CITY OF HAVELOCK
Post Office Box 368
Havelock, NC 28532

INVITATION TO BID

Pursuant to North Carolina General Statutes §143-131, the City of Havelock invites informal bids on the following:

Bids must be submitted in accordance with the attached specifications. Bids must include an itemized schedule of values (including quantity, unit price of materials, unit price of labor, and total) for each work element.
Bids can be submitted by mail, email, fax or hand delivered. Cover sheets, envelopes, etc. should be clearly marked with the words:

"City of Havelock, Oakwood Drive Bank Stabilization"

Address Bids to:

Lee Tillman, Director of Finance
City of Havelock
P.O. Box 368
1 Governmental Ave.
Havelock, NC 28532
Fax 252-447-0126
Email: Ltillman@havelocknc.us

Bids will be accepted until **1:00 p.m. (EST) on Monday 7 January 2019** at which time they will be reviewed in the office of the City Finance Director. Quotes are not subject to public inspection until the contract is awarded. The bids are good for 75 days after opening.

Bidders are cautioned not to submit bids until the proposed requirements and specifications have been carefully examined. It will be considered that bidders will have satisfied themselves as to the accuracy of the specifications. No proposal will be considered unless prices are submitted for all items requested in any section. The City reserves the right to change the amount of quantities.

The names of certain brands or makes denote quality standard in the article desired, but do not restrict bidders to the specific brand, make or manufacturer named. They are meant to convey to prospective bidders the general style, type, character and quality of the article desired.

The successful bidder on all construction contracts will be required to conduct the operation in accordance with all Federal, State, and Municipal health and safety rules, regulations and laws applicable to the operation. The successful bidder may be asked to provide the City with a copy of the company's safety plan prior to commencing work. For all projects over $30,000, a general contractor's license must be furnished to the City if applicable.

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Post Office Box 368
Havelock, NC 28532

N.C.G.S. (North Carolina General Statutes), specifically §160A-20.1(b), prohibit the City from entering into contracts with contractors and subcontractors who have not complied with the requirement of Article 2 of Chapter 64. The Contractor shall submit the E-Verify Affidavit, located in the Bid Proposal section, with their bid. Bids that do not include this Affidavit will be considered non-responsive.

N.C.G.S 147-86.55-69 requires certification for bids with a North Carolina Local Government. The certification is required at the time when a bid is submitted. N.C.G.S 147-86.55-69 requires that contractors with a North Carolina Local Government must not utilize any subcontractor found on the State Treasurer's Final Divestment List. The State Treasurer's Final Divestment List can be found on the State Treasurer's website at the address www.nctreasurers.com/Iran and will be updated every 180 days.

The City of Havelock reserves the right to reject any or all proposals and to purchase items from the state contract in the efforts to award the contract to the bidder it deems to be for the best interest of the City.

This institution is an equal opportunity provider, and employer.

Contact person(s) for information on this bid:

For questions in regards to the bid specifications, the City requires and only responds to questions submitted in writing and sent via email to:
Ltillman@havelocknc.us **AND cc:** Asmith@havelocknc.us

Questions must be received by **1:00 p.m. (EST) on Friday 21 December 2018.** If questions are received, the City will respond no later than **1:00 p.m. (EST) on Monday 31 December 2018.**

Today is December 7, 2018.

CITY OF HAVELOCK

_____
Lee W. Tillman
Finance Director

STATE OF NORTH CAROLINA
AFFIDAVIT
CITY OF HAVELOCK

I, _____ (the individual attesting below), being duly authorized by and on behalf of _____ (the entity hereinafter "Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of employee through E-Verify in accordance with NCGS §64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in the State and that employs 25 or more employees in this State. (mark Yes or No)

   a. YES_____, or

   b. NO_____

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This _____ day of _____, 20___.

_____
Signature of Affiant
Print or Type Name:_____

State of North Carolina County of _____

Signed and sworn to (or affirmed) before me, this the
_____ day of _____, 20___.

_____ _____
Signature of Notary Printed Name of Notary

My Commission Expires: _____

Bid Sheet

Base Bid: _____

NC Sales Tax: _____

Delivery Cost (if applicable): _____

Total Cost to City: _____

Bids must include an itemized schedule by quantity, unit price and total for each work element.

Company Name: _____

Company Address: _____

Contact Person: _____

Telephone Number: _____

NC Contractor's License Type and Number _____

Number of Addendums Acknowledged (circle one): N/A 1 2 3 4

IRAN DIVESTMENT ACT CERTIFICATION
REQUIRED BY N.C.G.S 147-86.55-69

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 147-86.55-69.

The undersigned herby certifies that he or she is authorized by the vendor or bidder listed above to make the forgoing statement.

Authorized Signature: _____

Print Name of Authorized Signature: _____

Title: _____

Address Bid to:

Lee Tillman, Director of Finance
City of Havelock
P.O. Drawer 368
1 Governmental Avenue
Havelock, NC 28532

Please indicate the Bid name on the outside of the envelope.

1. Summary of Work

   A. The Work to be done under this Contracts and in accordance with these Specifications consists of furnishing all equipment, superintendence, labor, skill, material and all other items necessary for the construction of the Oakwood Drive Streambank Stabilization. The Contractor shall perform all work required for such construction in accordance with the Contract Documents and subject to the terms and conditions of the Contract, complete and ready for use.

   B. The Scope of this work includes replacement of a section of sanitary sewer pipe, installation of sheet pile wall, construction of imbricated rock wall, improvements to existing gravel drive for traffic detour, full depth repair of existing asphalt failure, and removal and replacement of surface course on all pavement within limits of disturbance damaged during construction. Also included in this work are mobilization, traffic control, and erosion and sediment control.

   C. The foregoing description(s) shall not be construed as a complete description of all work required.

2. Contract Documents

   A. The Work to be done is shown on the set of Drawings entitled Oakwood Drive Streambank Stabilization and dated November, 2018. The numbers and titles of all Drawings appear on the index sheet of the Drawings, Drawing G-02. All drawings so enumerated shall be considered an integral part of the Contract Documents as defined herein.

   B. Certain Document Sections refer to Divisions of the Contract Specifications. Sections are each individually numbered portions of the Specifications (numerically) such as 08110, 13182, 15206, etc. The term Division is used as a convenience term meaning all Sections within a numerical grouping. Division 16 would thus include Sections 16000 through 16902.

   C. Where references in the Contract Documents are made to Contractors for specific disciplines of work (i.e. Electrical Contractor, etc.), these references shall be interpreted to be the single prime Contractor when the project is bid or awarded as a single prime contract.

3. General Arrangement

   A. Drawings indicate the extent and general arrangement of the work. If any departures from the Drawings are deemed necessary by the Contractor to accommodate the materials and equipment he proposes to furnish, details of such departures and reasons therefore shall be submitted as soon as practicable to the Engineer for approval. No such departures shall be made without the prior written approval of the Engineer. Approved changes shall be made without additional cost to the Owner for this work or related work under other Contracts of the Project.

   B. The specific equipment proposed for use by the Contractor on the project may require changes, in structures, auxiliary equipment, piping, electrical, mechanical, controls or

other work to provide a complete satisfactory operating installation. The Contractor shall submit to the Engineer, for approval, all necessary Drawings and details showing such changes to verify conformance with the overall project structural and architectural requirements and overall project operating performance. The Bid Price shall include all costs in connection with the preparation of new drawings and details and all changes to construction work to accommodate the proposed equipment, including increases in the costs of other Contracts.

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SECTION 01530

PROTECTION OF EXISTING FACILITIES

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Contractor shall be responsible for the preservation and protection of property adjacent to the work site against damage or injury as a result of his operations under this Contract. Any damage or injury occurring on account of any act, omission or neglect on the part of the Contractor shall be restored in a proper and satisfactory manner or replaced by and at the expense of the Contractor to an equal or superior condition than previously existed.

B. Contractor shall comply promptly with such safety regulations as may be prescribed by the Owner or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of, his employees. In the event of the Contractor's failure to comply, the Owner may take the necessary measures to correct the conditions or practices complained of, and all costs thereof will be deducted from any monies due the Contractor. Failure of the Engineer to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.

C. In the event of any claims for damage or alleged damage to property as a result of work under this Contract, the Contractor shall be responsible for all costs in connection with the settlement of or defense against such claims. Prior to commencement of work in the vicinity of property adjacent to the work site, the Contractor, at his own expense, shall take such surveys as may be necessary to establish the existing condition of the property. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled or sufficient funds to cover such claims have been placed in escrow, or that an adequate bond to cover such claims has been obtained.

1.02 PROTECTION OF WORK AND MATERIAL

A. During the progress of the work and up to the date of final payment, the Contractor shall be solely responsible for the care and protection of all work and materials covered by the Contract, except as provided for in Article 14.05 of the Supplementary Conditions.

B. All work and materials shall be protected against damage, injury or loss from any cause whatsoever, and the Contractor shall make good any such damage or loss at his own expense. Protection measures shall be subject to the approval of the Engineer.

1.03 BARRICADES, WARNING SIGNS AND LIGHTS

A. The General Contractor shall provide, erect and maintain as necessary, strong and suitable barricades, danger signs and warning lights along all roads accessible to the public, as required by the authority having jurisdiction, to insure safety to the public. All barricades and

obstructions along public roads shall be illuminated at night and all lights for this purpose shall be kept burning from sunset to sunrise.

B. Each Contractor shall provide and maintain such other warning signs and barricades in areas of and around their respective work as may be required for the safety of all those employed in the work, the Owner's operating personnel, or those visiting the site.

1.04 EXISTING UTILITIES AND STRUCTURES

A. The term existing utilities shall be deemed to refer to both publicly owned and privately owned utilities such as electric power and lighting, telephone, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.

B. Where existing utilities and structures are indicated on the Drawings, it shall be understood that all of the existing utilities and structures affecting the work may not be shown and that the locations of those shown are approximate only. It shall be the responsibility of the Contractor to ascertain the actual extent and exact location of existing utilities and structures. In every instance, the Contractor shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any work in the vicinity of existing utilities.

C. Prior to beginning any excavation work, the Contractor shall, through field investigations, determine any conflicts or interferences between existing utilities and new utilities to be constructed under this project. This determination shall be based on the actual locations, elevations, slopes, etc., of existing utilities as determined in the field investigations, and locations, elevation, slope, etc. of new utilities as shown on the Drawings. If an interference exists, the Contractor shall bring it to the attention of the Engineer as soon as possible. If the Engineer agrees that an interference exists, he shall modify the design as required. Additional costs to the Contractor for this change shall be processed through a Change Order as detailed elsewhere in these Contract Documents. In the event the Contractor fails to bring a potential conflict or interference to the attention of the Engineer prior to beginning excavation work, any actual conflict or interference which does arise during the Project shall be corrected by the Contractor, as directed by the Engineer, at no additional expense to the Owner.

D. The work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to insure uninterruption of existing services. Any damage resulting from the work of this Contract shall be promptly repaired by the Contractor at his own expense in a manner approved by the Engineer and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.

E. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction work, such support and protection shall be provided by the Contractor. All such work shall be performed in a manner satisfactory to the Engineer and the respective authority having jurisdiction over such work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Engineer may, at his discretion, have the respective authority to provide such support or protection as may be necessary to insure the safety of such utility, and the costs of such measures shall be paid by the Contractor.

PART 2 – PRODUCTS
(NOT USED)

PART 3 – EXECUTION
(NOT USED)

- - END OF SECTION - -

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SECTION 01550

SITE ACCESS AND STORAGE

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Access Roads

1. The General Contractor shall construct and maintain such temporary access roads as required to perform the work of this Contract.

2. Access roads, where possible, shall be located over the areas of the future road system.

3. Access roads shall be located within the property lines of the Owner unless the Contractor independently secures easements for his use and convenience. Contractor shall submit written documentation to the Engineer for any Contractor secured easements across privately held property. Easement agreement shall specify terms and conditions of use and provisions for site restoration. A written release from the property owner certifying that all terms of the easement agreement have been complied by the Contractor shall be furnished to the Engineer prior to final payment.

4. Existing access roads used by the Contractor shall be suitably maintained by the Contractor at his expense during construction. Contractor shall not be permitted to restrict Owner access to existing facilities. Engineer may direct Contractor to perform maintenance of existing access roads when Engineer determines that such work is required to insure all weather access by the Owner.

5. The Contractor shall obtain and pay all cost associated with any bonds required by the N.C. Department of Transportation for the use of State maintained roads.

B. Parking Areas

1. Each Contractor shall construct and maintain suitable parking areas for his construction personnel on the project site where approved by the Engineer and the Owner.

C. Restoration

1. At the completion of the work, the surfaces of land used for access roads and parking areas shall be restored by each Contractor to its original condition and to the satisfaction of the Engineer. At a minimum, such restoration shall include establishment of a permanent ground cover adequate to restrain erosion for all disturbed areas.

D. Traffic Regulations

1. Contractor shall obey all traffic laws and comply with all the requirements, rules and regulations of the NCDOT and other local authorities having jurisdiction to maintain adequate warning signs, lights, barriers, etc., for the protection of traffic on public roadways.

E. Storage of Equipment and Materials

1. Contractor shall store his equipment and materials at the job site in accordance with the requirements of the General Conditions, the Supplemental Conditions, and as hereinafter specified. All equipment and materials shall be stored in accordance with manufacturer's recommendations and as directed by the Owner or Engineer, and in conformity to applicable statutes, ordinances, regulations and rulings of the public authority having jurisdiction.

2. Contractor shall enforce the instructions of Owner and Engineer regarding the posting of regulatory signs for loadings on structures, fire safety, and smoking areas.

3. Contractor shall not store materials or encroach upon private property without the written consent of the owners of such private property.

4. Contractor shall not store unnecessary materials or equipment on the job site, and shall take care to prevent any structure from being loaded with a weight which will endanger its security or the safety of persons.

5. Materials shall not be placed within ten (10) feet of fire hydrants. Gutters, drainage channels and inlets shall be kept unobstructed at all times, except as required for purposes of sediment and erosion control.

6. Contractor shall provide adequate temporary storage buildings/facilities, if required, to protect materials or equipment on the job site.

PART 2 -- PRODUCTS

(NOT USED)

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 01700

PROJECT CLOSEOUT

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Final Cleaning

1. At the completion of the work, the Contractor shall remove all rubbish from and about the site of the work, and all temporary structures, construction signs, tools, scaffolding, materials, supplies and equipment which he or any of his Subcontractors may have used in the performance of the work. Contractor shall broom clean paved surfaces and rake clean other surfaces of grounds.

2. Contractor shall maintain cleaning until project, or portion thereof, is occupied by the Owner.

B. Final Cleanup; Site Rehabilitation

1. Before finally leaving the site, the Contractor shall wash and clean all exposed surfaces which have become soiled or marked, and shall remove from the site of work all accumulated debris and surplus materials of any kind which result from his operation, including construction equipment, tools, sheds, sanitary enclosures, etc. The Contractor shall leave all equipment, fixtures, and work, which he has installed, in a clean condition. The completed project shall be turned over to the Owner in a neat and orderly condition.

2. The site of the work shall be rehabilitated or developed in accordance with other sections of the Specifications and the Drawings. In the absence of any portion of these requirements, the Contractor shall completely rehabilitate the site to a condition and appearance equal or superior to that which existed just prior to construction, except for those items whose permanent removal or relocation was required in the Contract Documents or ordered by the Owner.

C. Final Inspection

1. Final cleaning and repairing shall be so arranged as to be finished upon completion of the construction work. The Contractor will make his final cleaning and repairing, and any portion of the work finally inspected and accepted by the Engineer shall be kept clean by the Contractor, until the final acceptance of the entire work.

2. When the Contractor has finally cleaned and repaired the whole or any portion of the work, he shall notify the Engineer that he is ready for final inspection of the whole or a portion of the work, and the Engineer will thereupon inspect the work. If the work is not found satisfactory, the Engineer will order further cleaning, repairs, or replacement.

3. When such further cleaning or repairing is completed, the Engineer, upon further notice, will again inspect the work. The "Final Payment" will not be processed until the

Contractor has complied with the requirements set forth, and the Engineer has made his final inspection of the entire work and is satisfied that the entire work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents.

D. Project Close Out

1. As construction of the project enters the final stages of completion, the Contractor shall, in concert with accomplishing the requirements set forth in the Contract Documents, attend to or have already completed the following items as they apply to his contract:

   a) Required testing of project components.

   b) Correcting or replacing defective work, including completion of items previously overlooked or work which remains incomplete, all as evidenced by the Engineer's "Punch" Lists.

   c) Attend to any other items listed herein or brought to the Contractor's attention by the Engineer.

2. In addition, and before the Certificate of Substantial Completion is issued, the Contractor shall submit to the Engineer (or to the Owner if indicated) certain records, certifications, etc., which are specified elsewhere in the Contract Documents. A partial list of such items appears below, but it shall be the Contractor's responsibility to submit any other items which are required in the Contract Documents:

   a) Test results of project components.

   b) Certification of equipment or materials in compliance with Contract Documents.

   c) One set of neatly marked up record drawings showing as built changes and additions to the work under his Contract.

   d) Any special guarantees or bonds (Submit to Owner).

3. The Contractor's attention is directed to the fact that required certifications and information under Item 3 above, must actually be submitted earlier in accordance with other Sections of the Specifications.

PART 2 – PRODUCTS
(NOT USED)

PART 3 – EXECUTION
(NOT USED)

- - END OF SECTION - -

SECTION 02100

CLEARING, GRUBBING, AND SITE PREPARATION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Includes all labor, material, equipment and appliances required for the complete execution of any additions, modifications, or alterations to existing building(s) or roadways and new construction work as shown on the Drawings and specified herein.

B. Principal items of work include:

1. Notifying all authorities owning utility lines running to or on the property. Protecting and maintaining all utility lines to remain and capping those that are not required in accordance with instructions of the Utility Companies, and all other authorities having jurisdiction.

2. Clearing the site within the Contract Limit Lines, including removal of grass, brush, shrubs, trees, loose debris and other encumbrances except for trees marked to remain.

3. Boxing and protecting all trees, shrubs, lawns and the like within areas to be preserved.

4. All injury to trees, shrubs, and other plants caused by site preparation operations shall be repaired immediately. Work shall be done by qualified personnel in accordance with standard horticultural practice and as approved by the Engineer.

5. Removing topsoil to its full depth from designated areas and stockpiling on site where directed by the Engineer for future use.

6. Disposing from the site all debris resulting from work under this Section at a properly permitted facility.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 - Earthwork

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. North Carolina Administrative Code, Title 15, Chapter 2.

1.04 STREET AND ROAD BLOCKAGE

(NOT USED)

1.05 PROTECTION OF PERSONS AND PROPERTY

A. All work shall be performed in such a manner to protect all personnel, workmen, pedestrians and adjacent property and structures from possible injury and damage.

B. All conduits, wires, cables and appurtenances above or below ground shall be protected from damage.

C. Provide warning and barrier fence where shown on the Drawings and as specified herein.

PART 2 – PRODUCTS

2.01 WARNING AND BARRIER FENCE

A. The fence shall be made of a visible, lightweight, flexible, high strength polyethylene material. The fence shall be MIRASAFE as manufactured by Mirafi, Inc., or equal.

PART 3 -- EXECUTION

3.01 CLEARING OF SITE

A. Before removal of topsoil, and start of excavation and grading operations, the areas within the clearing limits shall be cleared and grubbed.

B. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, fallen timber, brush, bushes, rubbish, sanitary landfill material, fencing, and other perishable and objectionable material within the areas to be excavated or other designated areas. Prior to the start of construction, the Contractor shall survey the entire Contract site and shall prepare a plan which defines the areas to be cleared and grubbed, trees to be pruned, extent of tree pruning, and/or areas which are to be cleared but not grubbed. This plan shall be submitted to the Engineer for approval. Should it become necessary to remove a tree, bush, brush or other plants adjacent to the area to be excavated, the Contractor shall do so only after permission has been granted by the Engineer.

C. Excavation resulting from the removal of trees, roots and the like shall be filled with suitable material free from rubbish and debris, as approved by the Engineer, and thoroughly compacted per the requirements contained in Section 02200, Earthwork.

D. In temporary construction easement locations, only those trees and shrubs shall be removed which are in actual interference with excavation or grading work under this Contract, and removal shall be subject to approval by the Engineer. However, the Engineer reserves the right to order additional trees and shrubs removed at no additional cost to the Owner, if such, in his opinion, are too close to the work to be maintained or have become damaged due to the Contractor's operations.

3.02 STRIPPING AND STOCKPILING EXISTING TOPSOIL

A. Existing topsoil and sod on the site within areas designated on the Drawings shall be stripped to whatever depth it may occur and stored in locations directed by the Engineer.

B. The topsoil shall be free of stones, roots, brush, rubbish, or other unsuitable materials before stockpiling the topsoil.

C. Care shall be taken not to contaminate the stockpiled topsoil with any unsuitable materials.

3.03 GRUBBING

A. Grubbing shall consist of the removal and disposal of all stumps, roots, logs, sticks and other perishable materials to a depth of at least 6-inches below ground surfaces.

B. Large stumps located in areas to be excavated may be removed during grading operations, subject to the approval of the Engineer.

3.04 DISPOSAL OF MATERIAL

A. All debris resulting from the clearing and grubbing work shall be disposed of by the Contractor as part of the work of this Contract at a properly permitted facility. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed by the Engineer for reuse in this Project or removal by others.

B. Burning of any debris resulting from the clearing and grubbing work will not be permitted at the site.

3.05 WARNING AND BARRIER FENCE

A. The fence shall be made of a visible, lightweight, flexible, high strength polyethylene material. The fence shall be MIRASAFE as manufactured by Mirafi, Inc., or equal.

B. Physical Properties

Fence:

Color:	International Orange
Roll Size:	4' x 164'
Roll weight:	34 lbs.
Mesh opening:	1-1/2" x 3"

Posts:

ASTM Designation:	ASTM 702
Length:	5 feet long (T-Type)
Weight:	1.25 #/Foot (min)
Area of Anchor Plate:	14 Sq. In.

C. Drive posts 12 to 18 inches into ground every 10' to 12'. Wrap fence material around first terminal post allowing overlap of one material opening. Use metal tie wire or plastic tie wrap to fasten material to itself at top, middle and bottom. At final post, cut with utility knife or scissors at a point halfway across an opening. Wrap around and tie at final post in the same way as the first post.

D. Use tie wire or tie wrap at intermediate posts and splices as well. Thread ties around a vertical member of the fence material and the post, and bind tightly against the post. For the most secure fastening, tie at top, middle and bottom. Overlap splices a minimum of four fence openings, tie as above, fastening both edges of the fence material splice overlap.

- END OF SECTION -

SECTION 02200

EARTHWORK

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials required to complete all work associated with excavation, including off-site borrow excavation, dewatering, backfill, drainage layers beneath and around structures, foundation and backfill stone, filter fabric, embankments, stockpiling topsoil and any excess suitable material in designated areas, in place compaction of embankments, backfill and subgrades beneath foundations and roadways, excavation support, disposing from the site all unsuitable materials, providing erosion and sedimentation control grading, site grading and preparation of pavement and structure subgrade, and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

B. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by the Engineer.

C. It is the intent of this Specification that the Contractor conduct the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

D. All work under this Contract shall be done in conformance with and subject to the limitations of the latest editions of the North Carolina Department of Transportation Standard Specifications for Roads and Structures and the North Carolina Erosion and Sediment Control Planning and Design Manual.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 1 and Division 2 of these Specifications.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced Specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

2. North Carolina Erosion and Sediment Control Planning and Design Manual, latest edition

3. American Society for Testing and Materials (ASTM):

ASTM C 127	Test for Specific Gravity and Absorption of Coarse Aggregate.
ASTM C 136	Test for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Particle Size Analysis of Soils.
ASTM D 423	Test for Liquid Limit of Soils.
ASTM D 424	Test for Plastic Limit and Plasticity Index of Soils.
ASTM C 535	Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
ASTM D 698	Standard Method of Test for the Moisture - Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12-inch (305 mm) Drop.
ASTM D1556	Test for Density of Soil in Place by the Sand-Cone Method.
ASTM D1557	Test for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lbs. (4.5 kg) Rammer and 18-inch (457 mm) Drop.
ASTM D2049	Test Method for Relative Density of Cohesionless Soils.
ASTM D2167	Test for Density of Soil in Place by the Rubber-Balloon Method.
ASTM D2216	Test for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
ASTM D2487	Test for Classification of Soils for Engineering Purposes.
ASTM D2922	Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 SUBSURFACE CONDITIONS

A. Attention is directed to the fact that there may be water pipes, storm drains and other utilities located in the area of proposed excavation. Perform all repairs to same in the event that excavation activities disrupt service.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, the Contractor shall submit the following:

1. Name and location of all material suppliers.

2. Certificate of compliance with the standards specified above for each source of each material.

3. List of disposal sites for waste and unsuitable materials and all required permits for use of those sites.

4. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.

5. Samples of synthetic filter fabric and reinforced plastic membrane with manufacturer's certificates or catalog cuts stating the mechanical and physical properties. Samples shall be at least one (1) foot wide and four (4) feet long taken across the roll with the warp direction appropriately marked.

6. Construction drawings and structural calculations for any types of excavation support required. Drawings and calculations shall be sealed by a currently registered Professional Engineer in the State of North Carolina.

7. Monitoring plan and pre-construction condition inspection and documentation of all adjacent structures, utilities, and roadways near proposed installation of excavation support systems.

8. Dewatering procedures.

1.06 PRODUCT HANDLING

A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site.

PART 2 -- PRODUCTS

2.01 SELECT FILL

A. Soils from the excavations meeting requirements stipulated herein with the exceptions of topsoil and organic material may be used as select fill for backfilling, constructing embankments, reconstructing existing embankments, and as structural subgrade support.

B. Select fill used for embankment construction shall be a silty or clayey soil material with a Maximum Liquid Limit (LL) of 50 and a Plasticity Index (PI) between 6 and 20.

C. Select fill used for backfilling shall either be material as described in Paragraph B above or a granular soil material with a Maximum Plasticity Index (PI) of 5.

D. Regardless of material used as select fill, materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density except that the moisture content shall not be more than 1% below nor more than 4% above the optimum moisture content for the particular material tested in accordance with the ASTM D698.

E. Select fill used as subgrade support shall be a coarse aggregate material meeting the gradation requirements of #57 or #78 aggregates in accordance with ASTM C-33, or Aggregate Base Course (ABC) as defined in Section 02207 – Aggregate Materials.

F. Where excavated material does not meet requirements for select fill, Contractor shall furnish off-site borrow material meeting the specified requirements herein. Determination of whether the borrow material will be paid for as an extra cost will be made based on Article 4 of the General Conditions, as amended by the Supplementary Conditions. When the excavated material from required excavations is suitable for use as backfill, bedding, or embankments, but is replaced with off-site borrow material for the Contractor's convenience, the costs associated with such work and material shall be borne by the Contractor.

2.02 TOPSOIL

A. Topsoil shall be considered the surface layer of soil and sod, suitable for use in seeding and planting. It shall contain no mixture of refuse or any material toxic to plant growth.

2.03 GEOTEXTILES

A. The Contractor shall provide geotextiles as indicated on the Drawings and specified herein. The materials and placement shall be as indicated under Section 02274 – Geotextiles and Section 02264 – Geotextile for Streamwork.

PART 3 -- EXECUTION

3.01 STRIPPING OF TOPSOIL

A. In all areas to be excavated, filled, paved, or graveled the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by the Engineer, for subsequent reuse. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials.

3.02 EXCAVATION

A. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

B. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by the Engineer. No excavation shall be wasted except as may be permitted by the Engineer. Refer to the drawings for specific location and placement of suitable excavated materials in the formation of embankments, backfill, and structural and roadway foundations. THE ENGINEER WILL DESIGNATE MATERIALS THAT ARE UNSUITABLE. The Contractor shall furnish properly permitted off-site disposal areas for the unsuitable material. Where suitable materials containing excessive moisture are encountered above grade in cuts, the Contractor shall construct above grade ditch

drains prior to the excavation of the cut material when in the opinion of the Engineer such measures are necessary to provide proper construction.

C. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.

D. Excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas. Excavation requirements and slopes shall be as indicated in the Drawings. The Contractor shall intercept and collect surface runoff both at the top and bottom of cut slopes. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded as shown on the Drawings or as may be indicated by the Engineer. Concurrent with the excavation of cuts the Contractor shall construct intercepting berm ditches or earth berms along and on top of the cut slopes at locations shown on the Drawings or designated by the Engineer. All slopes shall be finished to reasonably uniform surfaces acceptable for seeding and mulching operations. No rock or boulders shall be left in place which protrude more than 1 foot within the typical section cut slope lines, and all rock cuts shall be cleaned of loose and overhanging material. All protruding roots and other objectionable vegetation shall be removed from slopes. The Contractor shall be required to submit plans of open-cut excavation for review by the Engineer before approval is given to proceed.

E. It is the intent of these Specifications that all structures shall bear on an aggregate base, crushed stone or screened gravel bedding placed to the thickness shown on the Drawings, specified in these Specifications, or not less than 6-inches.

F. The bottom of all excavations for structures and pipes shall be available for examination by the Engineer for bearing value and the presence of unsuitable material. If, in the opinion of the Engineer, additional excavation is required due to the low bearing value of the subgrade material, or if the in-place soils are soft, yielding, pumping and wet, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, and/or crushed stone or screened gravel as indicated by the Engineer. Payment for such additional work ordered by the Engineer shall be made as an extra by a Change Order in accordance with the General Conditions and Division 1. No payment will be made for subgrade disturbance caused by inadequate dewatering or improper construction methods.

G. All cuts shall be brought to the grade and cross section shown on the Drawings, or established by the Engineer, prior to final inspection and acceptance by the Engineer.

H. Slides and overbreaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as indicated by the Engineer at no additional cost to the Owner. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

I. Where the excavation exposes sludge, sludge contaminated soil or other odorous materials, the Contractor shall cover such material at the end of each workday with a minimum of 6-inches and a maximum of 24-inches of clean fill. The work shall be an odor abatement

measure and the material shall be placed to the depth deemed satisfactory by the Engineer for this purpose.

3.03 EXCAVATION SUPPORT

A. The Contractor shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect pipes and structures from possible damage and to provide safe working conditions. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor. The Contractor shall be responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing it.

