

**Project Special Provisions
On-Site Mitigation**

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PROJECT SPECIAL PROVISIONS
ON-SITE MITIGATION

STREAM CHANNEL RELOCATION WORK:

The Contractor performing the stream relocation work on this project shall be on NCDOT's Approved Pre-Qualified List for Stream Restoration and Construction (Work Code 1601).

STREAM CHANNEL RELOCATION LIMITATIONS:

The following sequence of construction shall be followed in the areas designated on the plans as stream relocations. 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 Article 108-7 of the *Standard Specifications*.

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

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

Approx. -L- Sta. 89+10 to 94+85 LT (See OSM Plans)

Approx. -Y16- Sta. 11+75 to 13+25 LT (See sheets 2D-1 thru 2D-2)

CHANNEL SUBSTRATE MATERIAL:

Description

The work covered by this section consists of the furnishing, stockpiling, placing, and maintaining an approved stone to be utilized to construct streambank protection devices in and along the stream and at other locations designated in the plans or as directed.

The quantity of channel substrate material to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of channel substrate material may

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be increased, decreased, or eliminated entirely as directed. 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

Channel Substrate Material shall consist of natural field stone or natural river rock. Crushed stone from a quarry will not be permitted. The channel substrate material shall be sound, tough, dense, resistant to the action of air and water, and suitable in all respects for the purpose intended. Channel Substrate Material may contain small amounts of fine aggregate but shall contain no amounts of soil material.

All channel substrate material 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 diameter across the intermediate axis.

Channel Substrate Material shall be a mixture containing approximately the following size distribution:

50% Gravel - 0.12 to 3 inch diameter
50% Stone - 3 to 12 inch diameter

No more than 60% of the material furnished can be gravel material and no more than 75% of the material furnished can be stone material.

Measurement and Payment

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

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, maintaining material, and disposal of any material not incorporated into the project.

Payment will be made under:

Pay Item

Channel Substrate Material

Pay Unit

Ton

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IMPERVIOUS SELECT MATERIAL:**Description**

This work consists of furnishing, stockpiling, placing and maintaining impervious select material for stream plugs in locations as shown on the plans and cross-sections or as directed.

The quantity of impervious select material to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of impervious select material may be increased, decreased, or eliminated entirely as directed. 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

Materials that will function as impervious barriers to water movement shall be a silty or clay soil material meeting the requirements of AASHTP M 145 for soil classification A-2, A-6 and A-7 provided such materials do not have a Liquid Limit (LL) greater than 50. To maintain soil workability for placement and compaction, the following criteria shall apply for Plasticity Index (PI):

<u>Position of Borrow Material</u>	<u>Constraints on Plasticity Index (PI)</u>
Below the water table	Must be greater than 7 and less than 25
Above the water table	Must be greater than 7 and less than 35

Plasticity Index shall be determined in accordance with AASHTO T90 and the Liquid Limit shall be determined in accordance with AASHTO T89. The Contractor is cautioned that soils tend to become less workable as the PI increases above 20. Although a PI of 35 may be acceptable, the Contractor should be aware that additional efforts might be necessary to work the soil in order to achieve the minimum compaction standards.

Construction Methods

Impervious select material for stream plugs shall be constructed at locations as shown on the plans and cross-sections or as directed. Impervious select material for stream plugs shall be used at the outlet end of uncompacted channel fills, and may be used at other locations to provide surface drainage relief from the uncompacted fills.

(A) Clearing and Grubbing

Clear and Grub the stream plug cross-section on all sides to remove all vegetation and root mat material as directed to an elevation at least 1 ft. below the elevation of the existing channel cross-section.

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(B) Construction

Construct the stream plug using material that meets the requirements of the Materials section listed above. Construct the stream plug to the dimensions detailed on the plans.

Measurement and Payment

Impervious Select Material will be measured and paid for as the actual number of cubic yards of material, measured in their original position and computed by the average end area method, which has been acceptably excavated in accordance with the plans and specifications. Original cross-sections for the determination of the excavation quantities will be taken before any grading begins. Final cross-sections will be taken after the excavation has been completed, except that the plan typical sections will be used for the final cross-sections where, in the opinion of the Engineer, the work has been constructed in reasonably close conformity to the plan typical section. Original and final cross-sections will be taken by either ground or aerial survey methods, as determined by the Engineer.

