse aggregate.

Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.

Maintain optimum moisture content of bedding material to attain required compaction density.

Install pipe, fittings and accessories in accordance with ASTM D2321 manufacturer's instructions. Seal joints watertight. Earthen fill placed around pipe and riser structures shall be compacted in layers not exceeding 6 inches compacted depth and to a dry density of at least 98% of the material's maximum dry density per ASTM D 698 (Standard Proctor).

All connections must be completely watertight. The barrel connection to the riser shall be welded all around. If joining pipe sections is necessary, connections shall use a rubber or neoprene gasket. Helically corrugated pipe shall have continuously welded seams.

Do not displace or damage pipe or structure when compacting.

Measurement

The quantity of riser outlet structures that has been installed as directed and accepted will be paid per each.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

Riser Outlet Structure.....EACH

M. TEMPORARY SILT FENCE

Description

Geotextile sediment fences shall be used to trap sediment from areas of limited runoff. Sediment filters shall be properly anchored to prevent erosion under them. These works are temporary and shall be removed and the area restored to its original state when they are no longer needed or permanent measures are installed. Locations for sediment filters are shown on the plans.

Materials

Refer to sediment fence specifications (6.62) in the North Carolina Sediment and Erosion Control Manual (March 2009).

Methods

Temporary Silt Fence shall be installed as shown in the plans in details.

Measurement

The quantity of silt fence to be measured for payment will be the actual number of linear feet of silt fence installed and approved by the engineer.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

Temporary Silt Fence.....LF

N. TEMPORARY CONSTRUCTION ENTRANCE

Description

The work covered by this section consists of furnishing, installing, maintaining, and removing any and all materials required for the construction of the temporary construction entrance. A temporary construction access easement has been granted by a private landowner for access to the project site.

Materials

Refer to sediment fence specifications (6.06) in the North Carolina Sediment and Erosion Control Manual (March 2009). Filter fabric and stone used in the temporary construction entrance shall conform to the "Filter Fabric" and "Stone" sections of these Construction Specifications.

Methods

Temporary construction entrance shall be installed as shown in the plans in details. After construction is complete and contractor is removing equipment and materials from the project site, the contractor is to remove the temporary construction entrance and repair the area to a condition equal to or better than the pre-construction condition. The contractor shall be solely responsible for damage to any areas outside of the temporary construction easement and shall bare any and all cost for repairs and these cost shall not be part of this project.

Measurement

The quantity of temporary construction entrance which has been installed as directed and accepted will be paid in one lump sum.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

TEMPORARY CONSTRUCTION ENTRANCE.....LS

O. TEMPORARY ROCK DAM

Description

The work covered by this section consists of furnishing, installing, maintaining, and removing any and all materials required for the construction of the temporary rock dam.

Materials

Refer to sediment fence specifications (6.63) in the North Carolina Sediment and Erosion Control Manual (March 2009). Filter fabric and stone used in the

temporary construction entrance shall conform to the "Filter Fabric" and "Stone" sections of these Construction Specifications.

Methods

Temporary rock dams shall be installed as shown in the plans in details. The contractor is to remove the temporary rock dams only after getting approval from the engineer.

Measurement

The quantity of temporary rock dams that have been installed as directed and accepted will be paid per each.

Payment

The contract price will include all materials, labor and equipment to complete the work and remove debris from the site.

Temporary Rock Dam.....EACH

*** End Technical Specifications***

APPENDICES