B. Selection of and design of any proposed excavation support systems is exclusively the responsibility of the Contractor. Contractor shall provide design of excavation support system accounting for full support of existing structures during construction, including settlement calculations. Design shall take all relevant site, anticipated loading, and soil conditions into account. Contractor shall submit drawings and calculations on proposed systems sealed by a Professional Engineer currently registered in the State of North Carolina.

C. The Contractor shall exercise caution in the installation and removal of supports to insure that excessive or unusual vibrations or loadings are not transmitted to any new or existing structure. The Contractor shall promptly repair at his expense any and all damage that can be reasonably attributed to installation or removal of excavation support system.

D. Contractor shall monitor vibration and movement in the excavation support systems as well as vibration and movement at adjacent structures, utilities and roadways near excavation supports. Contractor shall submit a monitoring plan developed by the excavation support design engineer. All pre-construction condition assessment and documentation of adjacent structures on-site and off-site shall be performed by the Contractor. If any sign of distress such as cracking or movement occurs in any adjacent structure, utility or roadway during installation of supports, subsequent excavation, service period of supports, subsequent backfill and construction, or removal of supports, Engineer shall be notified immediately. Contractor shall be exclusively responsible for any damage to any roadway, structure, utility, pipes, etc. both on-site and off-site, as a result of his operations.

E. All excavation supports shall be removed upon completion of the work except as indicated herein. The Engineer may permit supports to be left in place at the request and expense of the Contractor. The Engineer may order certain supports left permanently in place in addition to that required by the Contract. The cost of the materials so ordered left in place, less a reasonable amount for the eliminated expense of the removal work omitted, will be paid as an extra by a Change Order in accordance with the General Conditions and Division 1. Any excavation supports left in place shall be cut off at least two (2) feet below the finished ground surface or as directed by the Engineer.

3.04 PROTECTION OF SUBGRADE

A. To minimize the disturbance of bearing materials and provide a firm foundation, the Contractor shall comply with the following requirements:

1. Use of heavy rubber-tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.

2. Subgrade soils disturbed through the operations of the Contractor shall be excavated and replaced with compacted select fill or crushed stone at the Contractor's expense as indicated by the Engineer.

3. The Contractor shall provide positive protection against penetration of frost into materials below the bearing level during work in winter months. This protection can consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other acceptable means.

3.05 PROOFROLLING

A. The subgrade of all structures and all areas that will support pavements or select fill shall be proofrolled. After stripping of topsoil, excavation to subgrade and prior to placement of fills, the exposed subgrade shall be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed. The exposed subgrade shall be proofrolled with a heavily loaded tandem-wheeled dump truck to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed shall be removed and replaced with an approved compacted material.

3.06 DEWATERING

A. Dewatering shall be carried out in accordance with Specification Section 02241, Dewatering and Flow Diversion for Streamwork.

3.07 EMBANKMENTS

A. The Contractor shall perform the construction of embankments in such a manner that cut and fill slopes will be completed to final slopes and grade in a continuous operation. The operation of removing excavation material from any cut and the placement of embankment in any fill shall be a continuous operation to completion unless otherwise permitted by the Engineer.

B. Surfaces upon which embankments are to be constructed shall be stripped of topsoil, organic material, rubbish and other extraneous materials. After stripping and prior to placing embankment material, the Contractor shall compact the top 12-inches of in place soil as specified under Paragraph 3.09, COMPACTION.

C. Any soft or unsuitable materials revealed before or during the in place compaction shall be removed as indicated by the Engineer and replaced with select fill.

D. Ground surfaces on which embankment is to be placed, shall be scarified or stepped in a manner which will permit bonding of the embankment with the existing surface. The embankment soils shall be as specified under Part 2 - Products, and shall be deposited and spread in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width of the cross section, and shall be kept approximately level

by the use of effective spreading equipment. Hauling shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form during the construction of the embankment. The embankment shall be properly drained at all times. Each layer of the embankment shall be thoroughly compacted to the density specified under Paragraph 3.09, COMPACTION.

E. The embankment or fill material in the layers shall be of the proper moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken at frequent intervals. From these tests, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the embankment.

F. Where embankments are to be placed and compacted on hillsides, or when new embankment is to be compacted against embankments, or when embankment is built in part widths, the slopes that are steeper than 4:1 shall be loosened or plowed to a minimum depth of 6 inches or, if in the opinion of the Engineer, the nature of the ground is such that greater precautions should be taken to bind the fill to the original ground then benches shall be cut in the existing ground as indicated by Engineer.

G. When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portions of the embankments and the other material which meets the requirements for select fill shall be incorporated into the formation of the embankments. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the final grade. Stones, fragmentary rock, or boulders larger than 12-inches in their greatest dimension will not be allowed in any portions of embankments and shall be disposed of by the Contractor as indicated by the Engineer. When rock fragments or stone are used in embankments, the material shall be brought up in layers as specified or directed and every effort shall be exerted to fill the voids with finer material to form a dense, compact mass which meets the densities specified for embankment compaction.

3.08 BACKFILLING

A. All structures and pipes shall be backfilled with the type of materials shown on the Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the ground nor within 6 inches of pipes. No stone or fragmentary rock larger than 12-inches in their greatest dimension will be allowed for any portion of backfill. Compaction shall be in accordance with the requirements of Paragraph 3.09, COMPACTION.

B. Where excavation support is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The

Contractor shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

3.09 COMPACTION

A. The Contractor shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

	Density % Std. Proctor (D698)	Density % Mod. Proctor (D1557)	Max. Lift Thickness as Compacted Inches
Embankments Beneath Structures*	98	95	8
Other Embankments	95	92	8
Top Soil	80	77	8
Backfill Around Structures	95	92	8
Backfill in Pipe Trenches	95	92	8
Crushed Stone Beneath Structures	**	**	12
Select Sand	--	98	8
Aggregate Base Course (ABC) Beneath Pavements and Structures	--	98	8
Crushed Stone Backfill	**	**	12
Crushed Stone Pipe Bedding	**	**	12
In place Subgrade Beneath Structures	98	95	Top 12-inches

* Embankments beneath structures shall be considered to include a zone 10 feet out from the foundation of the structure extending down to the natural ground on a 45° slope.

** The crushed stone aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.

B. Field density tests may be performed by the Engineer to determine if the specified densities have been achieved, and these tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. The Engineer will be the sole judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the Contractor to re-compact the material or remove it as required. The Contractor shall, if necessary, increase his compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

C. Testing will be performed as frequently as deemed necessary by the Engineer. As a minimum, one in-place density test shall be performed for each 1000 cubic yards of embankment placed and 500 cubic yards of backfill placed or one test performed each day for either.

3.10 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

A. The Contractor shall remove and dispose of off-site all unsuitable materials. Within thirty (30) consecutive days after Notice to Proceed, the Contractor shall submit to the Engineer for review all required permits and a list of disposal sites for the unsuitable materials. If the disposal site is located on private property, the submittal shall also include written permission from the owner of record.

B. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

C. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

D. Any surplus excavated material not used for backfilling or embankment suitable for reuse shall be deposited on-site in the disposal area indicated on the Drawings or as directed by the Engineer. Approved disposal areas may also be used by the Contractor for spreading and drying any excavated material suitable as select fill that is too wet for use immediately after being excavated. The Contractor shall maintain the earth surfaces of the disposal area, both during the work and until the completion of all seeding and mulching or other erosion control measures specified, in a manner which will effectively control erosion and sedimentation. If necessary, the Contractor shall clear and grub the disposal site prior to any excavation work.

1. Earth waste shall be shaped to contours which are comparable to and blend in with the adjacent topography where practical, but in no case will slopes steeper than 3 horizontal to 1 vertical be permitted.

2. Seeding and mulching shall be performed over all the earth waste area. The work of seeding and mulching shall be performed in accordance with Section 02910 - Final Grading and Landscaping.

3. The Engineer shall have the authority to establish whatever additional requirements may be necessary to insure the satisfactory appearance of the completed work.

E. When all excess and unsuitable material disposal operations are completed, the Contractor shall leave the disposal sites in a condition acceptable to the Owner and Owner(s) of the disposal site(s).

3.11 BORROW EXCAVATION

A. Description

The work covered by this section consists of the excavation of approved material from borrow sources and the hauling and utilization of such material as required on the Drawings or directed by the Engineer. It shall also include the removing, stockpiling, and replacement of topsoil on the borrow source; the satisfactory disposition of material from the borrow

source which is not suitable for use; and the satisfactory restoration of the borrow source and haul roads to an acceptable condition upon completion of the work.

Borrow excavation shall not be used before all available suitable unclassified excavation has been used for backfill and incorporated into the embankments.

B. Coordination with Seeding Operations

The Contractor shall coordinate the work covered by this section with the construction of embankments so that the requirements of Section 02200 are met.

C. Materials

All material shall meet the requirements of Division 2 shown below:

Borrow Material .....Section 02200, Subsection 2.01 - Select Fill

D. Construction Methods

1. General

The surface of the borrow area shall be thoroughly cleared and grubbed and cleaned of all unsuitable material including all organics, topsoil, etc., before beginning the excavation. Disposal of material resulting from clearing and grubbing shall be in accordance with Section 02100.

Each borrow operation shall not be allowed to accumulate exposed, erodible slope area in excess of 1 acre at any one given time without the Contractor's beginning permanent seeding and mulching of the borrow source or other erosion control measures as may be approved by the Engineer.

The topsoil shall be removed and stockpiled at locations that will not interfere with the borrow operations and that meet the approval of the Engineer. Temporary erosion control measures shall be installed as may be necessary to prevent the erosion of the stockpile material. Once all borrow has been removed from the source or portion thereof, the stockpiled topsoil shall be spread uniformly over the source.

Where it is necessary to haul borrow material over existing roads, the Contractor shall use all necessary precautions to prevent damage to the existing roads. The Contractor shall also conduct his hauling operations in such a manner as to not interfere with the normal flow of traffic and shall keep the traffic lanes free from spillage at all times.

2. Owner Furnished Sources

Where borrow sources are furnished by the Owner the location of such sources will be as designated on the Drawings or as directed by the Engineer.

The Owner will furnish the necessary haul road right-of-way at locations designated by the Engineer. All haul roads required shall be built, maintained, and when directed by the Engineer, obliterated, at no cost to the Owner. Where the haul road is to be reclaimed for cultivation the Contractor shall plow or scarify the area to a

minimum depth of 8 inches.

The borrow sources shall be left in a neat and presentable condition after use. All slopes shall be smoothed, rounded, and constructed not steeper than 3:1. Where the source is to be reclaimed for cultivation the source shall be plowed or scarified to a minimum depth of 8 inches, disc harrowed, and terraces constructed. The source shall be graded to drain such that no water will collect or stand and a functioning drainage system shall be provided.

All sources shall be seeded and mulched in accordance with Section 02276.

3. Contractor Furnished Sources

Prior to the approval of any off-site borrow source(s) developed for use on this project, the Contractor shall obtain all required local, State, and Federal permits which may be required including certification from the State Historic Preservation Officer of the State Department of Cultural Resources certifying that the removal of the borrow material from the borrow source(s) will have no effect on any known district, site building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places. A copy of this certification shall be furnished to the Engineer prior to performing any work on the proposed borrow source.

The approval of borrow sources furnished by the Contractor shall be subject to the following conditions:

a. The Contractor shall be responsible for acquiring the right to take the material and any rights of access that may be necessary; for locating and developing the source; and any clearing and grubbing and drainage ditches necessary.

   Such right shall be in writing and shall include an agreement with the Owner that the borrow source may be dressed, shaped, seeded, mulched, and drained as required by these Specifications after all borrow has been removed.

b. Except where borrow is to be obtained from a commercial source, the Contractor and the property owner shall jointly submit a borrow source development, use, and reclamation plan to the Engineer for his approval prior to engaging in any land disturbing activity on the proposed source other than material sampling that may be necessary. The Contractor's plan shall address the following:

   (1) Drainage

   The source shall be graded to drain such that no water will collect or stand and a functioning drainage system shall be provided. If drainage is not practical, and the source is to serve as a pond, the minimum average depth below the water table shall be 4 feet or the source graded so as to create wetlands as appropriate.

   (2) Slopes

The source shall be dressed and shaped in a continuous manner to contours which are comparable to and blend in with the adjacent topography, but in no case will slopes steeper than 3:1 be permitted.

(3) Erosion Control

The plan shall address the temporary and permanent measures that the Contractor intends to employ during use of the source and as a part of the reclamation. The Contractor's plan shall provide for the use of staged permanent seeding and mulching on a continual basis while the source is in use and the immediate total reclamation of the source when no longer needed.

4. Maintenance

During construction and until final acceptance the Contractor shall use any methods approved by the Engineer which are necessary to maintain the work covered by this section so that the work will not contribute to excessive soil erosion.

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SECTION 02207

AGGREGATE MATERIALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment and materials required to complete all work associated with the installation of aggregate material beneath foundations, as backfill and as roadway subgrades and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01090 - Reference Standards

B. Section 02200 - Earthwork

C. Section 02276 - Erosion and Sedimentation Control

D. Section 02910 - Final Grading and Landscaping

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. North Carolina Department of Transportation (NCDOT) Standard Specifications for Roads and Structures.

2. ASTM C 127 Test for Specific Gravity and Absorption of Coarse Aggregate.

3. ASTM C 136 Test for Sieve Analysis of Fine and Coarse Aggregates.

4. ASTM C 535 Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Materials gradation and certification.

2. ASTM C127, ASTM C136, and ASTM C535 test results

PART 2 -- PRODUCTS

2.01 CRUSHED STONE, SCREENED GRAVEL and AGGREGATE BASE COURSE (ABC)

A. Crushed stone or screened gravel shall meet the requirements of Aggregate Standard Size No. 57 or No. 67 as defined by NCDOT Standard Specifications.

B. ABC shall meet the requirements of ABC as defined by NCDOT Standard Specifications.

2.02 SELECT SAND

A. Select sand shall meet the requirements of Sections 1005 and 1014 of the NCDOT Standard Specifications for materials and gradation. The size used shall be Standard Size No. 2S or 2MS as listed and defined in Table 1005-2, "Aggregate Gradation", of the NCDOT Standard Specifications.

PART 3 -- EXECUTION

3.01 CRUSHED STONE, SCREENED GRAVEL AND AGGREGATE BASE COURSE (ABC)

A. Contractor shall install crushed stone, screened gravel and ABC in accordance with the NCDOT Standard Specifications and as shown on the Drawings and indicated in the Contract Documents.

1. Unless otherwise stated herein or shown on the Drawings, all mat foundations (bottom slabs) for the proposed structures shall have a blanket of crushed stone or ABC 6-inches thick minimum placed directly beneath the proposed mat. The blanket shall extend a minimum of 12 inches beyond the extremities of the mat.

2. For subgrade preparation at structures and structural fill, the foundation material shall be ABC where specifically specified on Drawings, otherwise, crushed stone or screened gravel shall be used.

3. For ground under drains, pipe bedding, and drainage layers beneath structures the coarse aggregate shall meet the requirements of aggregate standard Size No. 57 or No. 67, as defined by NCDOT Standard Specifications.

3.02 SELECT SAND

A. Contractor shall install select sand in accordance with the NCDOT Standard Specifications and as shown on the Drawings and indicated in the Contract Documents.

- END OF SECTION -

SECTION 02242

COIR MAT

PART 1 -- GENERAL

1.01 SUMMARY

A. This section includes installation of coir matting on stream banks, benches, and terraces or other waterway features for the purpose of soil stabilization and erosion control. This work includes the stabilization of stream banks using natural coir fiber matting, top soil, straw and seeding. Coir mat blankets are woven from machine-spun bristle coir twines whose dual purpose is to (1) immediately secure slopes during and after construction and (2) provide long term protection for vegetative establishment. These mats are to be 100% biodegradable durable bristle coir woven blankets having an average field life of four to six years. Coir matting areas are first prepared with a base of disked subsoil that is amended with topsoil and/or compost, then temporary and/or permanent seed and straw mulch are applied. The coir matting is then installed and secured in place using wooden stakes. After the coir matting has been fully secured, any live stakes and/or other vegetative stabilization shall be installed per the Construction Documents.

B. Related Sections:

1. Section 02200, “Earthwork”.

2. Section 02280, “Temporary Seeding”.

3. Section 02277, “Specialty Seeding”.

4. Section 02246, “Live Stakes”.

5. Section 02261, “Tubelings”.

1.02 SUBMITTALS

A. Product data for each type and/or size of roll indicated.

1.03 QUALITY ASSURANCE

A. Contractor shall forward one copy of coir mat specifications from the coir mat supplier for all coir mat used on the project.

B. Sample – Contractor to supply Engineer with one sample of coir mat prior to delivery to, or installation at, the project site.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Coir Mat shall consist of a machine produced mat of degradable natural fibers. Matting shall be Rolanka Bio D as is indicated on the Construction Documents, or approved equal. See Table 1.

Table 1: Coir Mat Requirements

Attribute	Specification	Bio D 40	Bio D 70	Bio D 90
Weight (oz./sq. yd)	ASTM D 3776	13.6	23.0	29.0
Wet tensile strength:				
Machine direction (MD) or lengthwise (lbs/ft)	ASTM D 4595	672	1488	1776
Crosswise direction (CD) or transverse direction (lbs/ft)	ASTM D 4595	648	1032	936
% Open area	Calculated	65	48	38
Thickness (inch)	ASTM D 1777	0.35	0.35	0.35
Recommended slope	Na	up to 1:1	> 1:1	> 1:1
Recommended flow (fps)	Na	8	12	16
Recommended shear stress (#/sf)	Na	3	4.5	5
"C" Factor	Na	0.003	0.002	0.002

B. Stakes: Stakes shall be of sound quality hardwood “two by fours” split diagonally into triangular wedges. Wedges shall be eighteen (18) inches long and nominally two (2) inches by four (4) inches at the top, tapering to a point.

C. Temporary seed, per Section 02280, “Temporary Seeding”.

D. Permanent seed, per Section 02277, “Specialty Seeding”.

E. Live stakes, per Section 02246, “Live Stakes” and/or “Tubelings” per Section 02261 if called for on the Construction Documents.

F. Straw: Clean, exotic/invasive free native straw, in bales.

PART 3 -- EXECUTION

3.01 INSTALLATION

A. Base soil shall be tilled to a three (3) inch depth; rake in six (6) inches of organic matter or top soil prior to seeding, straw placement and coir mat placement.

B. Seeding shall be per the designated limits of the planting zones and schedules as shown on the Construction Documents. Permanent seed shall be placed if it is the correct time of year for installation; see Section 02277, “Specialty Seeding”. Otherwise, temporary seed shall be placed per Section 02280, “Temporary Seeding”. It is permissible for both temporary and permanent seed to be placed at the same time. Permanent seed mix shall be as described in the Construction Documents.

C. A loose layer of straw shall be evenly distributed over seeded areas prior to placement of coir matting; with enough straw coverage (60% - 80%) to secure seed and help maintain moisture, but not so much as to completely block sunlight and inhibit growth.

D. The Contractor shall unroll the coir fiber matting along the slope face beginning at the toe of slope and working in a direction from downstream to upstream. The long edge of the first (bottom) row of matting shall be anchored into a twelve (12) inch deep trench, staked, then backfilled and tamped firmly.

E. Matting shall be placed snugly (but not tightly) and in full contact with the soil with no obvious slack or wrinkles.

F. Matting shall be "keyed" into trenches twelve (12) inches deep on the top and bottom edge of blanket and at the terminal upstream and downstream limits of coir mat. Along the bottom of the trenches, matting shall be secured with one (1) stake per three (3) L.F.

G. Matting along the slope face shall be secured with wooden stakes placed at a minimum spacing of two (2) per square yard for slopes flatter than 2:1 and three (3) per square yard for slopes steeper than 2:1. Stakes shall be installed so that no more than two (2) inches of the stake remains above finished grade

H. Matting blanket edges shall overlap by a minimum of twelve (12) inches; upstream on top of downstream, and upslope on top of downslope. The overlapping areas shall be secured with stakes installed at a maximum spacing of twelve (12) inches on center with stakes staggered between the edges of the top blanket and the underlying blanket.

I. Stakes placed at the edge of blankets shall be installed no less than four (4) inches from the trenched fabric edges.

J. After coir matting is secured, any live stakes/tubelings and/or other vegetation can be installed. Care must be taken by vegetation planting crews so that coir mat is not excessively damaged during planting installation. Cuts made in the matting for plant installation shall not exceed six (6) inches in length.

- END OF SECTION -

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SECTION 02245

IMBRICATED ROCK WALL (IRW)

PART 1 – GENERAL

1.01 DESCRIPTION

A. An imbricated rock wall (IRW) is composed of flat, stackable boulders that are placed to create stable stream bank protection capable of withstanding severe erosive flows. The riprap boulders are stacked upon each other in a manner like that of a stone wall with a designed setback (slope, e.g., 1:1) between each layer creating the appearance of steps or ledges along the length of the IRW. IRW is used to protect and stabilize embankment soils from the erosive forces and the piping forces resulting from groundwater seepage and positive pore pressure. The IRW can be placed in either cut or fill sections and consists of excavation for footer and toe rocks, filter cloth placement, stone placement, bedding support/drainage gravel and backfill behind the stone, chinking of voids, as well as tying the IRW into existing banks.

B. Related Sections:

1. Section 02200, “Earthwork” for excavation necessary to install IRW

2. Section 02272, “Stone for Streamwork”

3. Section 02241, “Dewatering and Flow Diversion for Streamwork”

4. Section 02242, “Coir Mat”

5. Section 02264, “Geotextile for Streamwork”

6. Section 02559, “Select Material for Streamwork”

1.02 SUBMITTALS

A. Per Section 02272, “Stone for Streamwork”
Per Section 02264, “Geotextile for Streamwork”
Per Section 02242, “Coir Mat”
Per Section 02559, “Select Material for Streamwork”

1.03 QUALITY ASSURANCE

A. Per Section 02272, “Stone for Streamwork”
Per Section 02264, “Geotextile for Streamwork”
Per Section 02242, “Coir Mat”
Per Section 02559, “Select Material for Streamwork”

PART 2 – PRODUCTS

2.01 MATERIALS

A. Boulders: See Section 02272, “Stone for Streamwork” and “Rock Sizing Chart” on Construction Documents for boulder dimension.

B. Chinking stone: See Section 02272, “Stone for Streamwork” and “Rock Sizing Chart” on Construction Documents for stone class.

C. Bedding Support/Drainage Gravel: No. 57 stone.

D. Filter Cloth: See Section 02264, “Geotextile for Streamwork”.

E. Approved Fill: Section 02259, “Select Material for Streamwork”, or the ”Approved Fill” or “Select Borrow” sections under Specification 02200, “Earthwork,” or as otherwise specified on the Contract Documents.

PART 3 – EXECUTION

3.01 INSTALLATION AND PLACEMENT

A. IRW shall be installed according to the Construction Documents as well as the following specifications:

1. The IRW shall be constructed so that the exposed faces of the individual boulders are roughly vertical (see also the 6:1 requirement per 3.01.A.5 below), with the boulders placed using the designed setback between each layer to achieve the slope specified on the Contract Documents. This grade shall be one (1) horizontal (h) to one (1) vertical (v) unless otherwise specified on the plans. The footer boulders and boulder toes shall be placed so that the top of the boulders are flush with the channel invert. The top boulder shall be set at the elevation specified on the Construction Documents.

2. The lowest tier of IRW (the footer and toe boulders) will be placed a minimum of one full stone depth below the streambed or as specified on the Construction Documents. Footer rocks and toes are not necessary where the IRW is underlain by bedrock. The subgrade exposed should be smooth, firm and free from protruding objects or voids that would affect the proper positioning of the first layer of boulders. If excavation for the full footer and toe boulders does not reveal a firm subbase, immediately contact the Owner or Owner’s Agent. A footer rock and footer toe boulders will be placed with longest axis of boulder parallel to the flow of the stream.

3. Non-woven filter cloth will be placed on the sub-grade (below the IRW footer and toe boulders) and along the streambank parallel to the direction of stream flow. Each cloth layer shall overlap a minimum of two (2) feet. Geotextile torn or damaged shall be replaced or repaired at the Contractor’s expense.

4. No. 57 bedding support/drainage stone or other stone material as specified on the Construction Documents shall be placed to a minimum twelve (12) inch thickness on the backside of the boulders for purposes of leveling the boulders and accommodating drainage. Other than footer layer(s), the majority of each IRW boulder shall be supported by the underlying IRW boulders. Where necessary, approved fill shall be placed behind the fabric/bedding support gravel and compacted per Section 02200, “Earthwork”.

5. The first tier, or layer, of boulders will be placed on top of the footer rock, closer to the bank at the horizontal setback or slope of wall as specified in the detail. The boulder layers should be neatly stacked with staggered joints so that each stone rests firmly on two stones in the layer below with the longest stone axis parallel to the stream centerline. The boulders shall be placed as firmly as possible on each successive layer and shall not tip or rotate; with each boulder placed on a 6 (h) to 1 (v) angle with level. Boulders shall not puncture the fabric and shall be individually machine-placed and not dumped. The backfill slope angle (slope of material placed above the wall) shall be 2 (h) to 1 (v) or flatter but should be greater than zero degrees to facilitate drainage.

6. The beginning and ending of the walls shall be flared and tapered fifteen (15) to thirty (30) degrees into the bank, or as shown on the Construction Documents and shall not be flat face to the existing stream bank. Ends of wall should be buried two rock lengths (a minimum of six (6) feet) into the bank.

7. The outer rock surface shall be even and present a generally neat appearance. Individual rocks within the finished installations shall have a tolerance of +/- 0.5 feet (horizontal) and 0.2 feet (vertical) from the grades shown on the plan set.

8. The top of the wall and transition to grade shall be covered with coir matting and six (6) inches of top soil. The coir mat and filter cloth shall overlap twelve (12) inches.

9. Contractor is responsible for installing stable transitions from proposed to existing grade.

- END OF SECTION -

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SECTION 02264

GEOTEXTILE FOR STREAMWORK

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the furnishing and installation of permanent manmade *non-biodegradable* geotextile products within stream revetments where applicable.

B. Related Sections:

1. Section 02241, “Dewatering and Flow Diversion for Streamwork.”

2. Section 02245, “Imbricated Rock Wall”.

1.02 SUBMITTALS

A. Product data for each type of geotextile required as described on the Construction Drawings.

1.03 QUALITY ASSURANCE

A. Filter Cloth: The filter fabric shall meet the requirements of ASTM D 4632, ASTM D 4533, ASTM D 3786, ASTM 4833, ASTM D 6241, ASTM D 4751, ASTM D 4491, and ASTM D 4355.

B. Geogrid: ASTM D4759-02, ASTM D6637-01, ASTM D5732-01, ASTM D 5818-06, ASTM D 6637-0, EPA 9090, ASTM D4355-05

C. Provide original or copy of delivery ticket for all geotextile used on the project to the Engineer.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Filter Cloth shall be a non-woven geotextile composed of polypropylene fibers such as Mirafi 160N or approved equal and shall meet the following criteria:

Mechanical Properties	Test Method	Unit	Minimum Ave Value
Grab Tensile Strength	ASTM D 4632	lbs	160
Grab Tensile Elongation	ASTM D 4632	%	50
Trapezoid Tear Strength	ASTM D 4533	lbs	60
Mullen Burst Strength	ASTM D 3786	psi	305

Mechanical Properties	Test Method	Unit	Minimum Ave Value
Puncture Strength	ASTM D 4833	lbs	95
CBR Puncture Strength	ASTM D 6241	lbs	400
Appar. Opening Size	ASTM D 4751	mm	0.212
Permittivity	ASTM D 4491	sec^{-1}	1.4
Flow Rate	ASTM D 4491	$gal/min/ft^2$	110
UV Resist. (at 500 hrs)	ASTM D 4355	% stren.	70
Weight	ASTM D 5261	oz/yd^2	6.5
Thickness	ASTM D 5199	mm	1.7
Roll Dimensions (WxL)		ft	15x300
Roll Area		yd^2	500
Estimated Roll Weight		lb	215

B. Geogrid: Use an integrally formed biaxial polypropylene geogrid such as Tensar BX 1100 or approved equal meeting the following specifications:

Property	Units	MD Values
Aperture dimensions	in	1.0
Minimum Rib Thickness	in	0.03
Tensile Strength @ 2% strain	lb/ft	280
Tensile Strength @ 5% strain	lb/ft	580
Ultimate Tensile Strength	lb/ft	850
Junction Efficiency	%	93
Flexural Stiffness	mg-cm	250,000
Aperture Stability	m-N/deg	0.32
Resist. To Install. Damage	%SC/%SW/%GP	95/93/90
Resist. To long-term Degra.	%	100
Resist. To UV Degra.	%	100
Roll size	ft	9.8/13.1 x 246

The structural geogrid shall accept applied force in use by positive mechanical interlock (i.e. by direct mechanical keying) with: (a) compacted soil or construction fill materials; (b) contiguous sections of itself when overlapped and embedded in compacted soil or construction fill materials; and (c) rigid mechanical connectors such as bodkins, pins or hooks. The structural geogrid shall possess sufficient cross sectional profile to present a substantial abutment interface to compacted soil or particulate construction fill materials and to resist movement relative to such materials when subject to applied force. The structural geogrid shall possess sufficient true initial modulus to cause applied force to be transferred to the geogrid at low strain levels without material deformation of the reinforced structure. The structural geogrid shall possess complete continuity of all properties throughout its structure and shall be suitable for reinforcement of compacted soil or particulate construction fill arterials to improve their long term stability in structural load bearing applications such as earth retention systems.

PART 3 – EXECUTION

A. Filter Cloth Installation: Cut geosynthetic to proper width prior to placement. Width should be enough to conform to the trench perimeter with at least a 15cm (6 in) top overlap. Place the geosynthetic roll over the trench, and unroll enough geosynthetic that the geosynthetic can be placed down into the trench. Anchor the edges of the geosynthetic with heavy objects to prevent the geosynthetic from falling into the trench. Where overlaps are necessary between rolls, allow for 2 feet (2 ft) overlap from the upstream to the downstream roll.

B. Geogrid Installation: Install per manufacturer's specifications.

C. .

- END OF SECTION –

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SECTION 02265

DEWATERING SUMP

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes installation of temporary sump pits from which pumping is constructed to remove excess water while minimizing sedimentation. The sump pit filters water being pumped to reduce sedimentation to receiving streams.