Such price and payment will be full compensation for all work covered by this section, including but not limited to furnishing the source of the impervious select material, providing and implementing a development, use and reclamation plan; building, maintaining and obliterating haul roads; clearing and grubbing the source; removal and disposition of overburden and other unsuitable material; excavation; hauling; restoration of the source and haul roads to an acceptable condition, seeding and mulching and maintaining the work.

Payment will be made under:

Pay Item

Impervious Select Material

Pay Unit

Cubic Yard

PUMP AROUND OPERATION:**Description**

The work covered by this section consists of furnishing, installing, maintaining and removing any and all pump around operations used on this project. The Contractor shall install a pump around operation in locations chosen by the contractor and approved by the Engineer. The diversion pumping shall provide a passageway for the stream flow around the work site.

The quantity of diversion pumping may be increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work. See example pump around operation detail on the plans.

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Construction Methods

Install a temporary impervious dike as shown on the detail. Pump water around the work site. If the water is turbid or exposed to bare soil, pump through a special stilling basin. Follow detail for the pump around operation. Once the work is complete in an area remove the impervious dike and diversion pumping materials and equipment. Place structures in the area and stabilize immediately following removal of the pump around operation.

Measurement and Payment

Temporary impervious dikes will be considered incidental to the diversion pumping.

The pump around operation will be measured and paid for as lump sum for *Diversion Pumping*. This measurement shall include multiple installations and removals of the pump around operation.

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 necessary materials, construction, maintenance and removal of the impervious dike and pump around operation.

Payment will be made under:

Pay Item

Diversion Pumping

Pay Unit

Lump Sum

ROCK CROSS VANE:

Description

This work 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 as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

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Materials

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock cross vanes shall be constructed in accordance with the Rock Cross Vane Detail shown in the plans or as directed. 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 10 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 Geotextile and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A riprap as directed. 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.

Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

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

ROCK CROSS VANE FOR STEP POOLS:**Description**

This work 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 for step pools will be affected by the actual conditions that occur during the construction of the project. The quantity of rock cross vanes for step pools may be increased, decreased, or eliminated entirely as directed. 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

Refer to Division 10

Item	Section
Boulder	1042 and SP for Structure Stone
No. 57 Stone	1005
Riprap, Class A	1042-1
Geotextile for Drainage, Type 2	1056

Boulders shall be used as header and footer rocks for this device.

Construction Methods

Rock cross vanes for step pools shall be constructed according to the Rock Cross Vane for Step Pools Detail shown on the plans or as directed. 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 10 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 Geotextile and No. 57 stone. Voids between the header and footer rocks can be filled with hand-placed Class A riprap as directed. 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. The spacing of the rock cross vanes used to create the step pools shall be as shown on the Step Pool detail or as directed. The excavated pools shall be lined with No. 57 stone and backfill as shown on the Step Pool Detail.

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Measurement and Payment

Boulders will be measured and paid for as provided elsewhere in this contract.

No. 57 Stone will be measured and paid for as provided elsewhere in this contract.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

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

SITE GRADING FOR MITIGATION:**Description**

The Contractor shall perform grading as necessary to attain final surface elevations as shown on the plans and in the details.

Construction Methods**(A) Site Grading**

The Contractor shall perform grading as necessary to attain final surface elevations as shown on the plans and in the details. Field modifications shall be approved by the Engineer. Final grades shall meet the plan and stream dimensions within a tolerance of +/- 0.2 feet (2.4 inches).

(B) Stream Excavation/Ditch Filling

In areas where ditches are to be filled, the Contractor shall comply with the requirements of Subarticle 235-3(C) of the *Standard Specifications* to obtain a minimum 95% compaction rate. Lift thickness shall not exceed 1 ft. and compaction shall be achieved by use of mechanical compaction equipment only. Fill material shall be such that the Plasticity Index (PI) shall be equal to or greater than that of the PI in each surrounding soil strata. Organic material shall not exceed 10% of the total volume of the fill material used. No compaction shall be performed for graded areas unless directed.

Excess material shall be disposed of as shown on the plans or as directed.

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Measurement and Payment

All work completed under this section will be measured paid for as lump sum for *Grading*.

The above prices and payments will be full compensation for all work covered by this section.

Payment will be made under:

Pay Item

Site Grading for Mitigation

Pay Unit

Lump Sum

STREAMBANK REFORESTATION:**Description**

Streambank Reforestation will be planted in areas designated on the plans and as directed. See the Streambank Reforestation Detail Sheets.

The entire *Streambank Reforestation* operation shall comply with the requirements of Section 1670 of the *Standard Specifications*.

Materials**Item**

Coir Fiber Mat

Section

1060-14

Live Stakes:

Type I Streambank Reforestation shall be live stakes, planted along both streambanks. Live stakes shall be ½" - 2" in diameter. Stakes shall also be 2 ft. - 3 ft. in length.

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

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Staples, stakes, or reinforcement bars shall be used as anchors and shall meet the following requirements:

Wooden Stakes:

Provide hardwood stakes 12"- 24" long with a 2" x 2" nominal square cross section. One end of the stake must be sharpened or beveled to facilitate driving through the coir fiber mat and down into the underlying soil. The other end of the stake needs to have a 1"- 2" long head at the top with a 1"- 2" notch following to catch and secure the coir fiber mat.

Steel Reinforcement Bars:

Provide uncoated #10 steel reinforcement bars 24" nominal length. The bars shall have a 4" diameter bend at one end with a 4" straight section at the tip to catch and secure the coir fiber mat.

Staples:

Provide staples made of 0.125" diameter new steel wire formed into a *u* shape not less than 12" in length with a throat of 1" in width.

Bare Root Seedlings:

Type II Streambank Reforestation shall be bare root seedlings 12"-18" tall.

Construction Methods

Coir fiber matting shall be installed on the streambanks where live staking is to be planted as shown on the Streambank Reforestation Detail Sheets and in locations as directed. Work includes providing all materials, excavating and backfilling, and placing and securing coir fiber mat.

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 and permanent seeding. 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" 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" overlap. Construct check trenches at least 12" deep every 50 ft. longitudinally along the edges of the matting, or as directed. Fold over and bury matting to the full depth of the trench, close and tamp firmly. Overlap matting at least 6" where 2 or more widths of matting are installed side by side.

Wooden stakes, reinforcement bars, or staples may be used as anchors in accordance with the Streambank Reforestation Detail Sheets and as directed. Place anchors across the matting at ends, junctions, and check trenches approximately 1 ft. apart. Place anchors down the center of each

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strip of matting 3 ft. apart. Place anchors along all lapped edges 1 ft. apart. Refer to the Streambank Reforestation Detail Sheets for anchoring pattern. The Engineer may require adjustments in the trenching or anchoring requirements to fit individual site conditions.

During preparation of the live stakes, the basal ends 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.

Live stakes shall be spaced approximately 2 ft. on center. Live stakes shall be installed according to the configuration presented on the Streambank Reforestation Detail Sheets.

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 $\frac{3}{4}$ 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.

1" - 2" 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.

The bare root 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 the stream, as designated on the plans.

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 designated 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 and Payment

Streambank Reforestation will be measured and paid for as the actual number of acres of land measured along the surface of the ground, which has been acceptably planted in accordance with this section.

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Payment will be made under:

Pay Item

Streambank Reforestation

Pay Unit

Acre

SURVEYING FOR MITIGATION:**Description**

Surveying for Mitigation shall be performed in accordance with the applicable requirements of Section 801 of the *Standard Specifications* and shall include but not be limited to the layout of the stream channel, temporary and permanent easements, and all sensitive areas associated with the implementation of the design as indicated in the plans. The contractor shall maintain a level and rod onsite at all times for use by the Engineer to ensure adequate stream grades are achieved. This will not alleviate the contractor's responsibility to make certain that the stream is constructed in accordance with the project plans and provisions.

Construction Methods

Stakeout of the stream channel in its entirety shall be performed in such a way that the Engineer can verify the layout of the stream channel prior to construction activities commencing. The Contractor shall mark the proposed location of the top of banks and centerline of the channel. At a minimum, ditch stakes shall be placed to indicate the head of riffle and max pool locations within the proposed channel. Differing front and back slopes shall be indicated on the stake. Stakes should be maintained until final inspection of the project. There will be no additional payment for re-staking.

Upon completion of the stakeout and prior to beginning construction, the contractor shall give the Engineer a 48-hour notice in order to approve the stream alignment.

Measurement and Payment

Payment for surveying for mitigation will be made for providing all construction layout, boundary surveying, and engineering necessary for the proper construction of the project in accordance with the project plans and special provisions. Surveying for adjustments to the stream alignment shall be considered incidental to the lump sum price for *Surveying for Mitigation*.