B. Related Sections:

1. Section 02241, “Dewatering and Flow Diversion for Streamwork.”

2. Section 02264, “Geotextile for Streamwork”

1.02 SUBMITTALS

A. Product data for each component of sump pit (geotextile fabric, stone, hard cloth, stand pipe) required as described on the Construction Drawings.

1.3 QUALITY ASSURANCE

A. Geotextile to meet tenets of Section 02264, “Geotextile for Streamwork.”

B. Gravel to meet AASHTO M-43.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Geotextile: Per Section 02264, “Geotextile for Streamwork.”

B. Stone: Shall be #57 clean gravel stone (1.5-inch max diameter).

C. Hard Cloth: Shall be ½ inch metal hardware cloth.

D. Standpipe to be 12 to 24-inch diameter perforated HDPE, PVC, or CMP with ½ inch by 6-inch slits or 1-inch diameter holes 6 inches on center. Bottom of pipe to have a watertight cap or plate attached.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Pit dimensions are variable, with the minimum diameter being twice the diameter of the standpipe.

B. The standpipe shall be constructed by perforating a 12-inch to 36-inch diameter pipe then wrapping it with ½-inch hardware cloth and approved geotextile. Perforations shall be ½-inch X 6-inch slits or 1-inch holes six inches on center.

C. A base of filter material consisting of clean gravel or #57 stone (1.5-inch max diameter) is to be placed in the pit to a depth of 12 inches. After installing the standpipe, the pit surrounding the standpipe should then be backfilled with the same filter material.

D. The standpipe shall extend 12 inches to 18 inches above the lip of the pit or riser crest elevation (if basin dewatering is being used) and filter material should extend 3 inches minimum above the anticipated standing water level.

- END OF SECTION -

SECTION 02267

FILTER BAG

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes installation of temporary filter bag sediment control bags for use in dewatering and retaining sediment pumped out of active sediment-laden stream restoration project areas where water is pumped from work area, sent through the bag and flow is then released from the bag to discharge on a stable flood plain or other secure area.

B. Related Sections:

1. Section 02241, “Dewatering and Flow Diversion for Streamwork.”

1.02 SUBMITTALS

A. Product data for each type and/or size of filter bag required as described on the Construction Documents.

1.03 QUALITY ASSURANCE

A. Product shall meet ASTM D-4884.

B. Provide original or copy of delivery ticket for filter bags used on the project to the Engineer for verification that correct product and bag size is being used.

PART 2 – PRODUCTS

2.01 MATERIALS

A. The filter bag shall be a nonwoven bag which is sewn with a double needle matching using a high strength thread. The dewatering bag must be made of non-woven geotextile with a minimum surface area of 225 square feet per side. Each sack is required to have a fill spout large enough to accommodate a 4-inch discharge hose. Straps are to be attached such that the hose is secure and the hose prevents pumped water from escaping without being filtered.

B. The geotextile fabric shall be non-woven and shall meet the following properties:

Properties	Test Method	Units	
Weight	ASTM D-3776	Oz/yd	12
Grab Tensile	ASTM D-4632	lbs	300
Puncture	ASTM D-4833	lbs	180
Flow Rate	ASTM D-4491	gal/min/ft^2	75
Permittivity	ASTM D-4491	sec^{-1}	1.1
Mullen Burst	ASTM D-3786	psi	550
UV Resistant	ASTM D-4355	%	70
AOS% Retained	ASTM D-4751	%	100

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install filter bag on a slope so incoming water flows downhill through the filter bag without creating more erosion. Strap the neck of the filter bag tightly to the discharge hose. To increase the efficiency of filtration, place the bag on an aggregate or hay bale bed to maximize water flow through the surface area of the bag.

B. The filter bag is full when it no longer can efficiently filter sediment or pass water at a reasonable rate. Flow rates will vary depending on the size of the filter bag, the type and amount of sediment discharged into the filter bag, the type of ground, rock or other substance under the bag and the degree of the slope on which the bag lies. Under most circumstances filter bags will accommodate flow rates of 1500 gallons per minute. Use of excessive flow rates or overfilling filter bag with sediment will cause ruptures of the bags or failure of the hose attachment straps. Damage and replacement costs for improper pumping shall be the responsibility of the Contractor.

C. Full or partially full silt bags cannot be left in place and must be removed from site and legally disposed. If allowed, the filter bag may be cut open and the contents seeded after removing visible fabric. Filter bag may be lifted with added straps. Off-site disposal may be facilitated by placing the filter bag in the back of a dump truck or flatbed prior to use and allowing the water to drain from the bag in place, thereby dismissing the need to lift the filter bag.

- END OF SECTION -

SECTION 02272

STONE FOR STREAMWORK

PART 1 – GENERAL

1.01 SUMMARY

A. This work shall consist of furnishing and placing stone for stabilization, protection, and other purposes within stream channels or along bank slopes in accordance with the Construction Documents.

B. Related Sections:

1. Section 02200, “Earthwork” for excavation necessary to install the streamwork stone.

2. Section 02241, “Dewatering and Flow Diversion for Streamwork.”

3. Section 02264, “Geotextile for Streamwork.”

4. Separate Revetment Execution: See Table 2 in Section 3.01 G for additional related specification sections.

1.02 SUBMITTALS

A. Geotextile: Per Section 02264, “Geotextile for Streamwork.”

B. All stone: The Contractor shall identify potential sources (quarry, off-site, on-site, etc.) for stone and forward source information to Engineer for approval. The Contractor shall not be granted an extension of time or extra compensation due to delay caused by sampling, testing, approval or disapproval of stone material under the requirements of these Specifications. The Contractor shall obtain from the quarry and submit to the Engineer a certificate verifying the following:

1. Stone Classification: NCDOT

2. Weight per cubic foot.

3. Weight range of stone being supplied.

4. Stone D_0, D_{50} and D_{100} weights.

C. Riffle Grade Control Stone: Stone specified in Contract Documents as Riffle Grade Control Stone/Cobble shall meet all requirements per Section 02249, "Riffle Grade Control”. The Contractor shall provide the Engineer a sample of riffle grade control stone material thirty days prior to starting work for approval.

D. Imbricated Boulders: Contractor shall provide to the Engineer a written description of the Contractor's method for quality control so only block-like, flat, stackable stone of the size specified on the Contract Documents is delivered onsite. Contractor is responsible for costs associated with rejected stone.

1.03 QUALITY ASSURANCE

A. Geotextile: Per Section 02264, "Geotextile for Streamwork."

B. The Engineer is required to field-approve the first delivery of all stone (rip rap, imbricated riprap, chinking stone, bank run gravel, etc.) material delivered to the site. Stone should be separated into appropriate sizes and not stockpiled together. Engineer shall inspect stone prior to placement and has the right to reject stone not meeting specifications. New stone must be brought onsite for testing at the Contractor's expense.

C. All stone should have a density greater than 165 lbs/ft^3.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Non-woven filter cloth: Per Section 02264, "Geotextile for Streamwork" and/or as specified on the Construction Documents. If not specified on Construction Drawings, cloth to be Mirafi 160N or approved equal.

B. Stone size: All stone sizing shall be per the "Rock Sizing Chart" on the Construction Documents. When nominal dimensions are identified (e.g., 16-inch stone) this value refers to the intermediate axis (not smallest nor largest axes).

C. Stone properties: Stone shall consist of angular rock, similar in color, texture and density to the native rock at the site and obtained from an approved source. Stone shall not be harvested from streams or rivers outside of a commercial quarry operation except as shown on the Construction Documents or directed by the Engineer. All stone shall be free from laminations, weak cleavages and shall not disintegrate from the action of air and water or in handling and placing. Granular sedimentary stone is unacceptable. Concrete shall not be considered as an alternative for stone. White stone is not acceptable. Stone sizes shall be as specified in the Construction Documents as per the 'Rock Sizing Chart' found thereon; stone classification shall be per Table 1 below.

Table 1: Stone Sizing Criteria

CLASS	Approximate Diameter[1]
A	**4 inches**
B	**8 inches**
1	**14 inches**
2	**18 inches**
2+ (flat, stackable boulders)	Minimum axis => 30 inches

[1]Bold values indicate intermediate axis measurement

D. Imbricated boulders: Imbricated stone shall meet requirements per Section 2.01C, but stones shall be large (boulder size), block-like, flat and stackable.

E. Gravel: Stone per AASHTO M43 aggregate sizing.

F. Gabion fill rock: Gabion fill rock shall meet the tenets of Specification 02278, "Gabion Baskets." In addition, stones used for filling gabion baskets shall meet the following: D_{10} = 4 inches, D_{50} = to 6 inches and D_{100} = 8 inches. Contractor to confirm gabion basket wire will retain the D10 = 4-inch stone prior to installation.

G. Three to four-inch stone: 3- to 4-inch stone (aka railroad ballast) shall meet the following: D_{10} = 2 inches, D_{50} = to 3.5 inches and D_{100} = 6 inches.

PART 3 – EXECUTION

3.01 ROCK INSTALLATION

A. Dewatering: Unless otherwise specified on the Contract Documents, excavation and/or fill placement required for rock installation shall occur in the dry per Specification 02241, "Dewatering and Flow Diversion for Streamwork."

B. Subgrade preparation—excavation for rock placement: Excavation must conform to the lines and grades specified in the Contract Documents. Should bedrock or other unsuitable soil be encountered, over-excavation beyond finished grade lines may be required. If these conditions occur, the Contractor is to immediately contact the Engineer for approval before excavating beyond lines and grades specified in the Contract Documents.

C. Subgrade preparation—fill for rock placement: Portions of rock installation may require placement of underlying fill. Unless otherwise specified on the Contract Documents (see 3.01 D), said fill shall be salvaged from onsite grading operations, preferably from the channel, including materials excavated under

3.01 B. Said placed material shall be compacted via machine-tamping (e.g., pressing with excavator bucket).

D. Subgrade preparation—approved fill requirements: Should the Contract Documents require the use and placement of "approved" or "select" fill, said fill shall meet the tenets of Specification 02200, "Earthwork," subsection 2.01: "Select Fill" and subsection 3.09: "Compaction." Compaction of approved fill shall be treated as "Other Embankments" under subsection 3.09A.

E. Filter cloth: Cloth installation shall meet the tenets of Specification 02664, "Geotextile for Streamwork," In addition, the subgrade must be smooth and firm, free from protruding objects that would damage the geotextile and constructed in a manner acceptable to the Engineer. Unless specified otherwise by Contract Documents or the Engineer, the geotextile must be placed on the prepared subgrade with the adjacent edges overlapping a minimum of two (2) feet. Geotextile torn or damaged must be replaced or repaired at the Contractor's expense in a manner acceptable to the Engineer. Fabric shall be placed along all upstream faces of revetments unless otherwise specified by the Contract Documents. All fabric shall be cut such that six (6) inches of exposed fabric is visible above existing grade.

F. Rock stacking: For revetments requiring rock stacking, the Contractor must use a "thumb" attachment to an excavator bucket or equivalent to place rock unless otherwise approved by the Engineer. Unless otherwise specified on the Contract Documents, rocks shall be stacked on each other at a 1:6 angle (vertical: horizontal) back into supporting slope, with at least a six (6) inch rock overlap.

G. Specific rock installation methods: Several stream rock revetment practices have separate Execution descriptions; please see Table 2. For practices not included in Table 2 that involve rock placement for toe protection or footers, use installation methods described for Specification 02262, "Stone Toe" or methods specified by the Contract Documents.

Table 2: Separate Revetment Execution Descriptions

Revetment	Specification
Imbricated Rock Wall	02245

H. Chinking and void-filling: If specified on the Contract Documents, fill voids within newly-placed stone with chinking stone as described in the "Rock Sizing Chart." Consult the Contract Documents to determine if use of in-situ material and/or stream bed material (see Specification 02559, "Stream Bed Material") is required for void filling.

- END OF SECTION -

SECTION 02276

EROSION AND SEDIMENTATION CONTROL

PART 1 -- GENERAL

1.01 THE REQUIREMENTS

A. The Contractor is responsible for implementing Best Management Practices (BMPs) to prevent and minimize erosion and resultant sedimentation in all cleared and grubbed areas during and after construction. This item covers the work necessary for the installation of structures and measures for the prevention of soil erosion and control of sedimentation. The Contractor shall furnish all material, labor and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion prevention and sediment control measures and, if applicable, to cause compliance with all local permits and the State of North Carolina Department of Environment and Natural Resources Division of Water Quality General Permit – NCG 010000 to Discharge Stormwater under the National Pollution Discharge Elimination System for Construction Activities, for any land disturbance or construction activity of one (1) acre or more, under this Section 02276.

B. Any land disturbance as the result of modifications to a site's drainage features or topography requires protection from erosion and sedimentation.

C. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Contract Drawings or established by the Engineer.

D. It is the intent of this Specification that the Contractor conducts the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

E. All work under this Contract shall be done in conformance with and subject to the limitations of the North Carolina Rules and Regulations for Erosion and Sedimentation Control as adopted by the North Carolina Sedimentation Control Commission (15A NCAC, Chapter 4, latest edition).

F. The following excerpts from the regulations are particularly important:

1. Pursuant to North Carolina G.S. 113A-57(2), the angle of graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion-control devices or structures.

2. As per North Carolina DWQ Construction General Permit NCG01, perimeter dikes, swales, ditches and slopes, disturbed areas within High Quality Water (HWQ) Zones, and slopes steeper than 3H:1V following completion of any phase of grading, shall be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion **within 7 calendar days**.

3. All other slopes of 3H:1V or flatter, except those with slopes greater than 50 feet in length or within HWQ Zones, following completion of any phase of grading, shall be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion **within 14 calendar days**.

G. Due to the nature of the work required by this Contract, it is anticipated that the location and nature of the erosion and sediment control devices will be adjusted on several occasions to reflect the current phase of construction. The construction schedule adopted by the Contractor will impact the placement and need for specific devices required for the control of erosion. The Contractor shall develop and implement such additional techniques as may be required to minimize erosion and off-site sedimentation. The location and extent of erosion and sedimentation control devices shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from constructed areas. All deviations from the erosion and sedimentation control provisions shown on the Contract Drawings shall have the prior acceptance of the Engineer and shall be completed at no additional cost to the Owner.

H. Erosion and sedimentation controls applicable to this project shall be as shown on the Contract Drawings, as specified herein, as indicated by the Engineer and as detailed in the North Carolina Erosion and Sediment Control Planning and Design Manual.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01300 – Submittals

B. Section 02100 – Clearing, Grubbing, and Site Preparation

C. Section 02241 – Dewatering and Flow Diversion for Streamwork

D. Section 02200 – Earthwork

E. Section 02264 – Geotextile for Streamwork

F. Section 02910 – Final Grading and Landscaping

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of other requirements of these specifications, all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.

1. 15A NCAC, Chapter 4

2. North Carolina Erosion and Sediment Control Planning and Design Manual, latest edition

3. North Carolina Department of Environment and Natural Resources General Permit NCG 010000 to Discharge Stormwater under the National Pollution Discharge Elimination System for Construction Activities, for any land disturbance or construction activity of one (1) acre or more.

4. North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition

5. North Carolina Division of Water Quality Stormwater Best Management Practices Manual, latest edition

B. See Specification Section 01090 - Reference Standards.

1.04 REGULATORY COMPLIANCE

A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of North Carolina and local authorities, as necessary. Contractor is the Co-Primary Permittee and Operator under the provisions of the NPDES Permit. As such, the Contractor will be required to sign certain certifications as described in the NPDES Permit. Contractor shall comply with requirements specified in the Contract Documents, on the approved Erosion Control Plan, and by the Engineer. Contractor shall also comply with all other laws, rules, regulations, ordinances and requirements concerning soil erosion and sediment control established in the United States, the State of North Carolina and local authorities as applicable. The following documents and the documents referenced therein define the regulatory requirements for this Section 02276.

1. NPDES PERMIT: The North Carolina Department of Environment and Natural Resources General Permit NCG 010000 to Discharge Stormwater under the National Pollution Discharge Elimination System for Construction Activities (NPDES permit) governs land disturbance or construction activities of one (1) acre or more. On applicable sites, Contractor is responsible for complying with terms and conditions of this permit.

2. Manual for Erosion and Sediment Control: Contractor shall follow Practices and Standards of the North Carolina Erosion and Sediment Control Planning and Design Manual (NC ESCPDM), latest edition.

B. During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge stormwater associated with construction activity including clearing, grading and excavation activities resulting in the disturbance of land and related support activities. Projects disturbing less than 1 acre are not subject to the provisions of the General Permit, but all erosion and sedimentation control measures, practices, and discharges noted on the Contract Drawings shall be installed, operated, and maintained in accordance with the Drawings, this Specification, and the NC ESCPDM. Such discharges shall be controlled, limited and monitored as specified below.

1. The Contractor, as Co-Primary Permittee and Operator under the provisions of the NPDES Permit, shall submit a plan for compliance with the Owner-provided approved erosion and sedimentation control plan to the Engineer for approval. Plans must include designation of where 7 and 14-day ground stabilization requirements and where basins which comply with surface-withdrawal requirements of the NPDES permit, if applicable, are located. Land disturbing activity shall not commence until the plan is approved by the Engineer. Maintain an up-to-date copy of the approved plan on the site.

2. Implement the approved plan. Deviation from the plan is allowed only to correct emergency situations of sediment discharge offsite or when minor modifications are made to improve performance of the measures and the approval authority has been notified. Note allowed deviations on the plan maintained on the site.

3. Manage onsite activities such that no adverse impacts to water quality occur from site activities or allowed discharges. The following activities, and others on a site-specific basis, require oversight throughout the construction and development process to assure that all water quality standards are protected.

   a. Equipment Operation and Maintenance: Equipment utilized during the construction activity on a site must be operated and maintained in such a manner as to prevent the potential or actual pollution of the surface or ground waters of the State. Fuels, lubricants, coolants, and hydraulic fluids, or any other petroleum products, shall not be discharged onto the ground or into surface waters. Spent fluids shall be disposed of in a manner so as not to enter the waters, surface or ground, of the State and in accordance with applicable state and federal disposal regulations. Any spilled fluids shall be cleaned up to the extent practicable and disposed of in a manner so as not to allow their entry into the waters, surface or ground, of the State.

   b. Material Handling: Herbicide, pesticide, and fertilizer usage during the construction activity shall be consistent with the Federal Insecticide, Fungicide, and Rodenticide Act and shall be in accordance with label restrictions.

   c. Building Material Waste Handling: All wastes composed of building materials shall be disposed of in accordance with North Carolina General Statutes, Chapter 130A, Article 9 - Solid Waste Management, and rules governing the disposal of solid waste (North Carolina Administrative Code Section 15A NCAC 13B). In particular, the following guidelines shall be followed:

      (1) No paint or liquid wastes in streams or storm drains.

      (2) Dedicated area for demolition, construction, and other wastes must be located a minimum of 50’ from storm drains and streams unless no reasonable alternatives are available.

      (3) Earthen-material stockpiles must be located a minimum of 50’ from storm drains and streams unless no reasonable alternatives are available.

      (4) Concrete materials onsite, including excess concrete, must be controlled to avoid contact with surface waters, wetlands, or buffers. (Note discharges from onsite concrete plants may require coverage under a separate NPDES permit – NCG140000).

   d. Litter and Sanitary Waste: The Permittee shall control the management and disposal of litter and sanitary waste from the site.

C. Violations and Fines

1. Contractor shall be responsible for reimbursing the Owner for any fines incurred as a result of violations to the NC Sedimentation Pollution Control Act, the NPDES General Permit for Stormwater Discharges on Construction Sites, and any applicable delegated local program's sediment control regulations until construction activities are complete and the project is accepted by the Owner. These include fines levied by the NCDENR Division of Land Quality, NCDENR Division of Water Quality and delegated local programs.

2. If violations result in the issuance of a Notice of Violation, the Contractor shall comply with the requirements of the Notice within the specified time period for compliance. Failure to comply could result in the assessment of a penalty for each day of the continuing violation, beginning with the date of the violation.

3. Violations may result in civil and/or criminal penalties which include fines and imprisonment.

1.05 SUBMITTALS

A. Prior to the start of the work, the Contractor shall prepare and submit a plan for implementing the temporary and permanent erosion and sedimentation control measures as shown on the Contract Drawings and in the Erosion and Sediment Control Plan approved by the appropriate regulatory authority, if required. Construction work shall not commence until the schedule of work and the methods of operations have been reviewed and approved.

B. The Contractor shall perform inspections of erosion and sedimentation control measures and stormwater discharge outfalls and prepare inspection reports as described in Part 3 of this Section. Copies of the inspection reports shall be submitted to the Engineer on a monthly basis.

C. In accordance with the procedures and requirements set forth in the General Conditions Division 1 and Section 01300 - Submittals, the Contractor shall submit the following:

1. Name and location of all material suppliers.

2. Certificate of compliance with the standards specified above for each source of each material.

3. List of disposal sites for waste and unsuitable materials and evidence of all required permits for use of those sites.

1.06 GUARANTEE

A. All restoration and re-vegetation work shall be subject to the guarantee period of the Contract as specified in the General Conditions and elsewhere in these Specifications.

PART 2 -- MATERIALS

2.01 MATERIALS

A. Materials for use in erosion and sedimentation control devices shall be in accordance with the NC ESCPDM.

B. All erosion and sediment control bid prices shall include all excavation, grading, maintenance, legal sediment disposal, permits and all other work and appurtenances necessary to design, install and maintain the sediment and erosion control measures as detailed herein and in accordance with the NC ESCPDM.

2.02 SILT FENCE

A. Silt (or sediment) fence shall be constructed as shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.62 of the NC ESCPDM. Silt fences shall be installed below small disturbed areas that are less than ¼ acre disturbed per 100-feet of fence when slopes are less than 2%. Contractor shall refer to Table 6.62a in the NC ESCPDM for criteria. Silt fence shall not be installed across streams, ditches, or waterways or other areas of concentrated flows.

B. Silt fence shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.62 of the NC ESCPDM. Silt fence shall be a woven geotextile filter fabric made specifically for sediment control. Filter fabric shall not rot when buried and shall resist attack from soil chemicals, alkalines and acids in the pH range from 2 to 13, and shall resist damage due to prolonged ultraviolet exposure. Filter fabric shall be C-50NW as manufactured by Contech Earth Stabilization Solutions, GT 142 as manufactured by SKAPS Industries, Soiltex ST 120N as manufactured by Geo-Synthetics, Inc., or approved equal. The cost of silt fence shall include the materials, excavation, backfill, aggregate, etc. and all maintenance and restoration activities required.

C. Silt fence shall be stable for the 10-year peak storm runoff. Fabric shall meet the following specifications:

Temporary Silt Fence Material Property Requirements					
	Test Material	**Units**	**Supported[1] Silt Fence**	**Un-Supported[1] Silt Fence**	**Type of Value**
Grab Strength	ASTM D 4632	N (lbs)			
Machine Direction			400	550	MARV
			(90)	(90)	
x-Machine Direction			400	450	MARV
			(90)	(90)	
Permittivity[2]	ASTM D 4491	sec-1	0.05	0.05	MARV
Apparent Opening Size[2]	ASTM D 4751	mm	0.60	0.60	Max. ARV[3]
		(US Sieve #)	(30)	(30)	
Ultraviolet Stability	ASTM D 4355	% Retained Strength	70% after 500 hours exposure	70% after 500 hours exposure	Typical

[1] Silt Fence support shall consist of 14 gage steel wire with a mesh spacing of 150 mm (6 inches), or prefabricated polymer mesh of equivalent strength.
[2] These default values are based on empirical evidence with a variety of sediment. For environmentally sensitive areas, a review of previous experience and/or site or regionally specific geotextile tests in accordance with Test Method D 5141 should be performed by the agency to confirm suitability of these requirements.
[3] As measured in accordance with Test Method D 4632.

D. The synthetic filter fabric shall consist of at least 95% by weight of polyolefins or polyester, certified by the manufacturer, and as specified by Section 6.62 of the NC ESCPDM.

E. The posts for silt fences shall be 1.33 lb/linear feet steel with a minimum length of 5 feet; posts shall have projections to facilitate fastening of the fabric.

F. For reinforcement of standard strength filter fabric use wire fence with a minimum 14 gauge and a maximum mesh spacing of 6 inches.

2.03 STONE FOR EROSION CONTROL

A. The Contractor shall place stone for erosion control as shown on the Contract Drawings, as specified herein, as specified in Section 1610 of the NCDOT Standard Specifications, and as detailed in Section 6.15 of the NC ESCPDM. The stone for erosion control shall consist of field stone or rough un-hewn quarry stone. The stone shall be sound, tough, dense, and resistant to the action of air and water. The stone for erosion control shall be Class (A) or Class (B) as specified in the NCDOT Standard Specifications, Section 1610, unless otherwise shown on the Contract Drawings.

B. Stone for erosion control shall be designed, installed and maintained in accordance with Part 3 of this Section, Section 1610 of the NCDOT Standard Specifications, and Section 6.15 of the NC ESCPDM. The cost for stone for erosion control shall include furnishing, weighing, stockpiling, re-handling, placing and maintaining stone; disposal of any stone not incorporated into the project if directed by the Engineer; and any other incidentals necessary to complete the work.

2.04 RIP RAP

A. The Contractor shall place rip rap as shown on the Contract Drawings, as specified in Section 1042 of the NCDOT Standard specifications for plain rip rap, and as detailed in Section 6.15 of the NC ESCPDM. The stone for rip rap shall consist of field stone or rough un-hewn quarry stone. The rip rap shall be sound, tough, dense, and resistant to the action of air and water. Neither the width nor thickness of individual stones shall be less than one third their length. The rip rap shall be Class 1, Class 2, or Class B as specified in the NCDOT Standard Specifications, Section 1042, unless otherwise shown on the Contract Drawings.

B. Rip rap shall be designed, installed and maintained in accordance with Part 3 of this Section, Section 1042 of the NCDOT Standard Specifications, and Section 6.15 of the NC ESCPDM. The cost for rip rap shall include furnishing, weighing, stockpiling, rehandling, placing and maintaining rip rap; disposal of any rip rap not incorporated into the project if directed by the Engineer; and any other incidentals necessary to complete the work.

2.05 ROLLED EROSION CONTROL PRODUCTS (RECPs)

A. RECPs, including Turf Reinforcement Mat (TRM), shall be installed as shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.17 of the NC ESCPDM. RECPs should be utilized to aid stabilization of slopes greater than 2:1 and with more than 10 feet of vertical relief.

RECPs should also be used when mulch cannot be adequately tacked and where immediate ground cover is required to prevent erosion damage. Examples of RECPs are blankets, nets and matting.

B. RECPs shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.17 of the NC ESCPDM. The cost for RECPs shall include all excavation, grading, and materials, and all maintenance activities.

C. RECPs shall be used to aid in permanent stabilization of vegetated channels where runoff velocity will exceed 2 feet/second on bare earth during the 2-year rainfall event that produces peak runoff.

D. RECPs shall be chosen based on the Design Criteria detailed in Section 6.17 of the NC ESCPDM. Typically, nets shall be used in conjunction with mulch; the use of mulch is typically not required with excelsior, woven straw blankets and coir blankets.

E. The recommended anchoring devices are 12-inch minimum length wooden stakes, 11-gauge staples that are at least 6 inches long by 1 inch wide, or rigid, biodegradable stakes of a minimum of 6 inches in length. If Manufacturer's recommendations are more stringent, they shall supersede.

F. The minimum bare soil shear stress values for specific RECPs are as follows:

1. Straw with net temporary RECP shall be North American Green S150, American Excelsior Co. Curlex I, Contech SFB1, or equal with a minimum bare soil shear stress value of 1.5 lb/ft^2.

2 Curled wood or coconut fiber RECP shall be American Excelsior Curlex II, North American Green C125, Contech EFB4 or equal matting with a minimum bare soil shear stress value of 2.0 lb/ft^2.

3. Synthetic Turf Reinforcement Mat (TRM) shall be Enkamat 7020 as manufactured by Colbond Geosynthetics, Synthetic Industries Landlock Erosion Mat TRM 1060, TH8 as manufactured by TC Mirafi, or equal matting with a minimum long-term vegetated shear stress value of 5.0 lb/ft^2.

2.06 TEMPORARY AND PERMANENT DIVERSIONS

A. Temporary diversions shall be constructed as shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Sections 6.20 and 8.05 of the NC ESCPDM. Permanent diversions shall be constructed as shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.21 and 8.05 of the NC ESCPDM. Temporary diversions shall be constructed adjacent to disturbed areas to collect surface runoff from disturbed areas and direct the runoff to sediment basins or to divert non-sediment laden runoff away from undisturbed areas and/or sediment basins. All temporary diversions transporting sediment-laden runoff shall terminate in a sediment trapping device. Permanent diversions should be planned as a part of initial site development and should be coordinated with temporary diversions. All temporary and permanent diversions shall be stabilized with vegetation or other means within 7 days of installation. Permanent diversions shall be used to divert water to locations where it can be used or released without erosion or flood damage. Dimensions shall be as shown on the Contract

Drawings.

B. Temporary diversions shall be designed, installed and maintained in accordance with Part 3 of this Section and Sections 6.20 and 8.05 of the NC ESCPDM, to the satisfaction of the Engineer, until the site has been stabilized. Permanent diversions shall be designed, installed and maintained in accordance with Part 3 of this Section and Sections 6.21 and 8.05 of the NC ESCPDM. The cost of temporary and permanent diversions shall include the excavation, grading, materials, etc. and all maintenance and restoration activities required.

2.07 TEMPORARY SLOPE DRAINS

A. Temporary slope drains shall be constructed as shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.32 of the NC ESCPDM. Temporary slope drains are used to convey concentrated runoff down the face of a slope without causing erosion and are generally used in conjunction with temporary diversions.

B. The pipe diameter for temporary slope drains shall be selected according to Table 6.32a of the NC ESCPDM. The pipe shall be heavy-duty flexible material such as non-perforated, corrugated plastic pipe or specially designed flexible tubing.

C. Temporary slope drains shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.32 of the NC ESCPDM, to the satisfaction of the Engineer, until the site has been stabilized. The cost of the temporary slope drains shall include the piping, earthwork, stone for erosion control, and all maintenance activities required.

2.08 TEMPORARY GRAVEL CONSTRUCTION ENTRANCES/EXITS

A. Temporary gravel construction entrances/exits shall be located at points where vehicles enter and leave a construction site, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.06 of the NC ESCPDM.

B. Temporary gravel construction entrances/exits shall be constructed with a minimum 6 inch layer of 2–3 inch washed stone placed over a stable foundation and shall be a minimum of 100 feet in length and 25 feet in width. Geotextile filter fabric shall be used under stone as shown on the Contract Drawings.

C. Temporary gravel construction entrances/exits shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.06 of the NC ESCPDM, to the satisfaction of the Engineer, until the site has been stabilized. The cost of temporary gravel construction entrances/exits shall include the materials and all maintenance activities required, including additional tire washing as may be necessary.

2.09 TEMPORARY AND PERMANENT STABILIZATION OF DISTURBED AREAS

A. Temporary and permanent stabilization of disturbed areas will be provided at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Sections 6.10, 6.11, 6.12 and 6.14 of the NC ESCPDM. The Contractor shall provide ground cover adequate to restrain erosion on

disturbed areas that will be left un-worked for periods exceeding 7 to 14 days, as noted in Section 1.01. F. of this specification.

B. Soil amendments, including lime and fertilizer, shall be as detailed in Sections 6.10, 6.11 and 6.12 of the NC ESCPDM.

C. Seed mixtures shall be selected based on site location and seasonal recommendations outlined in Sections 6.10 and 6.11 of the NC ESCPDM. Sod shall be selected based on site location and intended use as outlined in Section 6.12 of the NC ESCPDM.

D. Mulch shall be as detailed in Section 6.14 of the NC ESCPDM. RECPs shall be as detailed in 2.05 herein and in Section 6.17 of the NC ESCPDM.

E. Temporary soil stabilizer shall consist of an especially prepared highly concentrated powder which, when mixed with water, forms a thick liquid such as "Enviroseal 2001" by Enviroseal Corporation, "Terra Control" by Quattro Environmental, Inc., or "CHEM-CRETE ECO-110" by International CHEM-CRETE Corporation, and having no growth or germination inhibiting factors. The agent shall be used for hydroseeding grass seed in combination with other approved amendments resulting in a highly viscous slurry which, when sprayed directly on the soil, forms a gelatinous crust.

F. Temporary and permanent stabilization of disturbed areas shall be achieved in accordance with Part 3 of this Section and Sections 6.10, 6.11, 6.12, 6.14 and 6.17 of the NC ESCPDM. The cost of temporary and permanent stabilization of disturbed areas shall include all grading, excavation and materials as well as all reseeding and other maintenance activities required until stabilization is achieved.

2.10 CHECK DAMS AND CHECK DAMS WITH WEIRS

A. Check dams shall be constructed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.83 of the NC ESCPDM. Check dams with weirs shall be constructed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.87 of the NC ESCPDM.

B. Check dams and check dams with weirs shall not be constructed in an intermittent or perennial stream. The drainage area for any one check dam or check dam with weir shall be limited to ½ acre.

C. Dimensions shall be as shown on the Contract Drawings. Check dams shall be constructed of stone or riprap with filter fabric, fiber filtration tubes, or sediment logs, as indicated on the Contract Drawings. Check dams with weirs shall be constructed of stone or riprap with filter fabric. Material specifications for stone, riprap, fiber filtration tubes, and sediment logs appear herein. If Manufacturer's recommendations are more stringent, they shall supersede. Filter fabric shall be Type II Separator Geotextile, as specified in Section 02264 – Geotextile for Streamwork.

D. Check dams shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.83 of the NC ESCPDM. Check dams with weirs shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.87 of the NC ESCPDM. The cost of check dams and check dams with weirs shall

include all excavation, grading and materials as well as all maintenance activities required.

2.11 INLET EROSION CONTROL MEASURES

A. Yard, Curb and other Inlet Erosion Control Measures shall be constructed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Sections 6.50 through 6.55 of the NC ESCPDM. Inlet erosion control measures shall be used to prevent or limit the introduction of sediment to storm drain systems and allow early use of the of the storm drainage system. Maximum drainage areas for inlet erosion control measures vary from 1 acre for excavated drop inlet protection, hardware & cloth gravel inlet protection, and block and gravel inlet protection to more than 5 acres for rock pipe inlet protection. In addition to the inlet protection measures described in the NC ESCPDM, other measures may be specified by the Engineer. For measures not detailed in the NC ESCPDM, the materials will be as specified by the Engineer's and Manufacturer's instructions, with more stringent specifications superseding.

B. Materials for Inlet Erosion Control Measures consist of silt fence, riprap, stone (gravel), hardware wire, sod, concrete blocks, and sediment logs. Riprap and stone for erosion control shall be as specified herein. Hardware wire shall be as specified in Section 6.51 of the NC ESCPDM. Sod shall conform to the specifications set forth in Section 6.12 of the NC ESCPDM. Concrete blocks shall be as specified in Section 6.52 of the NC ESCPDM. Material specifications for sediment logs appear within. If Manufacturer's recommendations are more stringent, they shall supersede.

C. Inlet Erosion Control Measures shall be designed, installed and maintained in accordance with Part 3 of this Section and Sections 6.50 through 6.55 of the NC ESCPDM. Measures not described in the NC ESCPDM shall be designed, installed, and maintained in accordance with the Engineer's and Manufacturer's instructions, with more stringent instructions superseding. The cost of inlet erosion control measures shall include all excavation, grading and materials as well as all maintenance activities required.

2.12 FIBER FILTRATION TUBES (FFTs) AND SEDIMENT LOGS

A. FFTs and sediment logs shall be installed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, and as specified herein.

B. FFTs shall consist of composite wood fibers and man-made fibers, with or without performance-enhancing polymers, encased with cylindrical tubes composed of a heavy-duty, knitted, high density polyethylene mesh. The photodegradable mesh shall be oriented in a diamond or hexagonal pattern and shall move freely at all knitted yarn intersections.

C. Sediment logs shall consist of natural fibers (wood, coconut, etc.) inside heavy duty knitted cylindrical tubing.

D. FFTs and sediment logs shall be designed, installed and maintained as specified herein. If Manufacturer's recommendations are more stringent, they shall supersede. The cost of FFTs shall include all excavation, grading and materials as well as all maintenance activities required.

2.13 TEMPORARY AND PERMANENT CHANNELS

A. Temporary and permanent channels shall be installed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Sections 6.30, 6.31 and 8.05 of the NC ESCPDM. Temporary and permanent channels shall be used to convey concentrated runoff without damage from erosion, deposition or flooding.

B. Temporary and permanent channels shall be designed, installed and maintained in accordance with Part 3 of this Section and Sections 6.30, 6.31 and 8.05 of the NC ESCPDM. The cost of all temporary and permanent channels shall include all excavation, grading and materials as well as all maintenance activities required.

2.14 TEMPORARY SEDIMENT TRAPS, SEDIMENT BASINS, AND SKIMMER SEDIMENT BASINS

A. Temporary sediment traps shall be constructed as shown on the Contract Drawings, at the termination of all temporary diversions diverting sediment laden runoff, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.60 of the NC ESCPDM. These temporary measures shall not be constructed within an intermittent or perennial stream and shall be installed prior to any land disturbance activities within the drainage area. Temporary sediment traps shall be constructed by excavating the appropriate size rectangular basin and constructing a rock-fill dam on the discharge end. Where specific elevations are not indicated on the Contract Drawings, Contractor shall maintain basins at the depths shown below working grades.

B. Sediment basins shall be installed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Sections 6.61and 8.07 of the NC ESCPDM. Skimmer sediment basins shall be installed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.64 of the NC ESCPDM. Sediment basins and skimmer sediment basins shall be used where drainage areas are too large for temporary sediment traps. **Outlet structures must withdraw from basin surface unless drainage area is less than 1 acre.** They shall retain sediment on the site and prevent off site sediment in waterways, and they shall not be located in intermittent or perennial streams. Sediment basins and skimmer sediment basins shall be installed prior to any land disturbance activities within the drainage area.

C. Porous baffles shall be installed in temporary sediment traps, sediment basins, and skimmer sediment basins as shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.65 of the NC ESCPDM. Porous baffles are used to reduce the velocity and turbulence of the water flowing through the structure and to facilitate the settling of sediment in the water before discharge. They effectively spread the flow across the entire width of a structure.

D. Material used for porous baffles shall be as indicated on the Contract Drawings. Typical materials include silt fence, coir erosion blanket, coir mesh, and tree protection fence. Other materials may be used as noted on the Contract Drawings and indicated by the Engineer.

E. The structure life for temporary sediment traps shall be limited to 2 years. Temporary sediment traps shall be spaced to limit the maximum tributary drainage area to 5 acres.

The basin life of sediment basins and skimmer sediment basins shall be limited to 3 years unless they are designed as permanent structures. The drainage area for sediment basins and skimmer sediment basins shall be limited to 100 acres.

F. The principal spillway for sediment basins shall consist of a riser and barrel. Ensure that the pipe is capable of withstanding the maximum expected load without yielding, buckling, or cracking. The basin should be provided with a skimmer or flashboard riser to dewater the basin from the water surface. The emergency spillway shall be constructed in undisturbed soil. The principal spillway outlet and emergency spillway shall be stabilized as shown on the Contract Drawings. Materials shall be as noted on the Contract Drawings.

G. The principal spillway for skimmer sediment basins shall consist of a skimmer which dewaters the basin from the top of the water surface at a controlled rate. A dewatering rate of 24 to 72 hours is required. The skimmer outlet pipe shall be capable of withstanding the maximum expected load without yielding, buckling, or cracking. The emergency spillway shall be constructed in undisturbed soil whenever possible and shall be lined with impermeable geotextile fabric in accordance with Section 02264 – Geotextile for Streamwork. The principal spillway outlet and emergency spillway shall be stabilized as shown on the Contract Drawings.

H. Temporary sediment traps shall be designed, constructed and maintained in accordance with Part 3 of this Section and Section 6.60 of the NC ESCPDM, to the satisfaction of the Engineer, until the sediment producing areas have been permanently stabilized. The cost of the temporary sediment traps shall include the excavation, grading, fill, baffles, stone for erosion control, washed stone, geotextile, etc. and all maintenance activities required.

I. Sediment basins shall be designed, installed and maintained in accordance with Part 3 of this Section and Sections 6.61 and 8.07 of the NC ESCPDM. Skimmer sediment basins shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.64 of the NC ESCPDM. The cost of sediment basins and skimmer sediment basins shall include all excavation, grading and materials as well as all maintenance activities required.

J. Porous baffles shall be designed, installed and maintained in accordance with Part 3 of this Section and Section 6.65 of the NC ESCPDM. The cost of porous baffles shall include all excavation, grading and materials as well as all maintenance activities required.

2.15 OUTLET STABILIZATION STRUCTURE

A. Outlet stabilization structures shall be constructed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Sections 6.41 and 8.06 of the NC ESCPDM. These structures shall be used where the discharge velocity of the upstream water conveyance structure exceeds the permissible velocity of the receiving channel or disposal area.

B. Structures shall be sized for a capacity equivalent to a 10-year, peak runoff or design

discharge of the water conveyance structure, whichever is greater. Riprap materials shall be as specified on the Contract Drawings. Filter fabric shall be Type II Separator Geotextile, as specified in Section 02264 – Geotextile for Streamwork.

C. Outlet stabilization structures shall be designed, installed and maintained in accordance with Part 3 of this Section and Sections 6.41 and 8.06 of the NC ESCPDM. The cost of outlet stabilization structures shall include all excavation, grading and materials as well as all maintenance activities required.

2.16 FLEXIBLE GROWTH MEDIUM

A. Flexible growth medium shall be applied at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, and as specified herein.

B. Flexible growth medium is a spray-on flexible blanket that controls soil erosion and accelerates seed germination for establishment of vegetation. It is made of wood fibers, man-made fibers, and additives that are applied wet to the prepared surface. The flexible growth medium may be mixed with seed and fertilizer prior to application. Seed and fertilizer rates shall comply with applicable stabilization of disturbed area requirements of this Section.

C. Flexible growth medium shall not be used in areas of concentrated flow unless installed in conjunction with a RECM or TRM.

D. Flexible growth medium shall be installed and maintained in accordance with Part 3 of this Section. If Manufacturer's recommendations are more stringent, they shall supersede. The cost of flexible growth medium shall include all materials as well as all maintenance activities required.

2.17 TREE PROTECTION FENCE

A. Tree protection fence shall be installed at the locations shown on the Contract Drawings, at other locations indicated by the Engineer, as specified herein, and as detailed in Section 6.05 of the NC ESCPDM.

B. Tree protection fence shall used to protect trees and their root zones during construction. Tree protection fence shall be brightly-colored, UV-resistant poly barricade fabric. Signs designating the area as protected shall be installed on all sides of the fence. Wording and spacing of the signage shall be as indicated on the Contract Drawings.

C. Tree protection fence shall be installed and maintained in accordance with Part 3 of this Section and Section 6.05 of the NC ESCPDM. The cost of tree protection fence shall include all materials as well as all maintenance activities required.

PART 3 -- EXECUTION

3.01 INSTALLATION AND MAINTENANCE

A. All installation and maintenance shall be conducted in accordance with this specification and the NC ESCPDM. In the event of a discrepancy between this specification, Manufacturer's recommendations and the NC ESCPDM, the more stringent requirements shall take precedence.

B. If applicable, all requirements of the NPDES Permit shall be followed. In the event of a discrepancy between this specification and the NPDES Permit requirements, the more stringent requirements shall take precedence.

C. If possible, erosion and sedimentation control devices shall be established prior to clearing operations in a given area. Where such practice is not feasible, the erosion and sedimentation control device(s) shall be established concurrent with the clearing operations or immediately following completion of the clearing operations.

D. The Contractor shall furnish the labor, materials and equipment required for routine maintenance of all erosion and sedimentation control devices. At a minimum, maintenance shall be scheduled as required for a particular device to maintain the removal efficiency and intent of the device. Note that specific maintenance intervals for various measures and practices are specified within the NC ESCPDM. Of the maintenance requirements specified herein and in the NC ESCPDM, the more stringent shall take precedence for each and every sediment and erosion control measure utilized on the site. Maintenance shall include but not be limited to 1) the removal and satisfactory, legal disposal of accumulated sediment from traps or silt barriers and 2) replacement of filter fabrics used for silt fences and stone impaired by sediment in stone filters, gravel construction entrances, etc. Maintenance as noted in items 1) and 2) above shall be performed as required, and at least once every 3 months for the duration of construction activities. Sediment removed from erosion and sedimentation control devices shall be disposed of in locations that will not result in off-site sedimentation as acceptable to the Engineer, at no additional cost to the Owner. If no suitable on site locations are available, all such sediment will be legally disposed of off site, at no additional cost to the Owner.

3.02 SILT FENCE

A. Silt Fence shall be designed, installed and maintained in accordance with the requirements of Section 6.62 of the NC ESCPDM. Silt fence shall be erected at the locations shown on the Contract Drawings and at all other locations as may be directed by the Engineer. Silt fence shall be erected and maintained to the satisfaction of the Engineer until a vegetative ground cover has been established. Replacement of the filter fabric and its associated appurtenances, if required by the Engineer, will be at the Contractor's expense.

B. Silt fence shall not be installed across streams, ditches, waterways or other areas of concentrated flow.

C. Dig a trench approximately 8 inches deep and 4 inches wide and place the fabric in the bottom of the excavated ditch or use the slicing method to insert the fabric into a cut sliced in the ground with a disc. Ensure that the height of the sediment fence does not exceed 24 inches above the ground surface.

D. Install posts 4 feet apart in critical areas and 6 feet apart on standard applications when extra strength filter fabric is used. When wire mesh support is used, posts shall be installed a maximum of 8 feet apart. Install posts 2 feet deep on the downstream side of the silt fence, as close as possible to the fabric.

E. Joints should be avoided along the fencing. When joints are necessary, securely fasten the filter cloth only at a support post with 4 feet minimum overlap to the next post.

F. Compaction is vitally important for effective results. Compact the soil immediately next to the silt fence fabric with the front wheel of the tractor, skid steer or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of 4 trips.

G. Stabilized outlets for silt fence shall be provided at locations shown on the Contract Drawings. The outlet section shall have a maximum width of 4 feet. The height of silt fence at the outlet shall be a maximum of 1 foot. A 5 foot x 5 foot (minimum) apron of #57 washed stone shall be provided on the downstream side of the silt fence outlet.

H. Silt fence shall be erected around all catch basins which are located downstream from any construction work unless other inlet protection is specified. Should any catch basins be indicated to be relocated or modified, silt fence shall be utilized until work is completed on the catch basins. Upon completion of the modification, the area shall be rough graded, as shown on the Contract Drawings, until the end of the project, at which time final grading shall occur.

I. Inspect silt fence at least once a week and after each rainfall event. Make any required repairs immediately.

J. Should the fabric of any silt fence collapse, tear, decompose or become ineffective, replace it promptly. All fabric shall be replaced after the first 3 months of construction activity and every 3 months thereafter until construction activities are complete.

K. Remove sediment deposits as necessary to provide adequate storage volume for the next rain and to reduce pressure on the fence. Take care to avoid undermining the fence during cleanout.

L. Remove all fencing materials and unstable sediment deposits and bring the area to grade and stabilize it after the contributing drainage area has been properly stabilized. Removal of any silt fence shall be permitted only with the prior approval of the Engineer or the local governing agency.

3.03 STONE FOR EROSION CONTROL

A. Stone for erosion control shall be designed, installed, and maintained in accordance with the requirements of Section 6.15 of the ESCPDM. Stone for erosion control shall be dumped and placed in such manner that the larger rock fragments are uniformly distributed throughout the rock mass and the smaller fragments fill the voids between the larger fragments. Rearranging of individual stones by equipment or by hand shall only be required to the extent necessary to secure the results specified above, to protect structures from damage when rock material is placed against the structures, or to protect the underlying Type II Separator Geotextile from damage during installation.

B. Inspect at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period. Remove accumulated sediment and replace stone impaired by sediment as necessary.

3.04 RIPRAP

A. Riprap shall be designed, installed and maintained in accordance with the requirements of Section 6.15 of the NC ESCPDM. Riprap shall be graded so that the smaller stones are uniformly distributed through the mass. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary or ordered by the Engineer. The placed riprap shall form a properly graded, dense, neat layer of stone. The placed riprap shall have a minimum depth of 24 inches unless otherwise specified by the Engineer. Type II Separator Geotextile, as specified in Section 02264 – Geotextile for Streamwork, shall be used under all riprap unless otherwise noted.

B. Inspect periodically for scour or dislodged stones. Control of weed and brush growth may be needed.

3.05 ROLLED EROSION CONTROL PRODUCTS (Different from Section 02242 – Coir Mat)

A. RECPs shall be designed, installed and maintained in accordance with the requirements of Section 6.17 of the NC ESCPDM. The Engineer may direct the Contractor to place RECPs in permanent channels or on slopes at other locations in addition to those shown on the Contract Drawings. If Manufacturer's instructions are more stringent, they shall supersede.

B. The Contractor shall place the RECPs where directed immediately after the channel or slope has been properly graded and, if applicable, prepared, fertilized, and seeded.

C. Grade the surface of the installation area so that the ground is smooth and loose. When seeding prior to installation, follow the steps in Section 6.10 (Temporary Seeding) and 6.11 (Permanent Seeding) of the NC ESCPDM as applicable. Remove all large rocks, debris, etc. so as to ensure that good contact between the RECP and the ground is maintained so that no erosion occurs beneath the RECP. Terminal anchor trenches are required at RECP ends and intermittent trenches must be constructed across channels at 25-foot intervals. Terminal anchor trenches should be a minimum of 12 inches in depth and 6 inches in width, while intermittent trenches should be a minimum of 6 inches deep and 6 inches wide. Take care to maintain direct contact between the soil and the RECP.

D. For slope installation, place RECP 2-3 feet over top of slope and into an approximately 12 inch deep by 6 inch wide excavated end trench. Using staples, stakes, or pins, anchor the RECP at 1 foot intervals along the bottom of the trench, backfill, and compact. Along the slope, pin the RECP in a 3 foot center-to-center pattern; provide a minimum 3 inch overlap for adjacent rolls.

E. For channel installations, excavate 12 inch deep by 6 inch wide terminal trenches across the upper and lower end of the lined channel. Anchor the RECP at a minimum of 25 foot intervals utilizing either two rows of anchors or 6 inch by 6 inch cross trenches. Bury outside RECP edges in longitudinal trenches 6 inches deep and wide along the channel edges. Pin the RECP in at 1 foot intervals along the bottom of terminal trenches, backfill, and compact. Overlap adjacent rolls a minimum of 3 inches and pin at 1 foot intervals. Place the first RECP at the downstream end of the channel and unroll upstream. When starting installation of a new roll, begin in a trench or shingle-lap ends of rolls a minimum of 1 foot with upstream RECP on top to prevent uplifting.

F. Staples, stakes, and pins shall be driven so that the top is flush with the ground.

G. During the establishment period, check RECPs at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period. Immediately make repairs. Good contact with the ground must be maintained. Monitor and repair the RECP as necessary until ground cover is established.

3.06 TEMPORARY AND PERMANENT DIVERSIONS

A. Temporary diversions shall be designed, installed and maintained in accordance with the requirements of Sections 6.20 and 8.05 of the NC ESCPDM. Permanent diversions shall be designed, installed, and maintained in accordance with the requirements of Sections 6.21 and 8.05 of the NC ESCPDM. The Contractor shall provide temporary and permanent diversions at all locations noted on the Contract Drawings and at all other locations as may be directed by the Engineer.

B. Remove and properly dispose of all trees, debris, etc. Fill and compact all ditches, swales, etc. that will be crossed to natural ground level or above.

C. Excavate, shape and stabilize diversions as shown on the Contract Drawings and described herein. Unless otherwise noted, provide vegetative stabilization immediately after installation of permanent diversions. Temporary diversions that are to serve longer than 7 working days shall be seeded and mulched as soon as they are constructed to preserve dike height and reduce maintenance. Seed and mulch disturbed areas draining into the diversions within 14 calendar days of completing any phase of grading.

D. For temporary diversions, ensure that the top of the dike is not lower at any point than the design elevation plus the specified settlement. Provide sufficient room around temporary diversions to permit machine re-grading and cleanout. Vegetate the ridge of temporary diversions immediately after construction unless they will remain in place less than 7 working days.

E. Provide outlet protection adequate to accept flow from diversion plus any other contributing runoff. Sediment-laden runoff shall be routed through a sediment-trapping device.

F. Inspect temporary diversions once a week and after every rainfall event. Immediately remove sediment from the flow area and repair the diversion ridge. Carefully check outlets and make timely repairs as needed. When the area protected is permanently stabilized, remove the ridge and the channel to blend with the natural ground level and appropriately stabilize it. Inspect permanent diversions weekly and after every rainfall event during construction operations until permanent vegetation is established. After vegetation is established, inspect after major storms. Immediately remove any debris and make repairs as needed in a timely manner. Maintain healthy vegetation at all times.

3.07 TEMPORARY SLOPE DRAINS

A. Temporary slope drains shall be designed, installed and maintained in accordance with the requirements of Section 6.32 of the NC ESCPDM. The Contractor shall provide temporary slope drains with inlet and outlet protection and associated diversion channels at all locations noted on the Contract Drawings, and at other locations as may be directed by the Engineer.

B. Place slope drains on undisturbed soil or well compacted fill. Slightly slope the section of pipe under the dike toward its outlet. Hand-tamp the soil under and around the entrance section in lifts not to exceed 6 inches.

C. Ensure that all slope drain connections are watertight. Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet apart. Extend the drain beyond the toe of the slope and provide outlet protection.

D. Immediately stabilize all disturbed areas following construction.

E. Inspect the temporary slope drain, inlet and outlet protection, and supporting diversions weekly and after every rainfall event and promptly make any necessary repairs. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

3.08 TEMPORARY GRAVEL CONSTRUCTION ENTRANCES/EXITS

A. Temporary gravel construction entrances/exits shall be designed, installed and maintained in accordance with the requirements of Section 6.06 of the NC ESCPDM. The Contractor shall provide temporary gravel construction entrances/exits at all locations noted on the Contract Drawings and at all other locations as may be directed by the Engineer.

B. Maintain the gravel pad as specified in Section 6.06 of the NC ESCPDM and in a condition to prevent mud or sediment from leaving the construction site. This may require periodic topdressing with 2 – 3 inch stone. Inspect each construction entrance at least weekly and after each rainfall event and replace stone impaired by sediment as necessary. Immediately remove all objectionable materials spilled, washed, or tracked onto public roadways.

C. If, despite the use of a gravel construction entrance/exit, most of the mud and sediment are not removed from vehicle tires, tire washing may be necessary as detailed in Section

6.06 of the NC ESCPDM. If necessary this shall be done at no additional cost to the Owner.

3.09 TEMPORARY AND PERMANENT STABILIZATION OF DISTURBED AREAS

A. The Contractor shall temporarily stabilize disturbed areas that will not be brought to final grade within 14 calendar days unless as noted in 1.01 F. of this Section. Temporary seeding shall be applied on areas that include diversions, dams, temporary sediment basins, temporary road banks and topsoil stockpiles. Areas to be stabilized with permanent vegetation must be seeded or planted within 14 working days after final grade is reached, unless temporary stabilization is applied. Temporary seeding provides protection for no more than 1 year, after which permanent stabilization should be initiated.

B. Complete grading before preparing seedbeds, and install all necessary erosion control measures. Minimize steep slopes. If soils become compacted during grading, loosen to a depth of 6-8 inches.

C. Reseed and mulch temporary seeding areas where seedling emergence is poor, or where erosion occurs, as soon as possible. Do not mow. Protect from traffic as much as possible.

D. Refer to Section 6.10 of the NC ESCPDM for additional information and specifications regarding seedbed requirements, plant selection, seeding and mulching for temporary seeding applications.

E. The operation of equipment is restricted on slopes steeper than 3:1. Provisions for vegetation establishment can be made during final grading. Vegetation chosen for these sites must not require mowing or other intensive maintenance. Good mulching practices are critical for protecting against erosion on steep slopes.

F. Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

G. Reseeding – If a stand has inadequate cover, re-evaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand after seedbed preparation or over-seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

H. If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

I. Fertilization - On the typical disturbed site, full establishment usually requires re-fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

J. Refer to Section 6.11 of the NC ESCPDM for additional information and specifications regarding seedbed requirements, plant selection, seeding and mulching for permanent seeding applications.

K. Refer to Section 6.12 of the NC ESCPDM for additional information and specifications regarding soil preparation, sod selection, installation, and maintenance for sodding.

L. Inspect all seeded areas weekly and after heavy rains until permanent cover is established. Inspect within 6 weeks of planting to see if stands are adequate. Fertilize, reseed and mulch damaged and sparse areas immediately.

3.10 CHECK DAMS AND CHECK DAMS WITH WEIRS

A. Check dams shall be designed, installed and maintained in accordance with the requirements of Section 6.83 of the NC ESCPDM. Check dams with weirs shall be designed, installed and maintained in accordance with the requirements of Section 6.87 of the NC ESCPDM. The Contractor shall provide check dams or check dams with weirs at all locations noted on the Contract Drawings and at all other locations as may be directed by the Engineer.

B. Stone shall be placed on a filter fabric foundation. Center stone shall be at least 9 inches below natural ground level and stone shall extend 1.5 feet beyond ditch bank.

C. For check dams with weirs, provide an apron with a length 3 times the height of the dam and a width a minimum of 4 feet. A 12-inch layer (minimum) of sediment control stone shall be placed on the upstream side of the dam. Excavate sediment storage area to the dimensions shown on the Contract Drawings.

D. Fiber filtration tubes and sediment logs may be specified for use as check dams. These measures shall be installed according to instructions included herein. If Manufacturer's recommendations are more stringent, they shall supersede.

E. Spacing shall be such that the elevation of the top of the lower dam is the same as the toe elevation of the upper dam.

F. Check dams and check dams with weirs shall be inspected at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period. Sediment, limbs and other debris shall be cleared from the channel. Repairs shall be made immediately.

3.11 INLET EROSION CONTROL MEASURES

A. Inlet erosion control measures shall be designed, installed and maintained in accordance with the applicable requirements of Sections 6.50 through 6.55 of the NC ESCPDM. If inlet erosion control measures shown on the Contract Drawings are not included in the NC ESCPDM, Engineer's and Manufacturer's instructions for design, installation, and maintenance shall be followed, with more stringent instructions superseding. The Contractor shall provide inlet erosion control measures at all locations noted on the Contract Drawings, and at all other locations as may be directed by the Engineer.

B. Excavated drop inlet protection shall be installed and maintained in accordance with Section 6.50 of the NC ESCPDM. Drainage area is limited to 1 acre. The minimum volume of excavated area around the drop inlet is 1800 ft^3/acre disturbed. Minimum

depth of the excavated area shall be 1 foot and maximum depth shall be 2 feet as measured from the crest of the inlet structure. Weep holes shall be protected by gravel. Inspect the excavated basin at least weekly and after every storm event until the contributing drainage area has been permanently stabilized. Remove sediment when the storage volume has been reduced by one-half.

C. Block and gravel inlet protection shall be installed and maintained in accordance with Section 6.52 of the NC ESCPDM. Drainage area shall be limited to 1 acre unless site conditions allow for frequent removal of accumulated sediment. The height of the block barrier shall be no more than 12 inches and no less than 24 inches. On the bottom row, place some of the blocks on their side to allow for dewatering. Place wire mesh over all block openings to hold gravel in place. Lateral support may be provided by placement of 2 x 4 wood studs through block openings. Place gravel 2 inches below the top of the block barrier. The top elevation of the structure must be at least 6 inches below the ground elevation downslope from the inlet to ensure that all stormwater flows over the structure and enters the storm drain instead of bypassing the structure. Block and gravel inlet protection shall not be used near the edge of fill material and shall not divert water away from the storm drain. Inspect at least weekly and after every storm event until the contributing drainage area has been permanently stabilized. Remove sediment as necessary to provide adequate storage volume for subsequent rains. Replace stone as needed.

D. Rock pipe inlet protection shall be installed and maintained in accordance with Section 6.55 of the NC ESCPDM. Rock pipe inlet protection may be used at pipes with a maximum diameter of 36 inches. It shall not be installed in intermittent or perennial streams. The minimum crest width of the riprap berm shall be 3 feet, with a minimum bottom width of 11 feet and minimum height of 2 feet. The top of the riprap shall be 1 foot lower than the shoulder of the embankment or diversions. The outside face of the riprap should be covered with a 12-inch thick layer of #5 or #57 washed stone. The sediment storage area should be excavated upstream of the rock pipe inlet protection, with a minimum depth of 18 inches below grade. The rock pipe inlet protection shall be inspected at least weekly and after any storm event of greater than ½ inch of rain per 24-hour period. Repairs shall be made immediately. Remove sediment when the volume of the sediment storage area has been decreased by one-half and replace the contaminated part of the gravel facing.