Payment will be made under:

Pay Item

Surveying for Mitigation

Pay Unit

Lump Sum

RIFFLE GRADE CONTROL**1.0 Description**

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to provide grade control.

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

2.0 Materials

Item	Section
No. 57 Stone	1005
Riprap, Class B, 1, and 2	1042
Channel Substrate Material	SP for Channel Substrate Material
Natural Sand	1005-3 and SP for Structure Stone

3.0 Construction Methods

Construct Riffle Grade Controls according to the Riffle Grade Control Detail shown on the plans or as directed.

Excavate bed and banks as described in Contract Documents. Excavate as necessary to achieve proper subgrade for placement of Riffle Stone Mix. Proper subgrade excavations will include the glide and run portions as specified in the plans.

Mix the multiple rock materials of the Riffle Stone Mix so it is well mixed.

Place the Riffle Stone Mix to the lines and grades specified in the plans. Place the Riffle Stone Mix to the full-course thickness in a manner that prevents segregation of the material sizes. Place larger particles of the Riffle Stone Mix to the full placement depth as indicated in the plans with smaller particles placed around the larger particles to promote interlocking and sealing of the structure. Place the Riffle Stone Mix in a manner that shingles the rock in the downstream direction. Do not simply dump Riffle Stone Mix to achieve final grade. Ensure a well-mixed and evenly distributed gradation of Riffle Stone Mix by rearranging individual rock as directed by the Engineer.

The structure will slope downstream as specified in the plans. Establish run and glide slopes according to the plans. Cover the run and glide portions of the structure with Channel Substrate Material. Compact this material to match proposed grade or pre-construction conditions as specified in the plans.

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4.0 Measurement and Payment

No. 57 Stone will be measured and paid for as provided in the special provision for *Structure Stone*. Mixing the No. 57 Stone into the Riffle Stone Mix is incidental to the No. 57 Stone item.

Natural Sand will be measured and paid for as provided in the special provision for *Structure Stone*. Mixing the Natural Sand into the Riffle Stone Mix is incidental to the Natural Sand item.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*. Mixing the Riprap, Class __ into the Riffle Stone Mix is incidental to the Riprap, Class __ item.

Channel Substrate Material will be measured and paid for as provided in the special provision for *Channel Substrate Material*.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing and mixing all materials, labor, equipment and incidentals necessary to construct the riffle grade controls.

ROCK TOE PROTECTION:**1.0 Description**

The work covered by this section consists of the construction of physical barriers placed along the banks of the stream at locations designated on the plans.

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

2.0 Materials

Refer to Division 10

Item	Section
Geotextile for Drainage, Type 2	1056-4
Riprap, Class 2	1042

3.0 Construction Methods

Construct Rock Toe Protection according to the Rock Toe Protection detail shown on the plans or as directed by the Engineer.

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Excavate a section of the proposed channel bed and associated channel banks to obtain the necessary sub-grade in areas requiring cut. Fill and compact fill material, as indicated in the Wetland and Stream Mitigation Plan, along the proposed channel bed and associated channel banks to obtain the necessary sub-grade in areas requiring fill. Conform excavation and fill for the installation of Riprap, Class 2 to ensure the finished grade of the rock toe protection conforms to the dimensions, grades and details shown in the plans.

Install geotextile in accordance with Section 876-3.

Place Riprap, Class 2 as indicated in the plans and directed. Place stone carefully to not puncture the geotextile. Construct the rock toe protection so that the exposed face of the stones is flush with the proposed grade.

4.0 Measurement and Payment

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Riprap, Class 2 will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

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

STREAM PLUG:

1.0 Description

This work consists of the construction, maintenance, and removal of physical barriers placed in ditches, diversions or swales to reduce water flow.

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

2.0 Materials

Stream plugs shall consist of *Impervious Select Material* that shall meet the specifications as provided elsewhere in this contract.

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3.0 Construction Methods

Stream plugs shall be constructed at locations as shown on the plans or as directed. Clear and grub all side slopes of the channel. Place stream plug in channel ensuring that there is at least 10 ft. of embankment material between the plug and the face of the restored stream bank. Construct the stream plug across the entire width of the channel and to an elevation of 0.5 ft below the proposed fill elevation as shown on the plans. The length of the stream plug is to be a minimum of 16 ft and a maximum of 18 ft.