3.12 FIBER FILTRATION TUBES (FFTs) AND SEDIMENT LOGS

A. FFTs and sediment logs shall be placed along slopes to function as slope breaks and to minimize sediment transport and in diversions/channels to serve as check dams. The Contractor shall provide FFTs and sediment logs at all locations noted on the Contract Drawings, and at all other locations as may be directed by the Engineer.

B. FFTs and sediment logs shall be installed to maintain contact with the soil surface. Install prior to seeding. May be installed before or after installation of RECPs.

C. Anchor the upstream/upslope side of the FFTs using wire staples or approved devices at 1-foot intervals. Drive wooden stakes through downstream/downslope side of the FFTs at 2-foot intervals. Take care not to compress the FFTs. Backfill and compact loose soil against the upstream/upslope side. Overlap adjacent FFT ends by a minimum of 1 foot.

D. For channel installation, construct anchor trench 3 inches deep by FFT diameter and place loose soil against upstream side of FFT. For channel gradients of 2%, install trenches on 25-foot intervals. Decrease interval distance with steeper channel gradients or more highly erosive soils.

E. Any sediment accumulation at the base of the FFT must be removed when it reaches one-third of the height of the tube. FFT may need to be removed if fully loaded with captured sediment for maximum product performance. FFTs are to be left in place or removed from the site as directed by the Engineer.

F. Sediment logs do not require installation trenches. Wood stakes shall be placed at least every 2 feet along the length of the sediment log. Stakes shall only penetrate the netting around the log. They shall not be driven through the center of the log. Sediment logs are to be left in place or removed from the site as directed by the Engineer.

G. The FFTs and sediment logs shall be shall be inspected at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period. Look for signs of flow undercutting the logs. Re-anchor and replace as necessary.

3.13 TEMPORARY AND PERMANENT CHANNELS

A. Temporary and permanent channels shall be designed, installed and maintained in accordance with the requirements of Sections 6.30, 6.31 and 8.05 of the NC ESCPDM. The Contractor shall provide temporary and/or permanent channels at all locations noted on the Contract Drawings, and at all other locations as may be directed by the Engineer.

B. Remove all trees, brush, stumps, etc. from the channel area and dispose of properly.

C. Excavate the channel to the dimensions shown on the plans, over-excavating to allow for liner thickness. Remove and properly dispose of all excess soil so that surface water may enter the channel freely.

D. Armor the channel as specified on the Contract Drawings. If the specified channel lining requires an establishment period, protect the channel with mulch or a temporary liner sufficient to withstand anticipated velocities during this period.

E. During the establishment period, inspect channels weekly and after every rainfall. After lining has been fully established, inspect channels after any storm event of greater than ½ inch of rain per 24-hour period. Immediately make repairs.

F. Perform all channel construction to keep erosion and water pollution to a minimum. Immediately upon completion of the channel, vegetate all disturbed areas or otherwise protect them against soil erosion. Where channel construction will take longer than 7 days, stabilize channels by reaches.

G. Inspect the channel outlet and all road crossings for bank stability and evidence of piping or scour holes. Give special attention to outlets and points where concentrated flow enters the channel.

H. Maintain all vegetation adjacent to and in the channel in a healthy, vigorous condition to protect the area from erosion.

I. Remove all significant sediment accumulations to maintain the designed carrying capacity.

3.14 TEMPORARY SEDIMENT TRAPS, SEDIMENT BASINS, AND SKIMMER SEDIMENT BASINS

A. Temporary sediment traps shall be designed, installed and maintained in accordance with the requirements of Section 6.60 of the NC ESCPDM. Sediment basins shall be designed, installed and maintained in accordance with the requirements of Section 6.61 of the NC ESCPDM. Skimmer sediment basins shall be designed, installed and maintained in accordance with the requirements of Section 6.64 of the NC ESCPDM. The Contractor shall provide these structures at all locations shown on the Contract Drawings and at all other locations as may be directed by the Engineer.

B. Care shall be taken to ensure that proper site preparation operations are conducted prior to trap or basin construction. Clear, grub and strip embankment location.

C. A cut-off trench shall be excavated along the center line of the earth fill embankment for sediment basins and skimmer sediment basins. Keep the trench dry during backfilling and compaction operations.

D. Fill material shall be free of roots, woody vegetation, rocks, and other objectionable materials. Fill shall be placed in 6 to 8 inch layers and compacted. Construct the embankment to an elevation 10 percent (minimum of 6 inches) higher than the design height to allow for settling.

E. Inlets to the sediment traps and basins shall be constructed so as to prevent erosion. Use diversions to divert sediment-laden water to the upper end of the basin.

F. Shape the sediment trap or basin to the specified dimensions.

G. Following construction of the embankment, clear the sediment trap or basin area below the crest elevation of the spillway to facilitate sediment cleanout. Provide access for cleanout of accumulated sediment.

H. Spillway/outlet configuration shall be constructed as specified below.

I. Temporary sediment trap

1. Construct riprap outlet in embankment. Use filter fabric or a keyway cutoff trench between the riprap and the soil to protect it from piping. The outlet weir must be level and constructed to grade to assure design capacity**.** Ensure that the stone spillway outlet extends downstream past the toe of the embankment until the outlet velocity is acceptable for the receiving stream.

2. Provide emergency bypass in natural, stable areas, located so that flow will not damage the embankment.

J. Sediment Basin

1. Securely attach the riser to the barrel or barrel stub to make a watertight structural connection. Secure all barrel connections with approved watertight assemblies. Install anti-seep collar(s) as noted on the Contract Drawings. Ensure that the pipe stays in firm contact with its foundation when compacting fill around the pipe. Do not use pervious material as backfill around the pipe. Anchor the riser to prevent floatation. Install trash guard to prevent the riser and barrel from becoming clogged.

2. Install basin dewatering mechanism as noted on the Contract Drawings.

3. Install outlet protection as specified at principal spillway outlet. Install the emergency spillway in undisturbed soil and provide stabilization as specified.

K. Skimmer sediment basin

1. Excavate a shallow pit under the skimmer or provide a low support of stone or timber under the skimmer to prevent the skimming device from settling into the mud.

2. Place the barrel on a firm, smooth foundation of impervious soil. Do not use pervious material to backfill around the pipe. Ensure that the barrel stays in firm contact with its foundation when compacting fill around the pipe.

3. Assemble the skimmer following the Manufacturer's instructions, or as designed.

4. Lay the assembled skimmer on the bottom of the basin with the flexible joint at the inlet of the barrel pipe. Attach the flexible joint to the barrel pipe and position the skimmer over the excavated pit or support. Attach a rope to the skimmer and anchor it to the side of the basin so that the skimmer may be pulled to the side for maintenance.

5. Install the spillway in undisturbed soil to the greatest extent possible and line with laminated plastic or impermeable geotextile fabric. Anchor the edges of the fabric in a trench with staples or pins. Install outlet protection as specified at the principal spillway outlet.

L. Install porous baffles in temporary sediment traps, sediment basins, and skimmer sediment basins as shown on the Contract Drawings and as specified herein. Porous baffles shall be designed, installed and maintained in accordance with the requirements of Section 6.65 of the NC ESCPDM. The Contractor shall provide porous baffles at all locations noted on the Contract Drawings, and at all other locations as may be directed by the Engineer.

1. Care shall be taken when installing porous baffles so they perform as designed. Baffle material shall be secured at the bottom and sides of sediment trap or basin. Fabric shall not be spliced but a continuous piece shall be used across the trap or basin.

2. Install at least three rows of baffles between the inlet and outlet discharge point. Sediment traps and basins less than 20 feet in length may use 2 baffles.

3. Posts or saw horses shall be installed across the width of the sediment trap or basin unless an alternate baffle configuration is shown on the Contract Drawings. Steel posts shall be driven to a depth of 24 inches, spaced a maximum of 4 feet apart. Baffle weirs shall be installed at locations and according to details on the Contract Drawings. Except in locations of baffle weirs, the top of the fabric shall be 6 inches higher than the invert of the spillway and 2 inches lower than the top of the berms.

M. Sediment traps and basins shall be constructed so that the area disturbed and resulting erosion is minimized. The emergency spillway, embankment, and all other disturbed areas above the crest of the principal spillway are to be stabilized immediately after construction.

N. Sediment traps and basins may attract children and should be considered dangerous. Steep side slopes should be avoided and fences with warning signs may be necessary if trespassing is likely.

O. Inspect temporary sediment traps, sediment basins, and skimmer sediment basins once a week and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period. Repairs shall be made immediately.

1. Sediment, limbs and other debris shall be cleared and the trap or basin shall be restored to its original dimensions when it accumulates to one-half the design depth or more frequently as directed by the Engineer. Sediment material removed from traps and basins shall be disposed of by the Contractor in locations that will not result in off-site sedimentation as acceptable to the Engineer, at no additional cost to the Owner. If no suitable on site locations are available, all such sediment will be legally disposed of off site, at no additional cost to the Owner.

2. The embankment, spillways and outlet shall be checked for erosion damage and the embankment shall be checked for piping and settlement. Immediately fill any settlement of the embankment to slightly above design grade. Any riprap displaced from the spillway must be replaced immediately. Replace contaminated gravel facing of riprap outlets as necessary. Inspect vegetation. Reseed and re-mulch as necessary.

3. Baffles, fabric and skimmer shall be inspected for damage. Repairs shall be made immediately. Re-anchor baffles if water is flowing under or around them.

4. Debris shall be removed from the skimmer to prevent clogging. Special precautions shall be taken in winter to prevent the skimmer from plugging with ice.

3.15 OUTLET STABILIZATION STRUCTURE

A. Outlet stabilization structures shall be designed, installed and maintained in accordance with the requirements of Sections 6.41 and 8.06 of the NC ESCPDM.

B. The Contractor shall ensure the subgrade, riprap and gravel filter conforms to the grading limits shown on the plans.

C. Riprap shall be installed in accordance with the specifications contained herein, with filter fabric placed under the riprap.

D. The apron shall be constructed on zero grade with no overfill. Ensure the apron is properly aligned with the receiving stream.

E. All disturbed areas shall be stabilized with vegetation immediately after construction.

F. Outlet stabilization structures shall be inspected at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Repairs shall be made immediately.

3.16 FLEXIBLE GROWTH MEDIUM

A. Flexible growth medium shall be applied and maintained in accordance with the requirements detailed herein. If Manufacturer's recommendations are more stringent, they shall supersede.

B. Grade area according to the Contract Drawings and prepare seedbed in accordance with this Section and Section 02910 – Final Grading and Landscaping.

C. Apply flexible growth medium at rate noted on the Contract Drawings. Application may be made either in conjunction with application of seed and fertilizer or following application of seed and fertilizer. Slope interruption devices are recommended when slope lengths exceed 100 feet. Traffic shall be kept off treated areas.

D. Areas treated with flexible growth medium shall be inspected at least weekly and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period until vegetation is established. Reapply in areas where seedling emergence is poor.

3.17 TREE PROTECTION FENCE

A. Tree protection fence shall be installed and maintained in accordance with the requirements of Section 6.05 of the NC ESCPDM. If Manufacturer's recommendations are more stringent, they shall supersede.

B. Install tree protection fence around all designated tree protection areas prior to clearing, deliveries, and other construction activities onsite. Post signs designating area as protected on all sides of the fencing.

C. Inspect tree protection fence weekly. Repair and replace as needed.

3.18 ADDITIONAL REQUIREMENTS

A. All storm sewer piping shall be blocked at the end of every working day until the inlet is constructed above grade.

B. All streets around the construction area shall be scraped as necessary to prevent accumulation of dirt and debris.

C. The Contractor shall provide adequate means to prevent any sediment from entering any storm drains, curb inlets (curb inlet filter box), ditches, streams, or bodies of water downstream of any area disturbed by construction. Excavation materials shall be placed upstream of any trench or other excavation to prevent sedimentation of offsite areas. Silt fence will be provided, at no additional cost to the Owner, around excavation materials if deemed necessary by the Engineer. In areas where a natural buffer area exists between the work area and the closest stream or water course, this area shall not be disturbed.

D. The Engineer may direct the Contractor to place any additional sediment and erosion control devices at other locations not shown on the Drawings.

3.19 INSPECTIONS AND MAINTENANCE

A. The Contractor shall designate an Authorized Representative to perform inspections and maintenance as described herein. Contractor shall perform regular inspections and maintain records as follows:

1. Inspections shall be performed, at a minimum, once every seven calendar days and within 24 hours after any storm event of greater than ½ inch of rain per 24-hour period.

2. A rain gauge shall be maintained in good working order on the site and all rainfall amounts recorded throughout the duration of construction activities.

3. Inspection reports must be available on-site during business hours unless a site-specific exemption is approved.

4. Inspection records must be kept for 3 years following completion of construction and be available upon request.

5. Electronically-available records may be substituted under certain conditions as approved by Land Quality and DWQ.

B. During inspections the following will be observed and appropriate maintenance activities shall be performed:

1. The conformance to specifications and current condition of all erosion and sediment control structures.

2. The effectiveness and operational success of all erosion and sediment control measures.

3. The presence of sediments or other pollutants in storm water runoff at all runoff discharge points.

4. The presence of sediments or other pollutants in receiving waters.

5. Evidence of off-site tracking at all locations where vehicles enter or exit the site.

6. Evidence of impacts to water quality due to site activities pertaining to equipment operation and maintenance, material handling, and material storage and construction laydown areas exposed to precipitation.

C. Immediate action shall be taken to repair/maintain erosion and sediment control measures that are not performing as designed. The State reserves the right to stop all construction activities not related to these measures until such deficiencies are repaired.

D. In areas that have undergone final stabilization, inspections and, if necessary, maintenance by Contractor will occur at least once per month for the duration of the contract or project, whichever is longer.

3.20 REMOVAL OF TEMPORARY SEDIMENT CONTROL STRUCTURES

A. At such time that temporary erosion and sediment control structures are no longer required under this item, the Contractor shall notify the Engineer of its intent and schedule for the removal of the temporary structures. The Contractor shall obtain the Engineer's approval in writing prior to removal. Once the Contractor has received such written approval from the Engineer, the Contractor shall remove, as approved, the temporary structures and all sediments accumulated at the removed structure shall be returned upgrade and stabilized so they do not re-erode. In areas where temporary control structures are removed, the site shall be left in a condition that will restore original drainage. Such areas shall be evenly graded and seeded as specified in Section 02910 - Final Grading and Landscaping.

-- END OF SECTION –

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SECTION 02279

WATERING

PART 1 – GENERAL

1.01 SUMMARY

A. The work specified in this specification relates to watering necessary to ensure the success criteria for seeded areas, sod, herbaceous plants, shrubs, trees, tubelings and live stakes.

B. Related Sections:

1. Section 02280, “Temporary Seeding.”

2. Section 02277, “Specialty Seeding.”

3. Section 02246, “Live Stakes.”

1.02 SUBMITTALS – N/A

PART 2 – PRODUCTS - NA

PART 3 – EXECUTION

3.01 INSTALLATION

The work to be performed under this specification consists of the following:

A. Initial Week of Plant Installation: In the absence of adequate rainfall (one or more inches per week), watering shall be performed daily or as often as necessary during the first week and in sufficient quantities to maintain moist soil to a depth of 4 inches. Watering should be conducted in the early morning to minimize loss caused by evaporation to prevent wilting.

B. After Initial Week of Plant Installation: The Contractor is required to water plantings on a weekly basis during the period of time between April 1 and October 15 during dry weather weeks. A dry week is defined as 7 or more days without at least one inch of rain.

C. All watering must be accomplished using a hose with nozzle end breaker or a sprinkler. Water must be applied in sufficient quantities to maintain moist soil to a depth of at least 4 inches. Water must be applied at low water pressure directly to each plant, allowing water to be absorbed into the planting pit soil until saturated, but without runoff. The Contractor must avoid application of too much water.

D. The following may be used as a guideline for water volume requirements for plants installed for streamwork.

Caliper	Gallons of Water
Under 1”	5
1.5”	5 to 10
2”	10 to 15
2.5”	15 to 20
>2.5”	20 to 30

E. Acceptable water sources: Contractor to supply a water truck or water plants from a nearby hydrant. When a hydrant is used, the Contractor is responsible for all regulations, permits or expenses necessary to use the public water supply. Based on site conditions and the written pre-approval of the Engineer, the Contractor may use onsite water sources such as irrigation ponds, sediment basins, pools within stream areas, etc subject to all appropriate environmental regulations and the tenets of the sediment and erosion control plan for the project.

F. After written acceptance of the defined maintenance period, the Contractor is responsible for the removal of all watering lines, sprinklers, etc used for the project.

- END OF SECTION -

SECTION 02280

TEMPORARY SEEDING

PART 1 – GENERAL

1.01 SUMMARY

A. This work shall consist of furnishing and installing all temporary herbaceous seed for all areas distributed by construction as directed by the Engineer. Seed type, etc shall be as per the Construction Documents.

B. Related Sections:

1. Section 02279, “Watering.”

1.02 SUBMITTALS

A. Contractor shall submit seed mix and source of mix to Engineer for review and approval.

B. Seeding Alternates: The Engineer, prior to Notice to Proceed, 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 installation by a broadcast spreader shall be capable of placing seed at the specified rate.

1.03 QUALITY ASSURANCE

A. Temporary seed shall germinate within 14 days and shall provide 90% coverage within 28 days.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Seed: Seed shall be as specified on the Contract Documents.

B. Straw: Bright, small grain type straw. Shall be free of rot and noxious weeds.

PART 3 – EXECUTION

3.01 INSTALLATION

A. All stream corridor and construction staging areas shall receive temporary seed. 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 inches 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. Seeding shall be performed from March 1 through November 30 or as directed by the Owner. 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 directed by the Owner. Seeding areas require the placement of straw mulch. If significant wind is anticipated within the first week of seeding, an organically based tacktifier shall be used to keep straw in place.

B. 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 dragging the surface with chain link fence.

C. 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.

- END OF SECTION -

SECTION 02500

SURFACE RESTORATION

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Provide all labor, equipment, and materials necessary for final grading, topsoil placement, and miscellaneous site work not included under other Sections but required to complete the work as shown on the Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 - Earthwork

B. Section 02276 - Erosion and Sedimentation Control

C. Section 02910 - Final Grading and Landscaping

PART 2 -- MATERIALS

2.01 TOPSOIL

A. Topsoil shall meet the requirements of Section 02200 – Earthwork.

PART 3 -- EXECUTION

3.01 FINAL GRADING

A. Following approval of rough grading the subgrade shall be prepared as follows:

1. For riprap, bare soil 24 inches below finish grade or as directed by Engineer.

2. For topsoil, scarify 2-inches deep at 4 inches below finish grade.

3.02 TOPSOIL PLACEMENT

A. Topsoil shall be placed over all areas disturbed during construction under any contract except those areas which will be paved, graveled or rip rapped.

B. Topsoil shall be spread in place for lawn and road shoulder seed areas at a 4-inch consolidated depth and at a sufficient quantity for plant beds and backfill for shrubs and trees.

C. Topsoil shall not be placed in a frozen or muddy condition.

D. Final surface shall be hand or mechanically raked to an even finished surface to finish grade as shown on Drawings.

E. All stones and roots over 4-inches and rubbish and other deleterious materials shall be removed and disposed of.

- END OF SECTION -

SECTION 02510

PAVING AND SURFACING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, equipment and materials and perform all operations in connection with the construction of asphalt concrete pavement, asphalt concrete overlay, reinforced concrete pavement, gravel roads, concrete curb and gutter, repair and reconstruction of existing asphalt concrete pavement, repair of existing gravel roads, and pavement markings complete as specified herein and as detailed on the Drawings.

B. All new roads including the replacement of portions of the existing roads shall be to the limits, grades, thicknesses and types as shown on the Drawings. Patches for pipe crossings and areas damaged during the construction work shall be asphalt and/or gravel, depending upon the material encountered, unless otherwise indicated.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 1, Division 2 and Division 3 of these Specifications.

1.03 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 03300 - Cast-In-Place Concrete

1.04 STANDARD SPECIFICATIONS

A. Except as otherwise provided in the Specifications or on the plans, all work shall be in accordance with the North Carolina Department of Transportation Standard Specifications for Roads and Structures, 2002 except that any reference to "NCDOT", "Department" or "Unit" shall mean the "Owner". When reference to these Specifications is intended, the description will be NCDOT Section _____ or NCDOT Specifications.

B. Except with the approval of the Engineer, the placing of concrete or asphalt concrete surface paving shall be subject to the Seasonal and Weather Restrictions set forth in NCDOT Specifications.

PART 2 -- MATERIALS

2.01 SELECT FILL

A. The Contractor shall place select fill as necessary to complete the embankments, shoulders, subgrade foundation and replacement for removed unsuitable material in accordance with NCDOT Section 235, and Section 02200, Earthwork.

2.02 GRAVEL

A. All work, including materials, associated with gravel shall be in accordance with NCDOT Section 545, Incidental Stone Base, except that Articles 545-6 and 545-7, shall be deleted.

2.03 AGGREGATE STABILIZATION

A. All work, including materials, associated with Aggregate Stabilization shall be in accordance with NCDOT Section 510, Aggregate Stabilization, except that Articles 510-6 and 510-7, shall be deleted.

2.04 AGGREGATE BASE COURSE (ABC)

A. All work, including materials, associated with Aggregate Base Course shall be in accordance with NCDOT Section 520, Aggregate Base Course, except that Articles 520-11 and 520-12 shall be deleted. Type "A" or "B" aggregate will be acceptable for this project.

2.05 ASPHALT BINDER FOR PLANT MIX

A. All work, including materials, associated with asphalt binder shall be in accordance with Section 620, Asphalt Binder for Plant Mix, Grade PG 64-22, of the NCDOT Standard Specifications for Roads and Structures, except Articles 620-4 and 620-5 shall be deleted.

2.06 ASPHALT PAVEMENTS

A. All work, including materials, associated with asphalt pavement shall be in accordance with Section 610, Asphalt Concrete Plant Mix Pavements, of the NCDOT Standard Specifications for Roads and Structures, except Articles 610-15 and 610-16 shall deleted. Surface Course shall be Superpave S-9.5B, Intermediate Course shall be Superpave I-19.0B, and Base Course shall be Superpave B-25.0C. Asphalt pavement mix designs shall be in accordance with TABLE 610-2 of the NCDOT.

B. The job mix formulas shall be delivered to the Engineer at least two (2) weeks prior to beginning paving operations.

2.07 RIGID PORTLAND CEMENT CONCRETE PAVEMENT

A. All work, including materials associated with rigid concrete pavement shall be in accordance with Section 03300, Cast-In-Place Concrete. Class A concrete shall be used. Placement shall be in accordance with Section 03300 and NCDOT Section 700, General Requirements for Portland Cement Concrete Pavement and Section 710, Concrete Pavement, except that Articles 700-2, 700-15, 710-3, 710-4, 710-8, 710-9, 710-10, and 710-11 shall be deleted.

2.08 RIGID CONCRETE PAVEMENT REINFORCING

A. Reinforcing, if specified, shall be as shown on the Structural Drawings and as specified under Section 03200, Reinforcing Steel.

2.09 CONCRETE CURB AND GUTTERS

A. Concrete shall be Class B in accordance with the requirements of Section 03300, Cast-In-Place Concrete, except that concrete shall be air-entrained to provide an air content of 6% ± 1.5%.

B. Premolded expansion joint filler for expansion joints shall conform to ASTM D 1751 and shall be 1/2-inch thick, minimum.

2.10 ASPHALT TACK COAT

A. All work, including materials, associated with asphalt tack coat shall be in accordance with Section 605, Asphalt Tack Coat, of the NCDOT Standard Specifications for Roads and Structures, except that Article 605-10 shall be deleted.

PART 3 -- EXECUTION

3.01 EMBANKMENT

A. The embankment shall be constructed in accordance with Section 02200, Earthwork.

3.02 SUBGRADE

A. The subgrade, where shown on the Drawings, shall be aggregate stabilized by the addition and mixing of coarse aggregate with the top 3-inches of subgrade in accordance with NCDOT Section 510-4. Aggregate stabilization shall be applied to the subgrade at a rate of 300-pounds per square yard. Following the application of stabilizer aggregate, the subgrade shall be formed true to crown and grade, and shall be compacted with a minimum of four (4) passes of a 15-ton vibratory roller to conform to the maximum densities determined by AASHTO T99 Standard Specifications.

3.03 BASE COURSE

A. The finished base course of all paving shall be ABC and shall be of the thickness shown on the Drawings, formed true to crown and grade. Gravel roads, including repair to existing gravel roads shall be ABC and shall be of the thicknesses shown on the Drawings, formed true to crown and grade. No fill material except new ABC shall be placed on top of existing gravel.

3.04 ASPHALT BASE COURSE (OR INTERMEDIATE COURSE)

A. Asphalt Concrete Base (or Intermediate) Course shall be placed in accordance with NCDOT Standard Specifications for Roads and Structures 610-8, Spreading and Finishing. Asphalt Concrete Base (or Intermediate) Course shall be compacted in accordance with NCDOT Standard Specifications for Roads and Structures 610-9, Compaction. Thicknesses shall be as shown on the Drawings.

3.05 ASPHALT CONCRETE SURFACE COURSE

A. Prior to placement of the asphalt concrete surface course, the base/intermediate course shall be inspected for damage or defects and repaired to the satisfaction of the Engineer. The surface of the base/intermediate course shall be approved by the Engineer.

B. The asphalt tack coat shall be applied to the surface of the approved base/binder course as described in NCDOT Section 605. Equipment for applying the tack coat shall be power-oriented pressure spraying or distributing equipment suitable for the materials to be applied and approved by the Engineer.

C. The Asphalt Concrete Surface Course shall be placed and compacted on the base/intermediate course in layers not to exceed 2-inches and at the rate of 110-pounds per square yard per inch. Surface Course shall be compacted in accordance with NCDOT Standard Specification for Roads and Structures, Article 610-9. Thicknesses shall be as shown on the Drawings.

3.06 RIGID PORTLAND CEMENT CONCRETE

A. The subgrade and base course beneath portland cement concrete pavement shall be prepared in accordance with the applicable Sections of these Specifications and referenced Standard Specifications, except that the Contractor shall use an approved automatically controlled fine grading machine to produce final subgrade and base surfaces meeting the lines, grades, and cross sections (thicknesses) shown on the Drawings or established by the Engineer.

B. The surface of the base shall be damp at the time the concrete is placed. The Contractor shall sprinkle the base when necessary to provide a damp surface. The Contractor shall satisfactorily correct all soft areas in the subgrade or base prior to placing concrete.

C. Hauling over the base course shall not be allowed except where specifically permitted by and in writing by the Engineer. The Engineer may allow equipment dumping concrete to operate on the base to the extent and under the conditions the Engineer deems necessary to facilitate placing and spreading the concrete.

D. Installation of the rigid concrete pavement shall be in accordance with the details shown on the Drawings and Division 3 - Concrete. The rigid concrete pavement shall cure a minimum of ten (10) calendar days and until the concrete has attained a minimum flexural strength of 550 psi as indicated by flexural strength testing. The Contractor shall coordinate and pay for all flexural strength testing with a minimum of four (4) 6-inch by 6-inch by 20-inch beams for every fifty (50) cubic yards of pavement concrete installed.

E. Contraction joints shall be spaced at intervals as shown on the Drawings. Transverse contraction joints shall be formed by an approved joint insert. Expansion joints shall be placed when the pavement abuts a structure using 1-inch expansion joint material (filler) and sealant as specified herein.

3.07 CONCRETE CURB AND GUTTER

A. The expansion joint filler for concrete curb and gutters shall be cut to conform with the cross section of the curb. Expansion joints shall be spaced at intervals of not more than 25-feet. Formed control joints shall be installed at intervals not exceeding 10 feet. Depth of joint shall be 1/3 the thickness. Curved forms shall be used where radii are indicated; straight segments shall not be permitted. Upon removal of the forms, exposed curb faces shall be immediately rubbed down to a smooth and uniform surface. No plastering shall be permitted.

3.08 UNDERGROUND UTILITY LINES

A. Where an underground utility line is beneath the new roadway, the backfilling shall be carried out with special care, and the final consolidation shall be accomplished by a vibratory roller. Construction of the roadway over the trench shall be deferred as long as practicable.

3.09 JUNCTION WITH OTHER PAVING

A. Where new asphalt concrete pavement abuts existing asphalt concrete pavement, the existing pavement shall be cut back to insure obtaining the specified compaction of the new pavement courses and interlocking adjoining courses. Existing subbase courses shall be cut back from the subgrade level of the new pavement on a one-on-one slope into the existing pavement, and the asphalt courses of the existing pavement shall be removed for an additional 6-inches back from the slope. The edge of the existing asphalt courses shall be saw cut straight and true. The faces between new and existing asphalt courses shall receive an application of tack coat.

B. Where new rigid concrete pavement abuts existing rigid concrete or asphalt concrete paving, the existing paving shall be saw cut straight and true. An expansion joint of a 1/2-inch minimum thickness with filler material and sealant shall be placed between the new concrete pavement and the existing rigid concrete or asphalt concrete paving.

3.10 ASPHALT CONCRETE OVERLAY

A. Where asphalt concrete is proposed to be placed over an existing asphalt or rigid concrete surface, the surfaces shall be thoroughly cleaned by power brooming and a tack coat shall be applied in accordance with NCDOT Section 605, Asphalt Tack Coat, of the NCDOT Standard Specifications for Roads and Structures, prior to installing the overlay. The overlay shall be applied in accordance with Subsections 2.06 and 3.05 and Standard Details shown on the Drawings.

-END OF SECTION-

SECTION 02910

FINAL GRADING AND LANDSCAPING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Furnish all labor, equipment, and materials necessary for final grading, topsoiling, seeding, and miscellaneous site work not included under other Sections, but required to complete the work as shown on the Drawings and specified herein. Under this Section, all areas of the project site disturbed by excavation, materials storage, temporary roads, etc., shall be reseeded as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02276 - Erosion and Sedimentation Control.

B. Section 02500 - Surface Restoration.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Product Data
2. Certification of all materials
3. Three (3) copies of composition and germination certification and of test results for grass seed.

PART 2 -- PRODUCTS

2.01 CONTRACTOR'S RESPONSIBILITIES

A. Furnish and submit certification for the materials used as specified in the General Conditions, Division 1 and Division 2.

2.02 TOPSOIL

A. Upon completion and approval of the rough grading, the Contractor shall place the topsoil over all areas disturbed during construction except those areas which will be paved, graveled or rip rapped. Topsoil shall not be placed in a frozen or muddy condition and shall contain no toxic materials harmful to grass growth. Topsoil shall be as defined under Section 02200, Earthwork.

2.03 WATER

A. Water shall be furnished to the Contractor by the Owner from existing facilities as directed by the Engineer.

B. The Contractor shall furnish all hoses and connections necessary to complete the landscaping work.

2.04 FERTILIZER

A. Fertilizer shall be a complete commercial fertilizer with components derived from commercial sources. Fertilizer analysis shall be determined from field soil sampling in appropriate number taken by the Contractor and analyzed by the N.C. Department of Agriculture or other independent laboratory. Contractor shall furnish fertilizer in accordance with the recommendations of the N.C. Department of Agriculture.

B. One-quarter of the Nitrogen shall be in the form of nitrates, one-quarter in the form of ammonia salts, and one-half in the form of natural organic Nitrogen. Available Phosphoric Acid shall be free from superphosphate, bone, or tankage. Potash shall be Sulphate of Potash. Elements shall conform to the standards of Association of Official Agricultural Chemists.

C. Fertilizer shall be delivered in standard size bags marked with the weight, analysis of contents, and the name of the manufacturer. Fertilizer shall be stored in weatherproof storage areas and in such a manner that its effectiveness will not be impaired.

2.05 LIME

A. At least 50% shall pass a No. 200 U.S.S. mesh sieve. At least 90% shall pass a No. 100 U.S.S. mesh sieve and 100% shall pass a No. 10 U.S.S. mesh sieve. Total carbonates shall not be less than 80% or 44.8% Calcium Oxide equivalent. For the purpose of calculation, total carbonates shall be considered as Calcium Carbonate.

2.06 GRASS SEED

A. The Contractor shall furnish the kinds and amounts of seed to be seeded in all areas disturbed by the construction work. All seed shall be labeled to show that it meets the requirements of the North Carolina Seed Law. All seed must have been tested within six (6) months immediately preceding the planting of such material on the job.

B. The inoculant for treating legume seed shall be a pure culture of nitrogen-fixing bacteria prepared specifically for the species. Inoculants shall not be used later than the date indicated on the container. The quality of the seed shall conform to the following:

Type	Minimum Seed Purity (%)	Minimum Germination (%)	Maximum Weed Seed (%)
Fescue (fungus free)	98	90	1.00
Hybrid Rye	98	85	0.10
Sudan grass	98	85	0.25
Millet	98	85	0.50
Sericea Lespedeza			
Scarified	98	85	0.50
Unscarified	98	85	0.50

C. Scarified Lespedeza may contain 20% hard seed and unscarified 50% hard seed. Seed containing prohibited noxious weed seed shall not be accepted. Seed shall be in conformance with N.C. Seed Law restrictions for restricted noxious weeds.

D. Seed mixtures to be used on the project shall be as follows:

P - 25#/acre Bermuda Grass (Add 10#/acre German Millet between April 15th and August 15th. Add 40#/acre Hybrid Rye between August 15th and April 15th.)

TW - 120#/acre Hybrid Rye

TS - 40#/acre Pearl or Brown Top Millet or 50#/acre Sudan grass

Note: P - Permanent Seeding
TW - Temporary Winter Seeding
TS - Temporary Summer Seeding

2.07 WOOD CELLULOSE FIBER MULCH

A. For use in hydroseeding grass seed in combination with fertilizers and other approved additions, shall consist of especially prepared wood cellulose fibers such as "Conwed", "Mat-Fiber", or equal, and have no growth or germination inhibiting factors, and be dyed green.

B. The wood cellulose fiber shall have the additional characteristic of dispersing rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit, or adequate equal, with the specified materials.

C. When applied, the wood cellulose fiber with additives will form an absorptive mat but not a plant inhibiting membrane, which will allow moisture, natural or mechanical, to percolate into underlying soil.

D. The mulch shall be supplied, compressed in packages containing 50 pounds of material having an equilibrium air dry moisture content at time of manufacture of 12% plus or minus 3%. Wood cellulose fiber mulch shall be stored in a weatherproof storage area and in such a manner that effectiveness will not be impaired.

2.08 STRAW MULCH

A. Straw used for mulch shall be small grain hay. Hay shall be undamaged, air dry, threshed straw, free of undesirable weed seed. Straw mulch is not required for seeded areas treated with a temporary soil stabilizer.

2.09 TEMPORARY SOIL STABILIZER

A. The temporary agent for soil erosion control shall consist of an especially prepared highly concentrated powder which, when mixed with water, forms a thick liquid such as "Enviroseal 2001" by Enviroseal Corporation, "Terra Control" by Quattro Environmental, Inc., or "CHEM-CRETE ECO-110" by International CHEM-CRETE Corporation, and having no growth or germination inhibiting factors. The agent shall be used for hydroseeding grass seed in combination with other approved amendments resulting in a highly viscous slurry which, when sprayed directly on the soil, forms a gelatinous crust.

2.10 ROLLED EROSION CONTROL PRODUCTS

A. The rolled erosion control products (RECPs) shall be as specified in Section 02276 - Erosion and Sedimentation Control.

2.11 RIPRAP AND HERBICIDES

A. Furnish and install sufficient quantity of landscape gravel or riprap to cover over the ground to a minimum 4-inch depth for gravel and 24-inch depth for riprap, unless otherwise noted, or indicated on the Drawings. Also furnish and apply an approved herbicide to the subgrade surface just prior to installing the landscape gravel or riprap.

B. During placing, the stone shall be graded so that the smaller stones are uniformly distributed through the mass. The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary or ordered by the Engineer. The placed riprap shall form a properly graded, dense, neat layer of stone.

C. All topsoil and vegetative matter shall be removed from the subgrade surfaces prior to the application of the weed killer (herbicide) and to the placement of landscape gravel or riprap. Apply commercial-type herbicide as preemergence control of miscellaneous grasses and broadleaf weeds in granular or liquid form such as "Treflan", "Dymid", or equal. Methods and rates of application shall be in strict compliance to manufacturer's directions and acceptable to the Engineer.

D. The herbicide selected shall be safe for use around ornamental plantings, have long-lasting weed control, and shall be resistant to leaching away under excessive rainfall.

E. A second application of the herbicide shall be made on the surface of the landscape gravel or riprap sometime after the first six (6) months, but not later than 12-months. Same methods and rates apply as specified previously.

PART 3 -- EXECUTION

3.01 GRADING

A. After approval of the rough grading, the Contractor shall commence his preparations of the subgrade for the various major conditions of the work as follows:

1. Bare soil for riprap area at subgrade (24-inches below final grade, or as directed by the Engineer).

2. Topsoil for lawn and road shoulder seed area - scarify 2-inch depth of subgrade (4-inches below final grade) prior to placing topsoil.

B. Final surface grading of the topsoiled, landscape graveled, and riprapped areas shall be mechanically raked or hand raked to an even finished surface alignment.

3.02 TOPSOIL

A. Topsoil shall be spread in place for quantity required for lawn and road shoulder seed areas at 4-inch consolidated depth, and sufficient quantity for certain plant beds and backfill for shrubs and trees as specified.

3.03 SEEDBED PREPARATION

A. Contractor shall prepare all areas to receive temporary or permanent seeding measures prior to planting.

B. Topsoil shall be placed in areas to be seeded and roughened with tracked equipment or other suitable measures. Slopes steeper than 3:1 may be roughened by grooving, furrowing, tracking, or stairstep grading. Slopes flatter than 3:1 should be grooved by disking, harrowing, raking, operating planting equipment on the contour.

C. Soil amendments including, but not limited to, lime and fertilizer shall be spread as necessary, and at the rates specified in this Section. Seeding shall be as per the type and rates specified in this Section. Seed shall be broadcast as soon as possible following roughening, before surface has been sealed by rainfall.

3.04 HYDROSEEDING AND GRASS

A. The Contractor shall grow a stand of grass by hydroseeding method on all disturbed areas. The Contractor shall be responsible for the satisfactory growth of grass throughout the period of the one-year guarantee.

B. The Contractor's work shall include the preparation of the topsoil and bare soil seed bed, application of fertilizer, limestone, mulching, inoculant, temporary soil stabilizer, watering, and all other operations necessary to provide a satisfactory growth of sod at the end of the one-year maintenance period. Areas without satisfactory sod at the end of one (1) year shall be replanted until satisfactory growth is obtained and acceptable to the Engineer.

C. All areas to be seeded shall be done by the hydraulic seeding method including all additives and amendments required. A "Reinco", "Finn", or "Bowie" type hydromulcher with adjustable nozzles and extension hoses, or equal, shall be utilized. General capacity of tank should range from 500 to 2,500 gallons, or as approved by the Engineer.

D. Hydraulic seeding shall be carried out in three steps. Step one shall consist of the application of lime. In step two the seed mixture shall be mixed with the fertilizer, wood cellulose fiber mulch, and any required inoculants and applied to the seed bed. Step three shall consist of application of top dressing during the first spring or fall, whichever comes first, after step two.

E. Top dressing shall consist of a commercial grade fertilizer plus Nitrogen or other analysis as may be recommended by soil testing. Types and application rates of seed mixtures, lime, fertilizer, and wood cellulose fiber mulch, shall be as shown in the Seeding Schedule.

F. Ingredients for the mixture and steps should be dumped into a tank of water and thoroughly mixed to a homogeneous slurry and sprayed out under a minimum of 300-350 pounds pressure, in suitable proportions to accommodate the type and capacity of the hydraulic machine to be used. Applications shall be evenly sprayed over the ground surface. The Contractor shall free the topsoil of stones, roots, rubbish, and other deleterious materials and dispose of same off the site. The bare soil, except existing steep embankment area, shall be rough raked to remove stones, roots, and rubbish over 4-inches in size, and other deleterious materials and dispose of same off the site.

G. No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry. Any bare spots shown in two to three weeks shall be recultivated, fertilized at half the rate, raked, seeded, and mulched again by mechanical or hand broadcast method acceptable to the Engineer.

H. Areas that have been seeded with a temporary seed mixture shall be mowed to a height of less than 2-inches and scarified prior to seeding with the permanent seed mixture.

I. The Contractor shall provide, at his own expense, protection for all seeded areas against trespassing and damage at all times until acceptance of the work. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly at the Contractor's expense.

J. The Contractor shall water newly seeded areas of the lawn and road shoulder mix once a week until the grasses have germinated sufficiently to produce a healthy turf, or unless otherwise directed by the Engineer. Each watering shall provide three (3) gallons per square yard. The Contractor shall furnish all necessary hoses, sprinklers, and connections.

K. The first and second cutting of the lawn grasses only shall be done by the Contractor. All subsequent cuttings will be done by the Owner's forces in a manner specified by the Contractor.

3.05 DITCH AND SWALE EROSION PROTECTION

A. All ditches and swales indicated on the Drawings shall be lined with a rolled erosion control product (RECP). The area to be covered shall be properly graded and hydroseeded before the RECP is installed. Installation shall be in accordance with Section 02276, Erosion and Sedimentation Control.

3.06 MAINTENANCE

A. Maintenance shall include but not be limited to, annual fertilization, mowing, repair of seeded areas, irrigation, and weed control. The Contractor shall provide, at his own expense, protection for all seeded areas against trespassing and damage at all times until acceptance of the work. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly at the Contractor's expense.

B. Annual fertilization shall consist of an application of 500#/acre of 10-10-10 commercial grade fertilizer, or its equivalent and 60#/acre of nitrogen in early fall, or other analysis as may be determined by soil test. Annual fertilization shall be in addition to top dressing and shall be performed by the Contractor each fall season after planting until the work is substantially complete.

C. Mowing shall be scheduled so as to maintain a minimum stand height of 4-inches or as directed by the Engineer. Stand height shall be allowed to reach 8 to 10-inches prior to mowing. Mowing shall only be conducted in areas designated by the Engineer.

D. All seeded areas shall be inspected on a regular basis and any necessary repairs or reseedings made within the planting season, if possible. If the stand should be over 60% damaged, it shall be re-established following the original seeding recommendations.

E. Weed growth shall be maintained mechanically and/or with herbicides. When chemicals are used, the Contractor shall follow the current North Carolina Agricultural Experiment Stations' weed control recommendations and adhere strictly to the instructions on the label of the herbicide. No herbicide shall be used without prior approval of the Engineer.

3.07 CLEANUP

A. The Contractor shall remove from the site all subsoil excavated from his work and all other debris including, but not limited to, branches, paper, and rubbish in all landscape areas, and remove temporary barricades as the work proceeds.

B. All areas shall be kept in a neat, orderly condition at all times. Prior to final acceptance, the Contractor shall clean up the entire landscaped area to the satisfaction of the Engineer.

3.08 SEEDING SCHEDULE

A. All seeding and mulching to be completed by the Contractor shall conform to the following schedule. No permanent seeding shall be performed from May 1 - August 31 and November 1 - February 14. Temporary seed mixtures will be used during these times if seeding is necessary. Areas seeded with temporary seed mixtures shall be reseeded by the Contractor at no additional cost to the Owner with permanent seed as directed by the Engineer.

B. Application rates of seed mixtures, lime, fertilizer, mulch and top dressing are shown in the schedule.

SEEDING SCHEDULE

Application Rates (Pounds/Acre)

Seed Mixture	Planting Season	Lime[a]	Seed	Fertilizer	Straw[b] Mulch	Topdressing[a]	Annual Fertilizer	Comments
P	Feb. 15-April 30 Sept. 1-Oct. 31	4000	150	1000	4000	500 of 10-10-10 60 of Nitrogen	Same as Topdressing	Preferred planting seasons are Sept. 1 – Sept. 30 and Feb. 15 – March 30.
TW	Jan. 1-May 1	2000	170	750	4000	-	-	Over seed with Type P seed mixture during next planting season.
TS	May 1-Aug. 15	2000	40	750	4000	-	-	Over seed with Type P seed mixture during next planting season.
TF	Aug. 15-Dec. 30	2000	120	1000	4000	-	-	Over seed with Type P seed mixture during next planting season.

Footnotes:

a. Application rates and/or chemical analysis shall be confirmed or established by soil test.

b. On cut and fill slopes 2:1 or steeper, add 30#/acre Sericea Lespedeza to Type P seed mixture. Use scarified seed for spring plantings and unscarified for fall plantings.

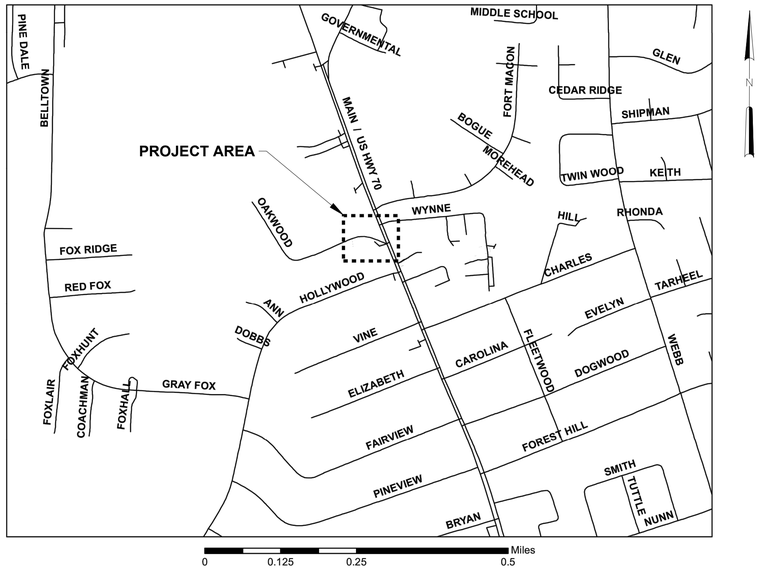
c. Apply asphalt at rate of 0.10 gallon per square yard (10 gal/1000 ft^2) to tack straw mulch.

- END OF SECTION -

CITY OF HAVELOCK
HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION ALONG CAPPS BRANCH

HAZEN CONTRACT NO.: 30906-018
DECEMBER 2018



LOCATION MAP
NTS

Hazen

HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER

PRELIMINARY DESIGN - DO NOT USE FOR CONSTRUCTION

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL VERIFY FIELD CONDITIONS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. THE CONTRACTOR SHALL VERIFY EXISTING ELEVATIONS AND DIMENSIONS WHERE NEW WORK WILL MATCH EXISTING. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

2. EXISTING UTILITIES AND NEW WORK UNDER THIS CONTRACT ARE DIFFERENTIATED BY A SYSTEM OF LABELING AND BY VARYING DRAFTING LINE WEIGHTS. EXCEPT AS OTHERWISE NOTED, HEAVY WEIGHT/DARKER LINES ARE UTILIZED ON DRAWINGS TO DEPICT NEW WORK AND LIGHT WEIGHT LINES ARE UTILIZED TO DEPICT EXISTING UTILITIES.

3. THE LOCATION OF FEATURES SHOWN ON THESE DRAWINGS ARE PROVIDED ONLY FOR THE CONVENIENCE OF THE CONTRACTOR, AND THE CITY OF HAVELOCK DOES NOT WARRANT AND/OR GUARANTEE THE ACCURACY OR COMPLETENESS OF THIS INFORMATION. THE CONTRACTOR SHALL FIELD VERIFY TO THEIR SATISFACTION, THE WORK REQUIREMENTS ASSOCIATED UNDER THIS CONTRACT.

4. THE CONTRACTOR SHALL TAKE CARE TO AVOID DAMAGE TO EXISTING PAVEMENT, TREES, VEGETATION, STRUCTURES, UTILITIES, ETC NOT INDICATED TO BE DEMOLISHED OR REMOVED. DAMAGE TO FEATURES NOT INDICATED TO BE DEMOLISHED OR REMOVED, WHETHER WITHIN OR OUTSIDE THE LIMIT OF DISTURBANCE, SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL PROVIDE PRE- AND POST-CONSTRUCTION PHOTOGRAPHS OF ALL DISTURBED AREAS.

5. THE CONTRACTOR SHALL MAKE EVERY EFFORT TO SAVE AND MAINTAIN ALL PROPERTY IRONS, MONUMENTS, OTHER PERMANENT POINTS AND LINES OF REFERENCE AND CONSTRUCTION STAKES. A NORTH CAROLINA REGISTERED LAND SURVEYOR, AT THE CONTRACTOR'S EXPENSE, SHALL REPLACE PROPERTY IRONS, MONUMENTS, AND OTHER PERMANENT POINTS OF REFERENCE.

6. NO TREES SHALL BE REMOVED UNLESS OTHERWISE DIRECTED IN THE FIELD BY THE ENGINEER OR CITY OF HAVELOCK.

7. FOR INFORMATION RELATED TO PROJECT GEOTECHNICAL TESTING, SEE SEPARATE GEOTECH INFORMATION AS PART OF THE SPECIFICATIONS PACKAGE.

8. CONTRACTOR IS RESPONSIBLE FOR CREATING AND MAINTAINING A SAFE AND APPROPRIATE TRAFFIC SAFETY PLAN AND IS RESPONSIBLE FOR MAINTAINING A SAFE WORK SITE INCLUDING ADHERENCE TO LOCAL, STATE AND FEDERAL REQUIREMENTS INCLUDING OSHA.

9. CONTRACTOR IS RESPONSIBLE FOR THE SAFE MAINTENANCE OF TRAFFIC DURING CONSTRUCTION.

10. DURING EXCAVATION AND PLACEMENT OF UTILITIES THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE SAFETY REGULATIONS FOR TEMPORARY SHEET PILING, SHORING, AND/OR BRACING DESIGNS.

11. THE CONTRACTOR IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING ROADS, DRIVEWAYS, CULVERTS, DITCHES, DRAIN FIELDS, UTILITIES, PIPING, STRUCTURES AND EQUIPMENT WHICH OCCURS AS A RESULT OF PROJECT CONSTRUCTION, AND SHALL REPAIR TO ORIGINAL CONDITION OR REPLACE IN KIND ANY DAMAGED ITEMS.

12. DISTURBED CURBS, GUTTERS, PATHS AND SIDEWALKS SHALL BE REPLACED IN-KIND TO THE NEAREST EXISTING JOINTS.

13. ROADS SHALL BE REGRADED AND RESURFACED WITHIN THE LIMITS OF DISTURBANCE, AS SHOWN ON THE CONTRACT DRAWINGS. DAMAGE CAUSED BY THE CONTRACTOR TO THE ACCESS ROAD OUTSIDE OF THE LIMITS OF DISTURBANCE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE

14. CONTRACTOR SHALL PROVIDE ALL MATERIALS AND MATERIAL CERTIFICATIONS FOR THIS PROJECT TO THE DESIGN ENGINEER IN ACCORDANCE WITH THESE APPROVED CONSTRUCTION DOCUMENTS AND ANY ASSOCIATED SPECIFICATIONS OR PROJECT MANUALS.

15. SPECIFIED AND/OR PROPRIETARY PRODUCTS SHOWN HEREON MAY BE SUBJECT TO SUBSTITUTION WITH OTHER PRODUCTS OF EQUAL OR SUPERIOR QUALITY AS RECOMMENDED BY THE CONTRACTOR SUBJECT TO THE WRITTEN PREVIEW AND APPROVAL OF THE DESIGN ENGINEER. WHEN THE CONTRACTOR USES PROPRIETARY PRODUCTS, IT THE CONTRACTOR'S RESPONSIBILITY TO VERIFY WITH THE SUPPLIER/MANUFACTURER THAT IT WILL FUNCTION PER THE DESIGN OR THE GIVEN FIELD CONDITIONS. THE DESIGN ENGINEER SHALL BE NOTIFIED IMMEDIATELY IF ANY DEVIATIONS FROM EXISTING FIELD CONDITIONS EXIST WHICH MAY AFFECT PRODUCT FUNCTION.

16. THESE PLANS WERE PREPARED WITH FIELD INFORMATION AND/OR GIS DATA AVAILABLE AT THE TIME OF PROJECT DESIGN. IT IS POSSIBLE THAT FIELD CONDITIONS AT THE TIME OF CONSTRUCTION MAY VARY FROM THESE PLANS AND IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY FIELD CONDITIONS SUCH AS ELEVATIONS AND DEPTHS PRIOR TO PROCEEDING WITH WORK.

17. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING QUANTITIES THROUGH A FIELD VISIT AND HIS/HER OWN QUANTITY TAKE-OFFS. ALL QUANTITIES AND TAKE OFFS SHOWN HEREON ARE ESTIMATED ONLY AND THE CONTRACTOR VERIFICATION IS REQUIRED.

UTILITIES:

1. UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE SURVEY INFORMATION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THEIR COMPLETENESS AND EXACT LOCATION AND TO AVOID DAMAGE TO THEM. THE CONTRACTOR SHALL CONTACT NORTH CAROLINA 811 AT PHONE NUMBER 811 OR 1-800-632-4949, OR BY REMOTE TICKET ENTRY, TO REQUEST UNDERGROUND UTILITY LOCATION MARK-OUT AT LEAST THREE (3) WORKING DAYS BUT NO MORE THAN TWELVE (12) WORKING DAYS PRIOR TO BEGINNING EXCAVATION OR DRILLING. THE CONTRACTOR SHALL ASLO CONTACT AND REQUEST UTILITY LOCATION MARK-OUT FROM BURIED UTILITY OWNERS WITH UTILITIES IN THE PROJECT SITE THAT ARE NOT PARTICIPANTS OF NORTH CAROLINA 811.

2. THE CONTRACTOR SHALL FIELD-VERIFY ALL EXISTING UTILITIES, INCLUDING DIMENSIONS, FEATURES AND/OR STRUCTURES RELATED TO PROJECT CONSTRUCTION PRIOR TO ORDERING MATERIALS OR COMMENCING WORK. UNLESS OTHERWISE INDICATED IN THE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL MAINTAIN UNINTERRUPTED UTILITY SERVICE. ANY DAMAGE INCURRED SHALL BE IMMEDIATELY REPAIRED TO THE SATISFACTION OF THE ENGINEER AT THE CONTRACTORS EXPENSE THE CONTRACTOR SHALL BE AWARE THAT COMMUNICATION AND OTHER UTILITIES MAY NOT BE SHOWN ON THE PLANS.

3. THE CONTRACTOR SHALL COORDINATE WITH UTILITY OWNERS FOR THE TEMPORARY SUPPORT AND / OR RELOCATION OF UTILITIES THAT CONFLICT WITH CONSTRUCTION, INCLUDING BUT NOT LIMITED TO: SUBSURFACE UTILITY LINES, OVERHEAD UTILITY LINES, UTILITY POLES, AND GUY WIRES.

4. WHERE PROPOSED WORK IS IN THE VICINITY OF UTILITY POLES, SUCH THAT SUPPORT OF THE POLE(S) WILL BE REQUIRED, THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE UTILITY, PUBLIC OR PRIVATE, OF THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH THE UTILITY FOR SUPPORT AND / OR RELOCATION.

5. WHERE OVERHEAD POWER LINES ARE PRESENT, THE CONTRACTOR MUST CONTACT THE UTILITY PRIOR TO THE COMMENCEMENT OF CONSTRUCTION TO DETERMINE THE MINIMUM REQUIRED EQUIPMENT CLEARANCE (MEC) DISTANCE BASED UPON LINE VOLTAGE.

6. THE CONTRACTOR SHALL VERIFY LOCATIONS OF ALL STREET LIGHTING PRIOR TO BEGINNING WORK. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN WORKING NEAR OVERHEAD OR UNDERGROUND ELECTRIC CABLING.

SITE ACCESS, STAGING, STOCKPILING AND HOUSEKEEPING:

1. ACCESS SHALL ONLY OCCUR PER APPROVED LOCATIONS AS PER THE CONSTRUCTION DOCUMENTS UNLESS ALTERNATIVE ACCESS LOCATIONS ARE APPROVED, IN WRITING, BY THE CITY OR THE DESIGN ENGINEER.

2. IF THE CONSTRUCTION DOCUMENTS REFER TO SPECIFIC CONSTRUCTION STAGING OR SEQUENCING, THESE STAGES OR SEQUENCES MUST BE ADHERED TO UNLESS AN ALTERNATIVE APPROACH IS AGREED ON AND APPROVED BY THE CITY OR THE CITY'S ENGINEER, IN WRITING, PRIOR TO USE OF ALTERNATIVE ACCESS POINT.

3. IN-STREAM AREAS, WHERE PUMP-AROUND IS REMOVED OR DE-ACTIVATED AT THE END OF THE WORKDAY, MUST BE COMPLETED AND STABILIZED DAILY. DISTURBED AREAS ABOVE THE WATERLINE SHALL RECEIVE STRAW/MULCH/COIR MAT AT THE END OF EACH WORKDAY ONCE STREAM FLOW IS RE-ESTABLISHED AT THE END OF THE WORKDAY, THE CONTRACTOR SHALL ALLOW SUFFICIENT TIME TO INSPECT THE NEW FLOW PATTERN AND MAKE ADJUSTMENTS AS NECESSARY TO ENSURE NON-EROSIVE CONDITIONS BEFORE VACATING THE SITE.

4. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF ALL DEBRIS GENERATED DURING THE PROJECT AT AN OFFSITE AND PROPERLY PERMITTED DISPOSAL FACILITY.

5. THE CONTRACTOR SHALL SECURE THE SITE AND PERFORM ANY NECESSARY CLEANUP OR HOUSEKEEPING AT THE END OF THE WORK DAY TO MINIMIZE INCONVENIENCE TO IMPACTED RESIDENCES AND BUSINESSES. UNLESS OTHERWISE COMMUNICATED TO, AND AGREED BY, THE CITY: REMOVE ON A DAILY BASIS ALL EXCESS CONSTRUCTION DEBRIS AND MATERIAL FROM THE WORK SITE.

6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING SILT AND DEBRIS OUT OF THE STORM DRAINAGE SYSTEM, STREAMS, RIVERS, ETC. FOR THE DURATION OF THE CONTRACT.

7. IT IS THE CONTRACTORS RESPONSIBILITY TO CLEAN STREETS AND ALLEYS OF DEBRIS AND/OR DUST AND TAKE WHATEVER MEASURES ARE NECESSARY TO ENSURE THAT ALL ROADS ARE MAINTAINED IN A MUD AND DUST FREE CONDITION AT ALL TIMES.

8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AVOIDING THE SPILLAGE OF RAW SEWAGE OR OTHER SUBSTANCES WHICH WOULD BE CONSIDERED DANGEROUS TO THE ENVIRONMENT DURING THEIR CONSTRUCTION OPERATIONS. THE CONTRACTOR SHALL FURNISH ALL NECESSARY EQUIPMENT (PLUGGING, PUMPING, CONTAINMENT EQUIPMENT, ETC) TO PREVENT SAID SPILLAGE.

9. WHENEVER POSSIBLE THE CONTRACTOR SHALL COMPLETE THE CONSTRUCTION WORK UNDER DRY WEATHER CONDITIONS.

10. STOCKPILING AND LAYDOWN AREAS: ANY STOCKPILE OR LAYDOWN AREAS SHOWN ON THE CONSTRUCTION DOCUMENTS ARE ILLUSTRATED FOR THE CONTRACTOR'S CONSIDERATION. THE CONTRACTOR CAN LOCATE STOCKPILING, LAYDOWN AND EQUIPMENT STORAGE AREAS WITHIN THE LIMITS OF DISTURBANCE BASED ON GOOD JUDGMENT, ADHERENCE TO PERMIT REQUIREMENTS, SCHEDULE REQUIREMENTS AND PROJECT GOALS. AREAS MAY BE STAGED AND MOVED AS THE CONTRACTOR SEES FIT.

11. UNLESS OTHERWISE INDICATED ON THE CONSTRUCTION DOCUMENTS, THE CONTRACTOR SHALL NOT STAGE OR STORE WITHIN A PUBLIC RIGHT-OF-WAY. SIMILARLY, THE CONTRACTOR SHALL NOT STAGE OR STORE MATERIALS ON PRIVATELY HELD PROPERTY.

WATER HANDLING AND SEDIMENT CONTROL:

1. CONTRACTOR IS RESPONSIBLE FOR CONTROL OF WATER THROUGHOUT THE PROJECT SITE, INCLUDING RUNOFF THROUGH DISTURBED AREAS. CONTRACTOR SHALL BE FAMILIAR WITH STATE AND LOCAL STANDARDS, SPECIFICATIONS AND REQUIREMENTS FOR SEDIMENT AND EROSION CONTROL.