4.0 Measurement and Payment

Stream plugs will not be measured for payment under this article. *Impervious Select Material* will be measured and paid for as provided in the special provision for *Impervious Select Material*. This payment shall be considered full compensation for all materials, labor, equipment, and incidentals necessary to construct the stream plug.

The removal and disposal of silt accumulations will be measured and paid for as *Silt Excavation* in accordance with Article 1630-4 of the *Standard Specifications*.

STRUCTURE STONE:

1.0 Description

This work consists of furnishing, stockpiling, placing and maintaining approved stone used 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 dissipaters, constructed riffles, wood drop riffles, riffle grade controls, rock toe protection and for use in other locations as directed.

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 as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

2.0 Materials

Refer to Division 10

Item	Section
No. 57 Stone	1005
Riprap, Class A, B, 1, and 2	1042
Geotextile for Drainage, Type 2	1056

Boulders shall meet the requirements of Section 1042 of the *Standard Specifications*. Boulders of minimum dimension 42" to 48" x 30" to 36" x 18" to 24" 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.

Natural Sand: Furnish sand that is made from natural material (e.g., sandstone) and meets size gradation requirements of 2S Fine Aggregate as in Article 1005-3 of the *Standard Specifications*. Sand manufactured from a mechanical process is acceptable as long as sand is made from natural material (e.g., sandstone). Sand made from limestone material will not be accepted. Provide material samples to the Engineer for approval a minimum of two weeks prior to furnishing material to the site. Use only material approved by the representative for construction. Material not conforming to the specified requirements will be rejected at no cost to NCDOT.

3.0 Construction Methods

The Contractor shall place Geotextile and stone in locations and to the thickness, widths, and lengths as shown on the plans or as directed. 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 contract and shall meet the approval of the Engineer.

4.0 Measurement and Payment

No. 57 Stone will be measured and paid as the actual number of tons that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. *No. 57 stone* that has been stockpiled will not be measured a second time.

Riprap, Class __ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Geotextile for Drainage will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*.

Boulders will be measured and paid for as the actual number of tons that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. *Stone* that has been stockpiled will not be measured a second time.

Natural Sand will be measured and paid for as the actual number of tons that have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. *Natural Sand* that has been stockpiled will not be measured a second time.

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, mixing, placing, and maintaining the stone and disposal of any materials not incorporated into the project.

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Payment will be made under:

Pay Item	Pay Unit
No. 57 Stone	Ton
Boulders	Ton
Natural Sand	Ton

TOPSOIL:

1.0 Description

Placing stockpiled topsoil and/or furnishing and placing topsoil along the stream at locations designated on the plans.

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

2.0 Materials

Stockpiled and/or furnished topsoil meeting the following requirements:

- Gradation:

Sieve	Minimum Percent Passing by Weight
2 inches	100
No. 4	90
No. 10	80

Sand, silt and clay material passing the No. 10 sieve as determined according to AASHTO T88:

Material	Minimum Percent	Maximum Percent
Sand	10	70
Silt	15	80
Clay	5	30

- Organic Matter not less than 3% nor more than 10% as determined according to AASHTO T194
- pH in accordance with Article 1019-2 of the *Standard Specifications*.

Provide independent testing to confirm the stockpiled and/or furnished topsoil meets the above requirements. Independent testing must have been completed within the most recent 12 months at the time topsoil is placed on the project. Provide results of independent testing to

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the Engineer for review and approval a minimum of 2 weeks prior to anticipated stockpiling or delivery of material to the site. Material not conforming to the above requirements will be rejected at no cost to NCDOT.

3.0 Construction Methods

Grade the areas where topsoil is to be placed according to the plans or as directed by the Engineer. Ensure that the subsoil elevation where topsoil will be spread is at appropriate elevations so that final grade will be attained once topsoil is properly installed. Ensure the subsoil surface is loos and able to provide a suitable bond for the topsoil layer. This can be accomplished by using acceptable methods (e.g., disking, scarifying, etc.) to a depth of two inches. Prior to placing topsoil, remove all stones, clods, lumps and other foreign material two inches or larger in any dimension.