2. DRY WEATHER STREAM BASE FLOW IS A FUNCTION OF WEATHER PATTERNS, TIME OF YEAR, GROUNDWATER, UPSTREAM MAN-INDUCED RELEASES AND OTHER NON-CALCULATED FACTORS AND THEREFORE WAS NOT ESTIMATED FOR THIS PROJECT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CARRY OUT SITE RECONNAISSANCE TO DETERMINE PUMP-AROUND NEEDS SUCH AS THE NUMBER AND SIZE OF PUMPS NEEDED TO SUCCESSFULLY COMPLETE THE PROJECT.

3. DISCHARGE FROM ALL DEWATERING AND PUMPING OPERATIONS SHALL BE DISCHARGED TO AN ENVIRONMENTALLY ACCEPTABLE LOCATION IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REQUIREMENTS.

SURVEY NOTES:

1. SITE SURVEY, DATED APRIL 25 2016, PREPARED BY JAMES C. SIMMONS AND ASSOCIATES , PROFESSIONAL LAND SURVEYORS; 603 WEBB BOULEVARD, HAVELOCK, NC 28532 (252) 447-1509.

2. HORIZONTAL CONTROL REFERENCED TO NORTH CAROLINA STATE GRID (NAD83). VERTICAL CONTROL REFERENCED TO NAVD88.

3. ONLY VISIBLE UTILITIES OBTAINED DURING SITE SURVEY. DEPTHS AND PLAN LOCATION OF WATER LINES WERE NOT SURVEYED AND WERE ESTIMATED. SLOPE OF SEWER PIPES ON PROFILES WERE NOT SURVEYED AND WERE ESTIMATED. SUBSURFACE AND AERIAL UTILITY INFORMATION SHALL BE CONFIRMED AND / OR OBTAINED PRIOR TO COMMENCEMENT OF CONSTRUCTION.

4. BOUNDARY SURVEY NOT CONDUCTED. EASEMENTS AND PROPERTY LINES SHOWN ON THE CONTRACT DRAWINGS WERE TAKEN FROM REFERENCED MAPS AND DEEDS AND MATCHED TO EXISTING MONUMENTS, AND SHALL BE CONSIDERED APPROXIMATE. THE CONTRACTOR SHALL VERIFY PROPERTY AND EASEMENT LINES PRIOR TO CONSTRUCTION.

DRAWING INDEX

ABBREVIATIONS

AC	ACRE
CL	CENTERLINE
CLB	CENTERLINE OF BRANCH
CONC	CONCRETE
DI	DROP INLET
DWG	DRAWING
E	EASTING
ECM	EXISTING CONCRETE MONUMENT
ELEV	ELEVATION
EIP	EXISTING IRON PIPE
EIR	EXISTING IRON ROD
EMN	EXISTING MAGNETIC NAIL
EN&C	EXISTING NAIL & CAP
EOP	EDGE OF PAVEMENT
ESC	EROSION & SEDIMENT CONTROL
EX	EXISTING
FB	FILTER BAG
FT	FOOT
H	HORIZONTAL
INV	INVERT
LBS	POUNDS
LF	LINEAR FEET
LOD	LIMIT OF DISTURBANCE
LP	LIGHT POLE
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
N	NORTHING
NMN	NEW MAGNETIC NAIL
OC	ON CENTER
OHE	OVERHEAD ELECTRIC
OHTL	OVERHEAD TELEPHONE
OHTV	OVERHEAD CABLE TV
PROP	PROPOSED
PT	POINT
PVMT	PAVEMENT
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
REF	REFERENCE
ROP	ROCK OUTLET PROTECTION
R/W	RIGHT OF WAY
SAN	SANITARY
SF	SILT FENCE
SS	SANITARY SEWER
SMH	SEWER MANHOLE
STA	STATION
TBM	TEMPORARY BENCH MARK
TEMP	TEMPORARY
TPA	TEMPORARY PUMP AROUND
TYP	TYPICAL
UP	UTILITY POLE
UTIL	UTILITY
V	VERTICAL
W	WATER
W/	WITH
WM	WATER METER
WSE	WATER SURFACE ELEVATION
XS	CROSS SECTION
YR	YEAR

SYMBOLOGY LEGEND

EXISTING

- ASPHALT PAVEMENT
- BUILDING/STRUCTURE
- CURB, EDGE OF PAVING
- CENTERLINE
- CENTERLINE OF BRANCH
- CONTOUR LINE
- METAL SAFETY RAIL
- OHE — OVERHEAD UTILITY LINE
- MANHOLE
- PROPERTY LINE (NOT SURVEYED)
- SS — SEWER MAIN
- STORMWATER PIPE
- W — WATER MAIN
- STORMWATER DROP INLET

PROPOSED

- APPROVED FILL
- ASPHALT REPAIR
- 250 — CONTOUR MAJOR
- CONTOUR MINOR
- GUARDRAIL
- HELICAL ANCHORS
- IMBRICATED ROCK WALL
- LOD — LIMITS OF DISTURBANCE
- SHEET PILE WALL

PROFILE/SECTIONS

- EXISTING GRADE
- PROPOSED GRADE
- EXISTING PIPES
- IMBRICATED ROCK WALL
- SHEET PILE WALL

EROSION AND SEDIMENT CONTROL

- COIR MAT
- CONTRACTOR STAGING AREA
- P — PUMP
- SF — SILT FENCE
- TPA — TEMPORARY PUMP AROUND
- TEMPORARY SAND BAG DIKE
- PSF — PEDESTRIAN SAFETY FENCE

REV	ISSUED FOR	DATE	BY
1			

PROJECT ENGINEER: T. SCHUELER
DESIGNED BY: J. MCSWAIN
DRAWN BY: J. MCSWAIN
CHECKED BY: T. SCHUELER
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER

Hazen
HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

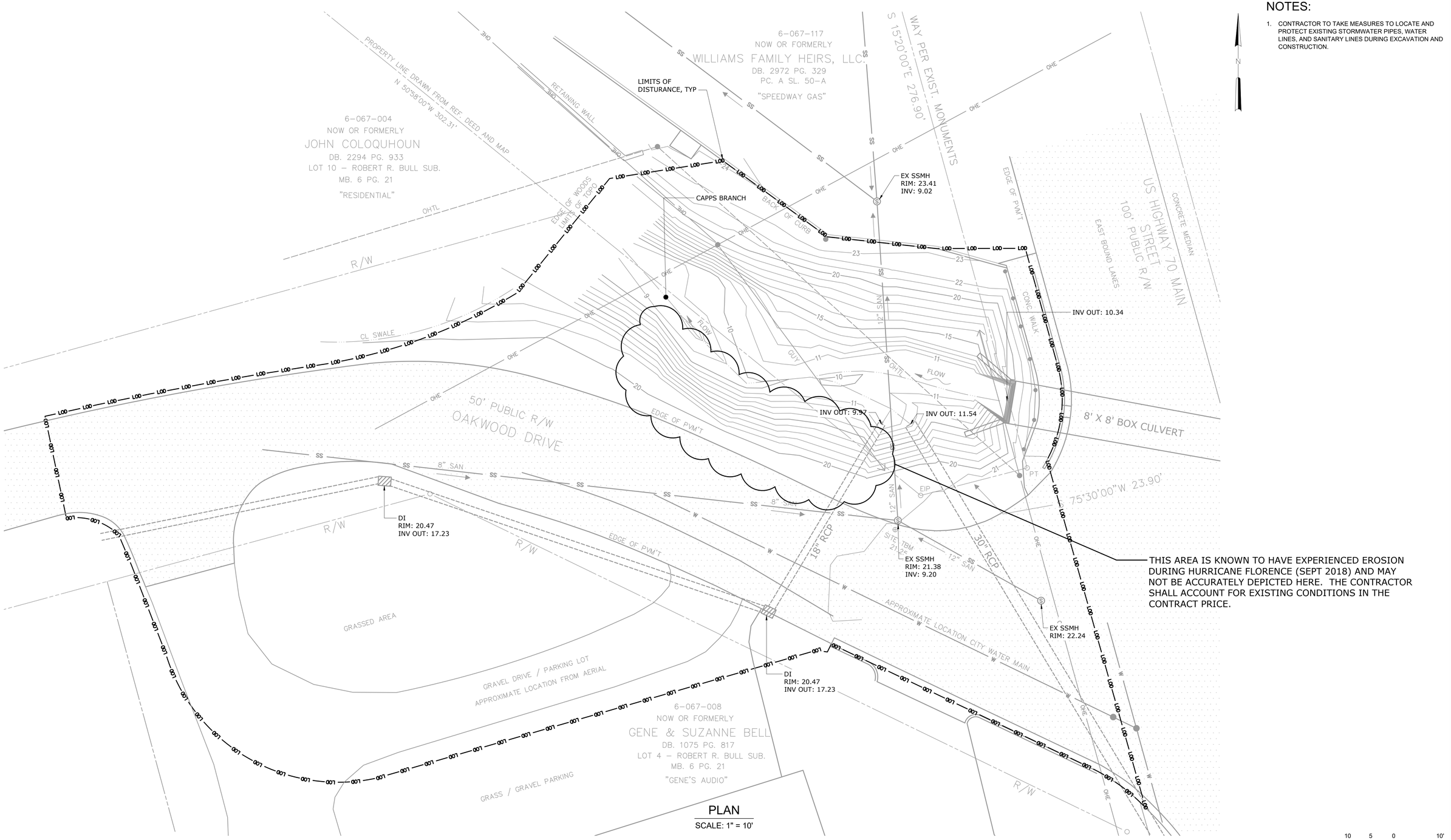
GENERAL NOTES, LEGEND, & DRAWING INDEX

DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: G-02

File: O:\30906\30906-01\BDESIGN\DRAWINGS\CIVIL\G-02 Saved by JMCSWAIN Save date: 12/6/2018 2:49 PM
PLOT DATE: 12/6/2018 2:58 PM BY: JMCSWAIN

NOTES:

1. CONTRACTOR TO TAKE MEASURES TO LOCATE AND PROTECT EXISTING STORMWATER PIPES, WATER LINES, AND SANITARY LINES DURING EXCAVATION AND CONSTRUCTION.



PLAN

SCALE: 1" = 10'

SCALE: 1" = 10'

10 5 0 10'

REV	ISSUED FOR	DATE	BY
1			

PROJECT ENGINEER:	T. SCHUELER
DESIGNED BY:	J. MCSWAIN
DRAWN BY:	J. MCSWAIN
CHECKED BY:	T. SCHUELER

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER

Hazen

HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

EXISTING CONDITIONS

DATE:	DECEMBER 2018
HAZEN NO.:	30906-018
CONTRACT NO.:	
DRAWING NUMBER:	C-01

File: O:\30906\30906-018\DESIGN\DRAWINGS\CIVIL\C-01 Saved by JMCSWAIN Save date: 12/6/2018 2:49 PM
PLOT DATE: 12/6/2018 2:55 PM BY: JMCSWAIN

STAKEOUT TABLE (SHEET PILE WALL)				
ALTERNATIVE	DESC	LENGTH	BEARING	NOTES
ALT 1	P1	21.40	N68° 49' 50"W	UPSTREAM END OF WALL FROM CONTROL POINT
ALT 1	P2	81.12	N65° 32' 58"W	DOWNSTREAM END OF WALL FORM CONTROL POINT
ALT 1	W1	59.71	N64° 22' 30"W	FINAL WALL ALIGNMENT (UPSTREAM TO DOWNSTREAM)
ALT 2	P1	20.39	N69° 02' 59"W	UPSTREAM END OF WALL FROM CONTROL POINT
ALT 2	P2	82.14	N65° 32' 04"W	DOWNSTREAM END OF WALL FORM CONTROL POINT
ALT 2	W1	61.75	N64° 22' 30"W	FINAL WALL ALIGNMENT (UPSTREAM TO DOWNSTREAM)

NOTES:

1. CONTRACTOR TO TAKE MEASURES TO LOCATE AND PROTECT EXISTING STORMWATER PIPES, WATER LINES, AND SANITARY LINES DURING EXCAVATION AND CONSTRUCTION.
2. CONTRACTOR TO COORDINATE RELOCATION OF OVERHEAD ELECTRIC LINE A MINIMUM OF 10' FROM THE END OF THE WALL DURING CONSTRUCTION. CONTACT WILL PITTMAN WITH CARTERET-CRAVEN ELECTRIC COOP (CCEC) AT 252-727-2214. CITY OF HAVELOCK WILL REIMBURSE CCEC DIRECTLY FOR COSTS INCURRED FOR RELOCATION.
3. CONTRACTOR TO SEQUENCE CONSTRUCTION OF IMBRICATED ROCK WALL SECTION EAST OF 12" SANITARY CROSSING OF CAPPS BRANCH BEFORE THE SECTION WEST OF SANITARY CROSSING TO ALLOW FOR RELOCATION OF GUY LINE. CONTRACTOR TO COORDINATE RELOCATION OF GUY LINE. CITY OF HAVELOCK WILL REIMBURSE CCEC DIRECTLY FOR COSTS INCURRED FOR RELOCATION.

6-067-117
NOW OR FORMERLY
WILLIAMS FAMILY HEIRS, LLC.
DB. 2972 PG. 329
PC. A SL. 50-A
"SPEEDWAY GAS"

NOW OR FORMERLY
JOHN COLOQUHOUN
DB. 2294 PG. 933
LOT 10 – ROBERT R. BULL SUB.
MB. 6 PG. 21
"RESIDENTIAL"

6-067-008
NOW OR FORMERLY
GENE & SUZANNE BELL
DB. 1075 PG. 817
LOT 4 – ROBERT R. BULL SUB.
MB. 6 PG. 21
"GENE'S AUDIO"

LIMITS OF DISTURBANCE, TYP

ALT 1: 60' NOMINALLY LONG SHEET PILE WALL (AZ 26 700) OR ALT 2: 62' NOMINALLY LONG SHEET PILE WALL (SCZ 18N) SEE DETAIL DWG S-01 / S-02

RELOCATE OVERHEAD ELECTRIC A MINIMUM OF 10' FROM END OF SHEET PILE WALL DURING CONSTRUCTION; SEE NOTE 2.

ALTERNATE 2 HELICAL ANCHOR, TYP SEE DETAIL DWG S-02

GRADE TO BE MAINTAINED FOR DRAINAGE THROUGHOUT CONSTRUCTION

APPROXIMATE LIMITS OF ASPHALT REPAIR

REMOVE AND REPLACE SURFACE COURSE

CUT AND PLACE 6-INCHES OF AGGREGATE BASE COURSE TO EXISTING GRADE FOR 20' WIDE IMPROVED GRAVEL CORRIDOR

IMPROVED GRAVEL DRIVE FOR DETOURED TRAFFIC (TO REMAIN FOLLOWING CONSTRUCTION)

PROPOSED NEW GUY LOCATION SEE NOTE 3.

25 LF OF 12" DIP REPLACMENT SEE PIPE PROFILE DWG C-04

IMBRICATED ROCK WALL SEE DETAIL DWG D-01

106 LF GUARD RAIL SEE DETAIL DWG D-02

CONTROL POINT FOR WALL STAKEOUT

FULL DEPTH ASPHALT REPAIR SECTION 40 SY

CONTRACTOR TO GRADE FOR DRAINAGE AND SMOOTH TRANSITION FROM ASPHALT TO IMPROVED GRAVEL

ALTERNATIVE 1: NOMINALLY 60 LF OF DRIVEN AZ-26-700 SHEET PILE ONLY (NO HELICAL ANCHORS); SEE SHEETS C-03 AND S-01

ALTERNATIVE 2: NOMINALLY 62 LF OF DRIVEN SCZ-18N SHEET PILE WITH HELICAL ANCHORS; SEE SHEETS C-03 AND S-02

EX SSMH RIM: 23.41 INV: 9.02
EX SSMH RIM: 21.38 INV: 9.20
EX SSMH RIM: 22.24
DI RIM: 20.47 INV OUT: 17.23
DI RIM: 20.47 INV OUT: 17.23
INV OUT: 10.34
INV OUT: 9.97
INV OUT: 11.54

WAY PER EXIST. MONUMENTS
S 15°20'00"E 276.90'
N 75°30'00"E

US HIGHWAY 70 MAIN STREET
100' PUBLIC R/W
EAST BOUND LANES
CONCRETE MEDIAN
EDGE OF PVMT
BACK OF CURB
CONC WALK
8' X 8' BOX CULVERT
CAPPS BRANCH
RETAINING WALL
EDGE OF WOODS
TOP OF LIMITS
CL SWALE
GUY
FLOW
GRASSED AREA
GRAVEL DRIVE / PARKING LOT
APPROXIMATE LOCATION FROM AERIAL
GRASS / GRAVEL PARKING
20'
R/W
OHE
SS
SAN
FIP
PT

PLAN
SCALE: 1" = 10'

SCALE: 1" = 10'
10 5 0 10'

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1			

PROJECT ENGINEER: T. SCHUELER
DESIGNED BY: J. MCSWAIN
DRAWN BY: J. MCSWAIN
CHECKED BY: T. SCHUELER
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER 6/4/18

Hazen
HAZEN AND SAWYER
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RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

PROPOSED PLAN
FOR ALTERNATIVES 1 AND 2

DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: C-02

File: O:\30906\30906-01\EDESIGN\DRAWINGS\CIVIL\C-02 Saved by JMCSWAIN Save date: 12/6/2018 2:50 PM
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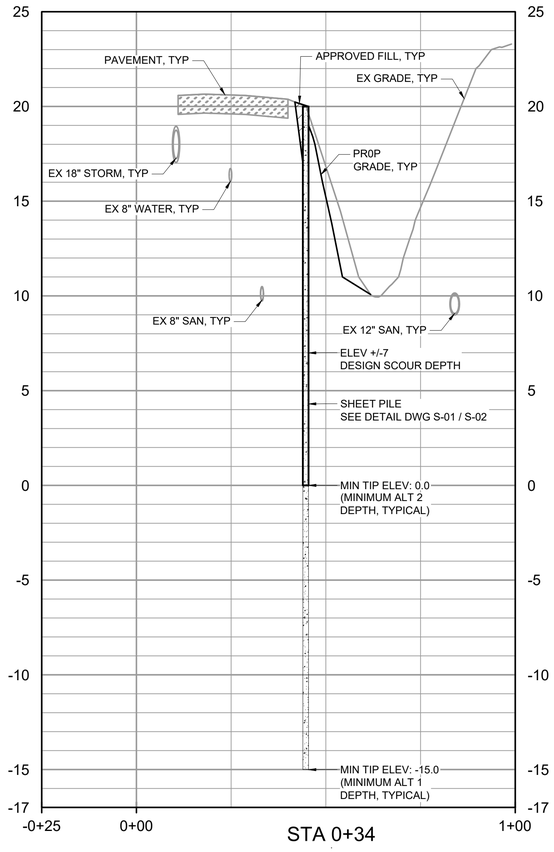
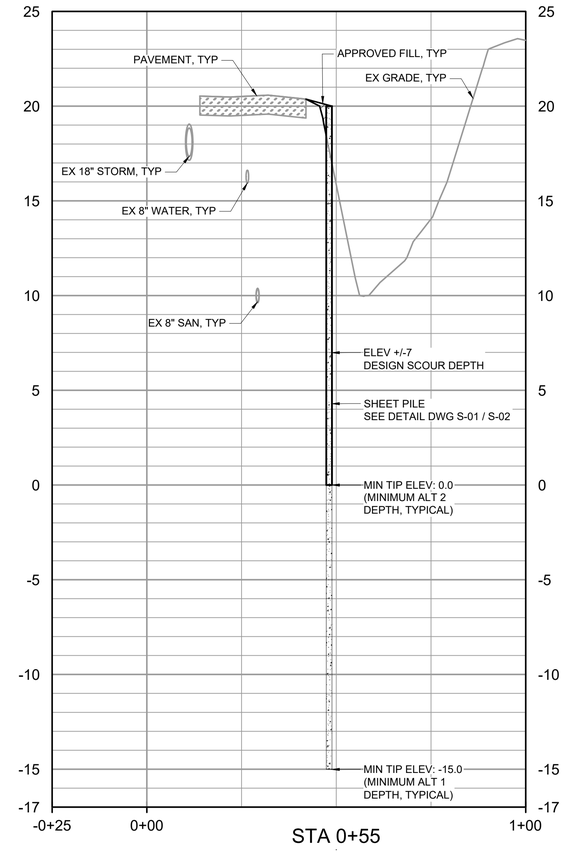
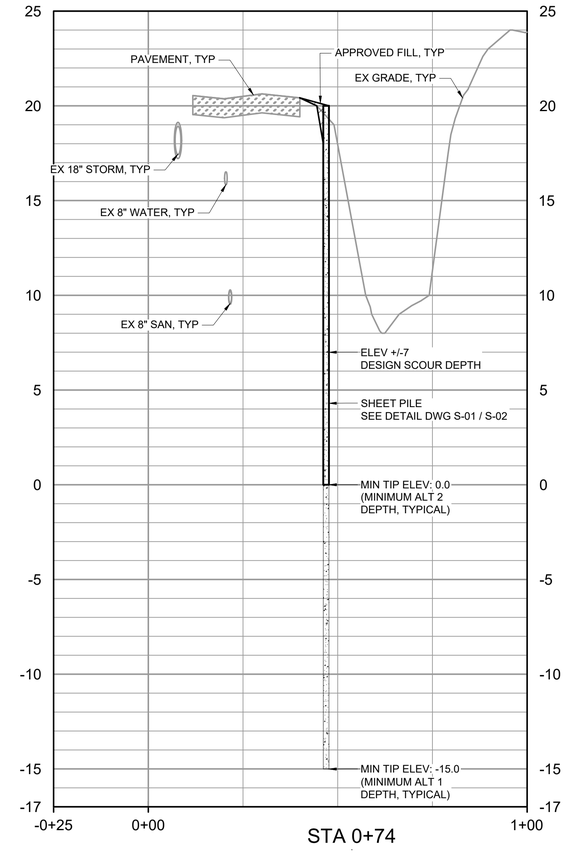
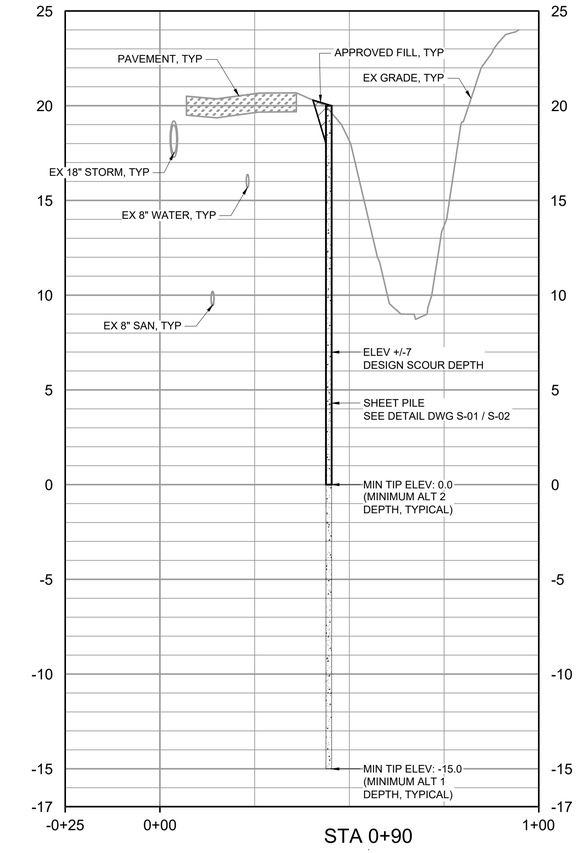




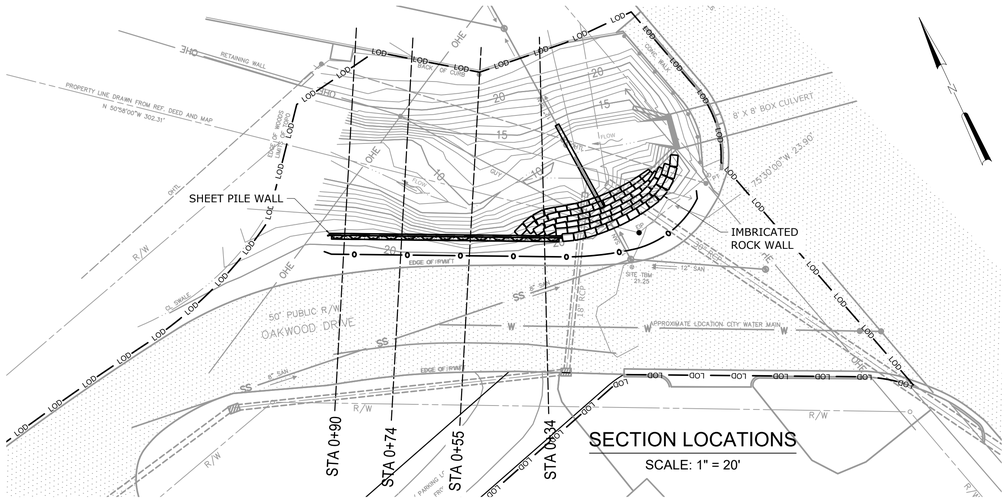




CROSS SECTIONS

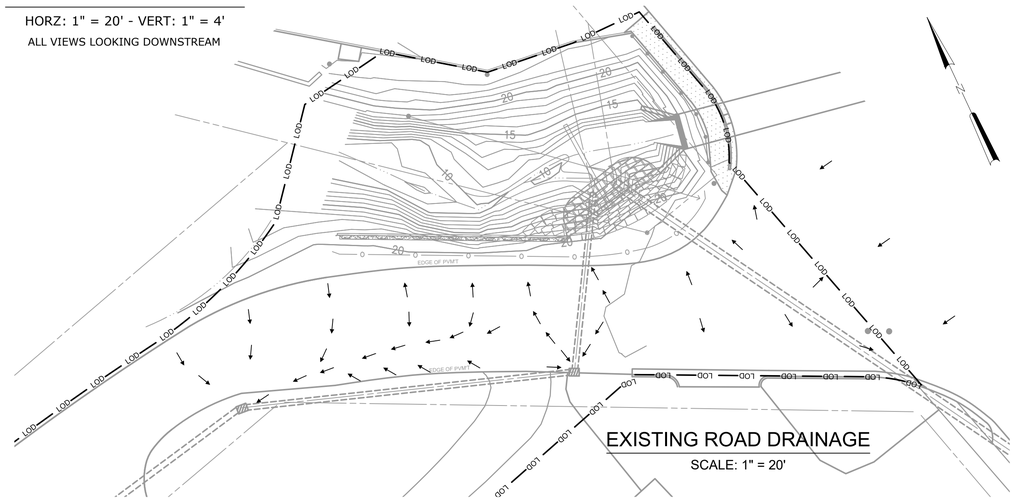
HORZ: 1" = 20' - VERT: 1" = 4'

ALL VIEWS LOOKING DOWNSTREAM



SECTION LOCATIONS

SCALE: 1" = 20'



EXISTING ROAD DRAINAGE

SCALE: 1" = 20'

NOTES:

1. WATER UTILITY ELEVATION BASED ON 4FT ASSUMED COVER
2. SANITARY SEWER ELEVATION BASED ON ASSUMED 0.5% SLOPE FROM MANHOLE INVERT
3. ASPHALT REPAIR AREA NOT SHOWN FOR CLARITY; SEE PAVING SECTION DWG C-02
4. ALTERNATIVE 2 HELICAL ANCHORS NOT SHOWN ON PROFILES, SEE SHEET S-02
5. PROPOSED FEATURES (SHEET PILE WALL, ROCK WALL, AND GUARDRAIL) SCREENED LIGHTER IN ROAD DRAINAGE VIEW FOR CLARITY.