Place topsoil to a sufficient depth to ensure a finished and compacted topsoil depth of six inches (+/- 1/2 inch). Ensure finished elevations of the topsoil meet lines and grades in the plans within acceptable project tolerance. Compact topsoil with a roller having a weight not over 120 pounds per foot width or by other acceptable methods, as approved by the Engineer. Remove overdepth topsoil, unless otherwise agreed upon in writing. Do not place topsoil in wet or frozen condition.

4.0 Measurement and Payment

Topsoil will be measured and paid as the actual number of cubic yards of topsoil placed as specified herein and accepted. Topsoil will be measured by pit measurement as provided in Subarticle 230-5(A) of the *Standard Specifications* or by truck measurement as provided in Subarticle 230-5(B) of the *Standard Specifications*, as directed by the Engineer. Such price and payment will be full compensation for stockpiling, furnishing and hauling all materials, labor, equipment and incidentals necessary to complete the work satisfactorily.

Payment will be made under:

Pay Item	Pay Unit
Topsoil	Cubic Yard

WOOD DROP RIFFLE:

1.0 Description

This work consists of the construction and maintenance of physical barriers placed in and along the stream at locations designated on the plans to provide grade control.

The quantity of wood drop riffles to be installed will be affected by the actual conditions that occur during the construction of the project. The quantity of wood drop riffles may be

increased, decreased, or eliminated entirely as directed. Such variations in quantity will not be considered as alterations in the details of construction or a change in the character of the work.

2.0 Materials

Item	Section
No. 57 Stone	1005
Rip Rap, Class B, 1, and 2	1042
Channel Substrate Material	SP for Channel Substrate Material
Natural Sand	1005-3 and SP for Structure Stone

Logs: Hardwood tree species with a trunk diameter of 8” to 16” and a minimum length of 10’ to allow proper construction in accordance with the Wood Drop Riffle Detail.

3.0 Construction Methods

Construct Wood Drop Riffles according to the Wood Drop Riffle Detail shown on the plans or as directed.

Excavate bed and banks as described in Contract Documents. Excavate as necessary to achieve proper subgrade for placement of Riffle Stone Mix. Proper subgrade excavations will include the glide and run portions as specified in the plans.

Place the Riffle Stone Mix to the lines and grades specified in the plans. Place the Riffle Stone Mix to the full-course thickness in a manner that prevents segregation of the material sizes. Place larger particles of the Riffle Stone Mix to the full placement depth as indicated in the plans with smaller particles placed around the larger particles to promote interlocking and sealing of the structure. Place the Riffle Stone Mix in a manner that shingles the rock in the downstream direction. Do not simply dump Riffle Stone Mix to achieve final grade. Ensure a well-mixed and evenly distributed gradation of Riffle Stone Mix by rearranging individual rock as directed by the Engineer.

The structure will slope downstream as specified in the plans. Establish run and glide slopes according to the plans.

Trench the installed Riffle Stone Mix to allow for the installation of embedded logs as shown in the plans. The trench width should be no more than six (6) inches greater than the log diameter. Embed logs into bed and banks and place at the angles, locations and embedment shown in the plans.

Replace bed material into the open space within the trench and compact to obtain a tight seal around the log.

Cover the run and glide portions of the structure with Channel Substrate Material. Compact this material to match proposed grade or pre-construction conditions as specified in the plans.

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4.0 Measurement and Payment

No. 57 Stone will be measured and paid for as provided in the special provision for *Structure Stone*. Mixing the *No. 57 Stone* into the Riffle Stone Mix is incidental to the *No. 57 Stone* item.

Natural Sand will be measured and paid for as provided in the special provision for *Structure Stone*. Mixing the *Natural Sand* into the Riffle Stone Mix is incidental to the *Natural Sand* item.

Riprap, Class ___ will be measured and paid for in accordance with Article 876-4 of the *Standard Specifications*. Mixing the *Riprap, Class ___* into the Riffle Stone Mix is incidental to the *Riprap, Class ___* item.

Channel Substrate Material will be measured and paid for as provided in the special provision for *Channel Substrate Material*.

Logs will be measured and paid for as the actual number of logs of each acceptable species and size, which have been incorporated into the work, or have been delivered to and stockpiled on the project as directed. Logs that have been stockpiled will not be measured a second time.

Such price and payment will be full compensation for all work covered by this section, including, but not limited to, furnishing and mixing all materials, labor, equipment and incidentals necessary to construct the wood drop riffles.

Payment will be made under:

Pay Item
Logs

Pay Unit
Each