HORIZONTAL SCALE: 1" = 20'

20 10 0 20'

VERTICAL SCALE: 1" = 4'

4 2 0 4

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PROJECT ENGINEER: T. SCHUELER

DESIGNED BY: J. MCSWAIN

DRAWN BY: J. MCSWAIN

CHECKED BY: T. SCHUELER

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PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

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LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

SHEET PILE WALL CROSS SECTIONS

DATE: DECEMBER 2018

HAZEN NO.: 30906-018

CONTRACT NO.:

DRAWING NUMBER: C-03

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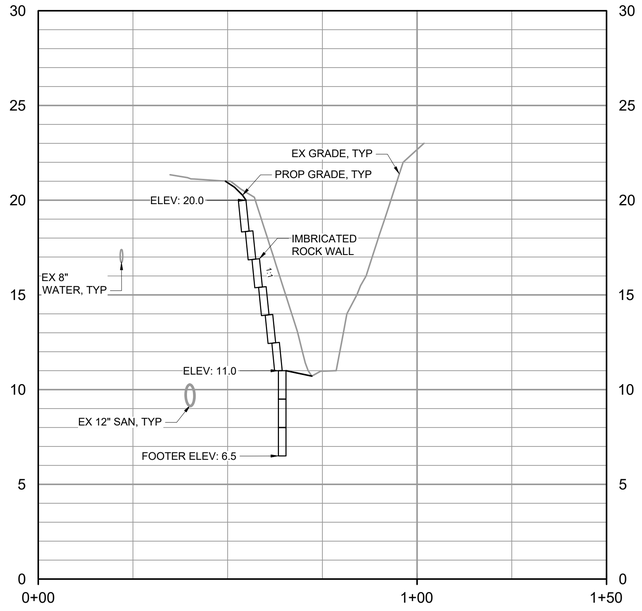
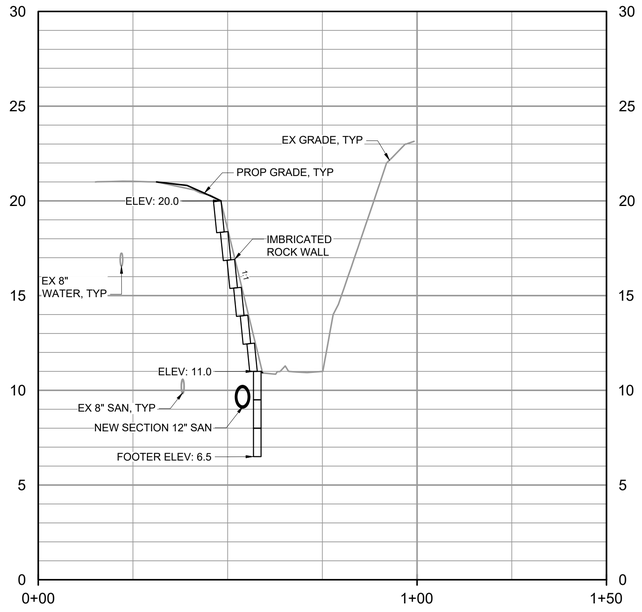
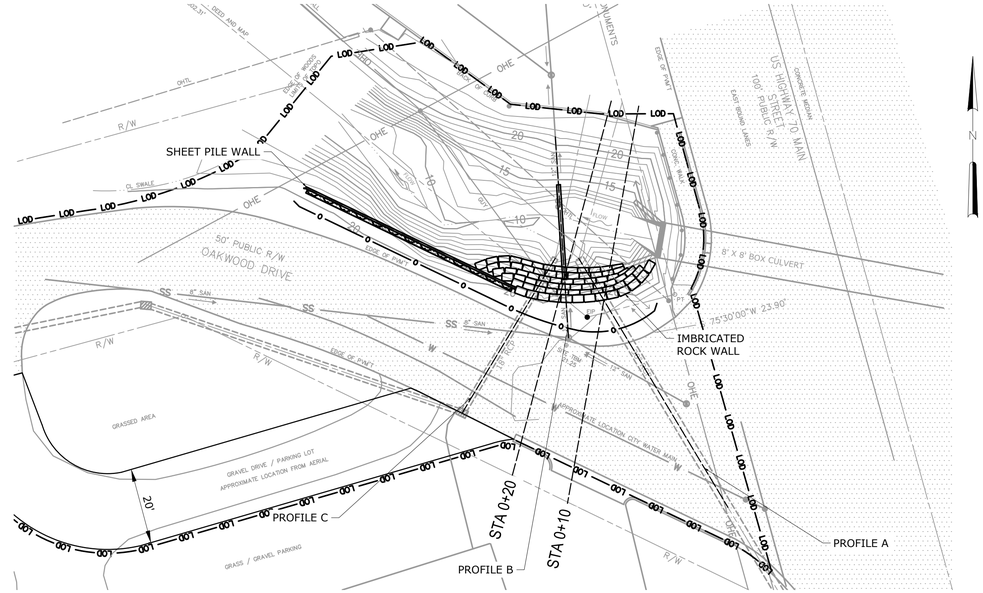


STA 0+10

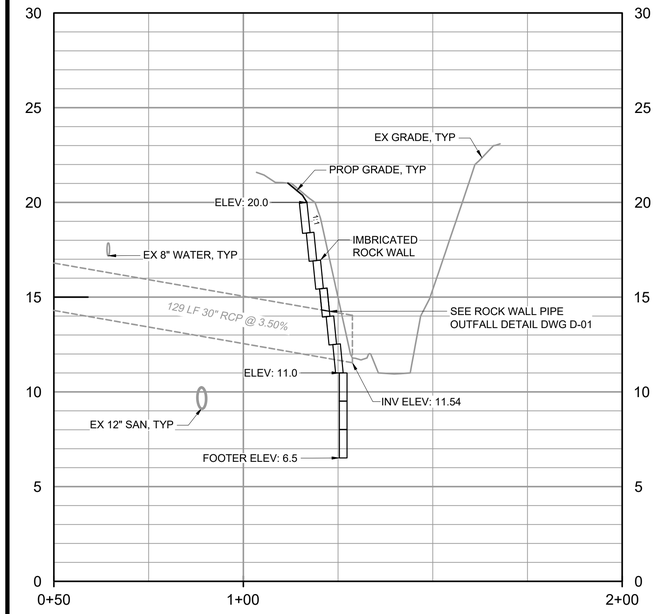


STA 0+20

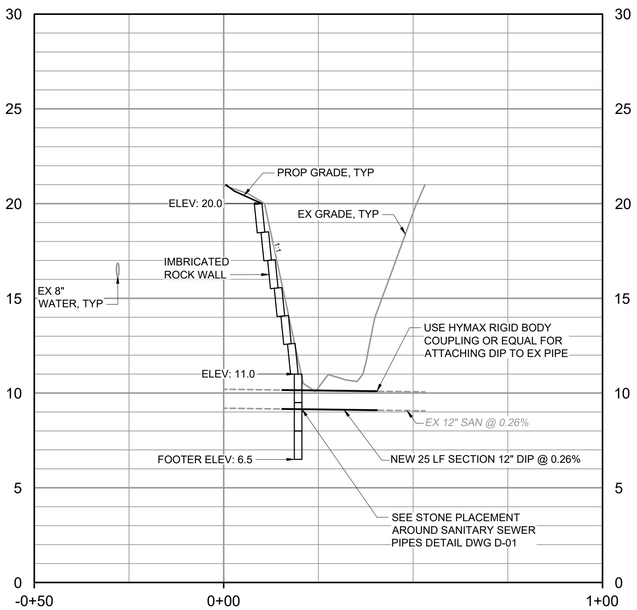


SECTION LOCATIONS

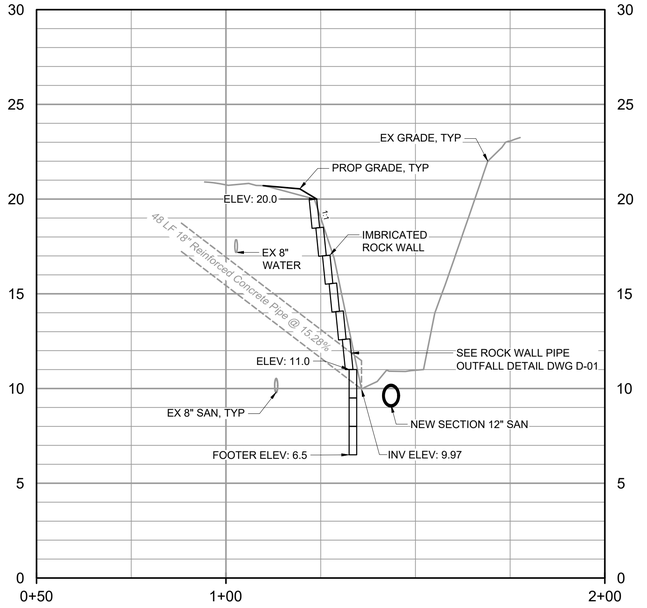
SCALE: 1" = 20'



PROFILE A - 30" RCP STORM PIPE PROFILE



PROFILE B - SANITARY SEWER STREAM CROSSING



PROFILE C - 18" RCP STORM PIPE PROFILE

CROSS SECTIONS

HORZ: 1" = 20' - VERT: 1" = 4'

ALL VIEWS LOOKING DOWNSTREAM

NOTES:

1. WATER UTILITY ELEVATION BASED ON 4FT ASSUMED COVER
2. SANITARY SEWER ELEVATION BASED ON ASSUMED 0.5% SLOPE FROM MANHOLE INVERT
3. 30" RCP STORMWATER PIPE APPROXIMATED AS 3.5% SLOPE FROM AVAILABLE SURVEY INFORMATION
4. CCTV REQUIRED TO CONFIRM CONDITION BEFORE REPLACEMENT OF 12" SANITARY PIPE SECTION

HORIZONTAL SCALE: 1" = 20'

20 10 0 20'

VERTICAL SCALE: 1" = 4'

4 2 0 4

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PROJECT ENGINEER: T. SCHUELER

DESIGNED BY:

DRAWN BY:

CHECKED BY:

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PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER 04/04/18

Hazen

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RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

IMBRICATED ROCK WALL
CROSS SECTIONS

DATE: DECEMBER 2018

HAZEN NO.: 30906-018

CONTRACT NO.:

DRAWING NUMBER: C-04

File: O:\30906\30906-018\DESIGN\DRAWING\GSCIVIL\C-04 Saved by JMCSWAIN Save date: 12/6/2018 2:51 PM
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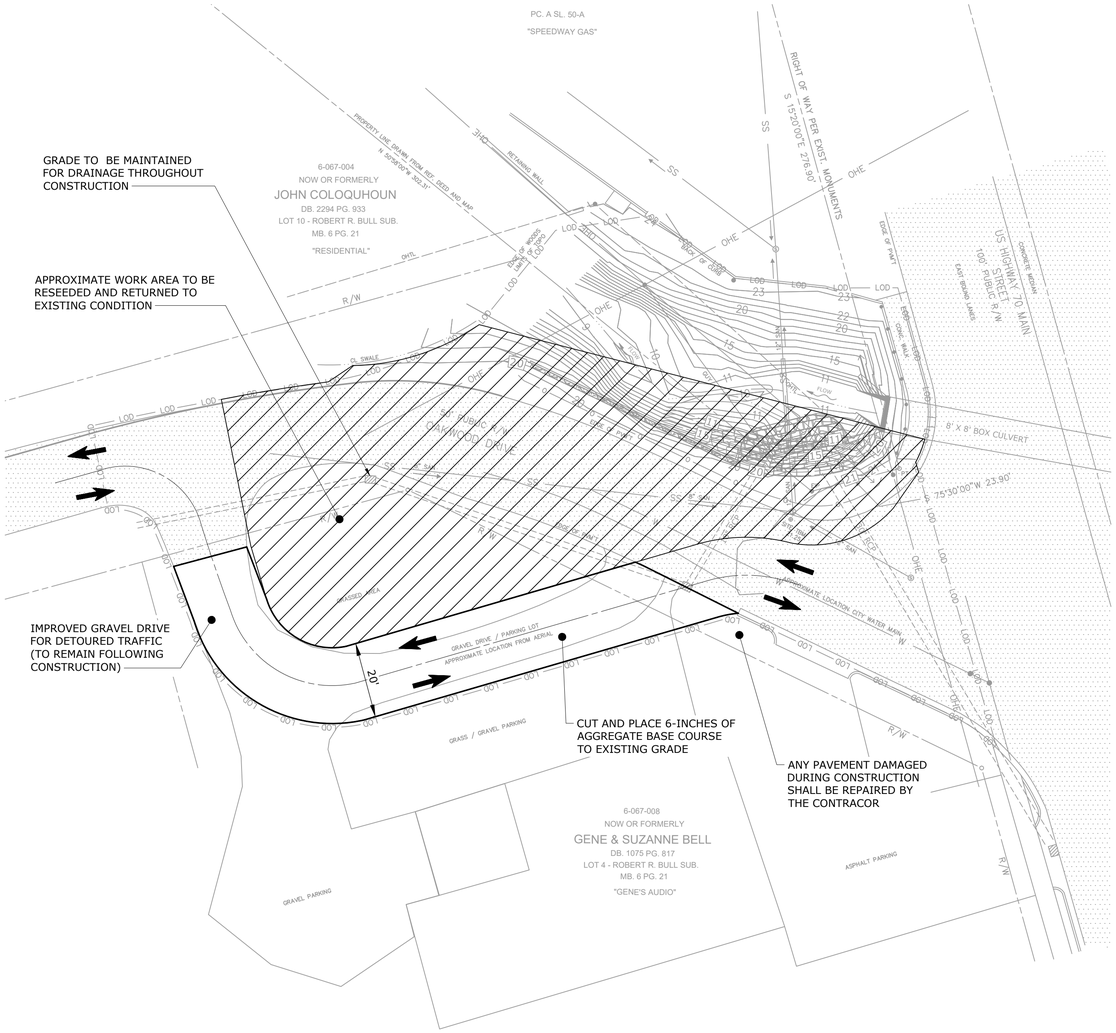
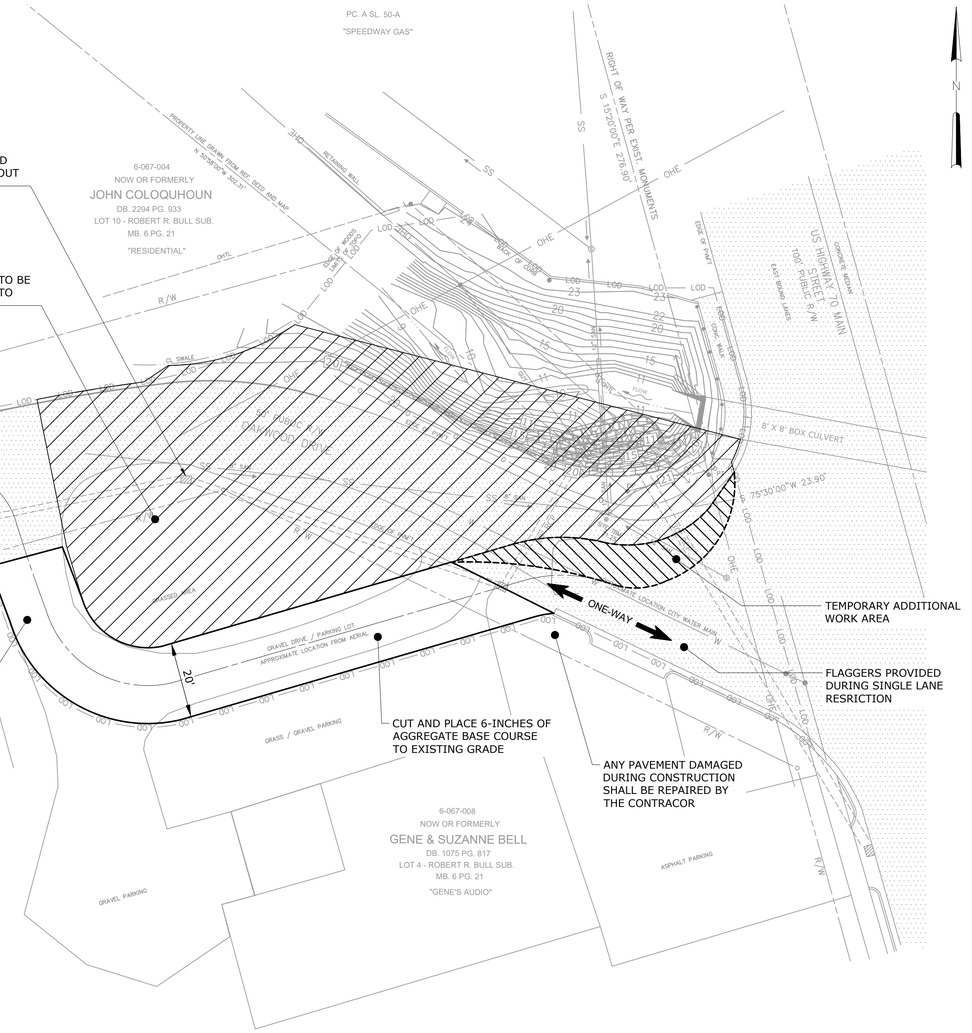


TWO-WAY DETOUR PLAN

SCALE: 1" = 20'



ONE-WAY DETOUR PLAN

SCALE: 1" = 20'

NOTES:

1. CONTRACTOR TO MAINTAIN GRAVEL DRIVE THROUGHOUT CONSTSRUCTION
2. VEHICULAR ACCESS TO EACH PROPERTY SHALL BE MAINTAINED THROUGHOUT THE DURATION OF CONSTRUTION.
3. DETOUR SIGNS SHALL BE PLACED AT EACH END OF THE DETOUR TO INSTRUCT MOTORISTS TO FOLLOW THE DESIGNATED ROUTE.
4. FLAGGERS SHALL BE PROVIDED ANYTIME TRAFFIC IS RESTRICTED TO A SINGLE LANE.
5. TRAFFIC SHALL BE RESTORED TO 2-WAY AT THE END OF EACH WORK DAY.
6. ANY DAMAGE DUE TO CONSTRUCTION TRAFFIC AND EQUIPMENT SHALL BE REPAIRED

SCALE: 1" = 20'

20 10 0 20'

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PROJECT ENGINEER: T. SCHUELER
DESIGNED BY: J. MCSWAIN
DRAWN BY: J. MCSWAIN
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PRELIMINARY DRAWING
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NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER

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RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

TRAFFIC CONTROL PLAN

DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: C-05

File: O:\30906\30906-018\DESIGN\DRAWINGS\CIVIL\C-05 Saved by JMCSWAIN Save date: 12/5/2018 2:48 PM
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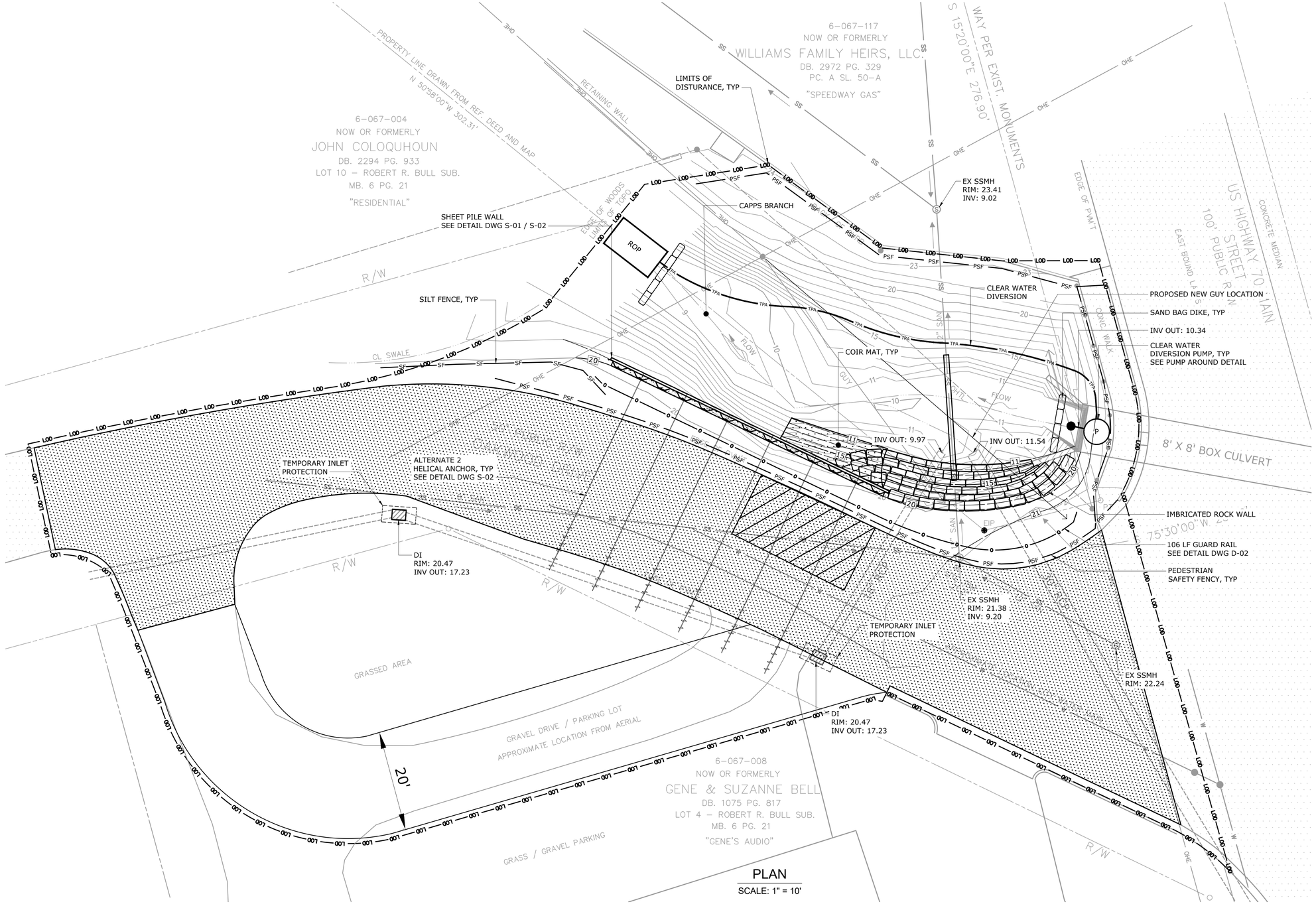
NOTES:

1. FOR EROSION & SEDIMENT CONTROL NOTES AND DETAILS, SEE DWG ESC-02 AND ESC-03.



PLAN

SCALE: 1" = 10'

SCALE: 1" = 10'

10 5 0 10'

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PROJECT ENGINEER:	T. SCHUELER
DESIGNED BY:	J. MCSWAIN
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PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER 12/14/18

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RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

EROSION & SEDIMENT CONTROL PLAN

DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: ESC-01

EROSION & SEDIMENTATION CONTROL NOTES

1. THE CONTRACTOR SHALL PHASE CONSTRUCTION TO MINIMIZE EXPOSED SOIL AREAS THROUGHOUT THE PROJECT.

2. ALL ONSITE ACTIVITIES SHALL BE MANAGED TO ENSURE NO ADVERSE IMPACTS TO WATER QUALITY OCCUR DURING AND AFTER CONSTRUCTION.

3. THESE ARE MINIMUM EROSION CONTROL MEASURES, AND THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY EROSION CONTROL MEASURES TO ACCOMMODATE CONSTRUCTION SEQUENCES AND METHODS WHETHER OR NOT SHOWN ON THE PLANS TO PROTECT ADJACENT CREEKS, ROADWAYS, ETC FROM SILTATION AND EROSION.

4. EACH EROSION AND SEDIMENTATION CONTROL MEASURE SHALL BE INSPECTED ON A WEEKLY BASIS AND WITHIN 24 HOURS FOLLOWING A STORM EVENT GREATER THAN ONE INCH. EACH MEASURE SHALL BE MAINTAINED AS REQUIRED TO ENSURE PROPER FUNCTIONING OF THE MEASURE.

5. ALL EROSION CONTROL MEASURES SHALL REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE, PERMANENT VEGETATION IS ESTABLISHED ON ALL DISTURBED AREAS, AND APPROVAL BY THE ENGINEER IS GIVEN. AREAS WHERE EROSION AND SEDIMENTATION CONTROL MEASURES ARE REMOVED SHALL BE REGRADED AND SEEDED TO MATCH ORIGINAL SITE CONDITIONS.

EROSION & SEDIMENTATION CONTROL CONSTRUCTION SEQUENCING NOTES

1. NO CONSTRUCTION OR LAND DISTURBANCE ACTIVITIES SHALL BEGIN UNTIL TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES HAVE BEEN INSTALLED. CONTRACTOR SHALL INSTALL SILT FENCE AS SHOWN ON THE DRAWING FOR TEMPORARY PERIMETER EROSION CONTROL.

2. TEMPORARY SEEDING MEASURES SHALL BE EMPLOYED THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES ON ANY AREA WHICH WILL REMAIN UNDISTURBED FOR MORE THAN 7 WORKING DAYS OR 14 CALENDAR DAYS, WHICHEVER IS SHORTER. ALL SLOPES STEEPER THAN 3H:1V SHALL BE PLANTED OR OTHERWISE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION WITHIN 7 CALENDAR DAYS. ALL OTHER SLOPES OF 3H:1V OR FLATTER, EXCEPT THOSE GREATER THAN 50 FT IN LENGTH, SHALL BE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR OTHER STRUCTURES SUFFICIENT TO RESTRAIN EROSION WITHIN 14 CALENDAR DAYS.

3. PERMANENT SEEDING SHALL BE IMMEDIATELY INSTALLED, FOR ALL AREAS REACHING FINAL GRADE WHICH WILL NOT BE DISTURBED AGAIN.

4. UPON COMPLETION OF FINAL GRADING, PERMANENT STRUCTURAL OR VEGETATIVE STABILIZATION SHALL BE ESTABLISHED.

5. ALL EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE DURATION OF CONSTRUCTION ACTIVITIES AND THE SITE HAS BEEN PERMANENTLY STABILIZED WITH STRUCTURAL AND/OR PERMANENT VEGETATIVE MEASURES.

6. CONTRACTOR SHALL PERFORM SITE INSPECTION AND MAINTENANCE ONCE EVERY SEVEN CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 1/2 INCH OF RAIN PER 24 HOUR PERIOD.

7. ONCE PERMANENT STABILIZATION HAS OCCURRED, TEMPORARY SEDIMENT CONTROL MEASURES MAY BE REMOVED UPON APPROVAL FROM THE CITY. ANY AREAS DISTURBED BY THE REMOVAL OF EROSION CONTROL MEASURES SHALL BE RETURNED TO THE ORIGINAL, OR BETTER, CONDITION, THEN SEEDED, MULCHED, AND FERTILIZED.

8. THE NORTH CAROLINA SEDIMENTATION POLLUTION CONTROL ACT REQUIRES PEOPLE RESPONSIBLE FOR LAND DISTURBING ACTIVITIES TO INSPECT EROSION AND SEDIMENTATION CONTROL MEASURES AFTER EACH PHASE OF THE PROJECT UNTIL PERMANENT GROUND COVER IS ESTABLISHED. THE SELF INSPECTION PROGRAM IS SEPARATE FROM THE WEEKLY MONITORING PROGRAM OF THE NPDES STORMWATER PERMIT FOR CONSTRUCTION ACTIVITIES. THE FOCUS OF THE SELF-INSPECTION REPORT IS TO ENSURE THE INSTALLATION OF EROSION AND SEDIMENTATION CONTROL MEASURES ARE CONTINUALLY PERFORMING AS INTENDED.

CONTROL OF WATER NOTES

1. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL EQUIPMENT, SUPPLIES, AND MATERIALS NECESSARY FOR THE CONTROL OF WATER, INCLUDING BUT NOT LIMITED TO: PUMPS, HOSE, SANDBAGS, DEWATERING DEVICES.

2. THE CONTRACTOR SHALL IMPLEMENT A CLEARWATER DIVERSION PLAN TO TEMPORARILY BYPASS FLOWS AROUND WORK AREAS. PUMPING MAY BE REQUIRED TO BYPASS FLOWS.

3. THE CONTRACTOR SHALL IMPLEMENT A WORK SITE DEWATERING PLAN TO DEWATER WORK AREAS AND TREAT WATER COLLECTED FROM DISTURBED AREAS. FLOWS COLLECTED FROM DISTURBED AREAS SHALL BE TREATED WITH AN APPROVED SEDIMENT CONTROL DEVICE PRIOR TO DISCHARGE.

4. ALL PUMPED FLOWS SHALL BE DISCHARGED IN A NON-EROSIVE MANNER TO A STABILIZED WATERCOURSE.

5. THE CONTRACTOR SHALL REMOVE OR MODIFY SANDBAG DIKES OR OTHER WATER CONTROL BARRIERS PRIOR TO FORECASTED RAIN EVENTS TO ALLOW FLOW THROUGH THE CANAL AS NEEDED TO MAINTAIN UPSTREAM FLOW WITHIN CANAL BANKS.

6. THE CONTRACTOR SHALL REMOVE CONSTRUCTION EQUIPMENT FROM THE CANAL AT THE END OF EACH WORK DAY AND PRIOR TO FORECASTED RAIN EVENTS. THE CITY IS NOT RESPONSIBLE FOR DAMAGE TO CONSTRUCTION EQUIPMENT.

SEEDING NOTES

SEED BED PREPARATION

1. CONTRACTOR SHALL PREPARE ALL AREAS TO RECEIVE TEMPORARY OR PERMANENT SEEDING MEASURES PRIOR TO PLANTING.

2. TOPSOIL SHALL BE PLACED IN AREAS TO BE SEEDED AND ROUGHENED WITH TRACKED EQUIPMENT OR OTHER SUITABLE MEASURES. SLOPES STEEPER THAN 3:1 MAY BE ROUGHENED BY GROOVING, FURROWING, TRACKING, OR STAIRSTEP GRADING. SLOPES FLATTER THAN 3:1 SHOULD BE GROOVED BY DISKING, HARROWING, RAKING, OPERATING PLANTING EQUIPMENT ON THE CONTOUR.

3. PER NEUSE RIVER BASIN REQUIREMENTS, SOIL AMENDMENTS INCLUDING, BUT NOT LIMITED TO, LIME AND FERTILIZER SHALL BE SPREAD ONLY AS NECESSARY FOR A ONE TIME APPLICATION TO ESTABLISH REPLANTED VEGETATION, AND AT THE RATES SHOWN IN THE SEEDING SCHEDULE. SEEDING SHALL BE AS PER TYPE AND RATES SHOWN IN THE SEEDING SCHEDULE. SEED SHALL BE BROADCAST AS SOON AS POSSIBLE FOLLOWING ROUGHENING, BEFORE SURFACE HAS BEEN SEALED BY RAINFALL.

MULCHING AND TACKING AGENTS

1. MULCH MUST COVER A MINIMUM OF 80 PERCENT OF THE SOIL SURFACE AND MUST BE SECURED BY TACKING, CRIMPING, OR NETTING.

2. WOOD CELLULOSE FIBER MULCH SHALL BE USED IN HYDROSEEDING GRASS SEED IN COMBINATION WITH FERTILIZERS AND OTHER APPROVED ADDITIONS.

3. NO NETTING WITH PLASTIC MESH AND / OR PLASTIC TWINE SHALL BE USED IN WETLAND AND RIPARIAN BUFFERS TO PROTECT SMALL ANIMALS.

HYDROSEEDING

1. HYDROSEEDING SHALL BE CARRIED OUT IN THREE STEPS. STEP ONE SHALL CONSIST OF THE APPLICATION OF LIME. IN STEP TWO THE SEED MIXTURE SHALL BE MIXED WITH THE FERTILIZER, WOOD CELLULOSE FIBER MULCH, AND ANY REQUIRED INOCULANTS AND APPLIED TO THE SEED BED. STEP THREE SHALL CONSIST OF APPLICATION OF TOP DRESSING DURING THE FIRST SPRING OR FALL, WHICHEVER COMES FIRST, AFTER STEP TWO.

2. INGREDIENTS FOR THE MIXTURE AND STEPS SHOULD BE DUMPED INTO A TANK OF WATER AND THOROUGHLY MIXED TO A HOMOGENEOUS SLURRY AND SPRAYED OUT UNDER A MINIMUM OF 300-350 POUNDS PRESSURE, IN SUITABLE PROPORTIONS TO ACCOMMODATE THE TYPE AND CAPACITY OF THE HYDRAULIC MACHINE TO BE USED. APPLICATIONS SHALL BE EVENLY SPRAYED OVER THE GROUND SURFACE. THE CONTRACTOR SHALL FREE THE TOPSOIL OF STONES, ROOTS, RUBBISH AND OTHER DELETERIOUS MATERIALS AND DISPOSE OF SAME OFF THE SITE. THE BARE SOIL, EXCEPT EXISTING STEEP EMBANKMENT AREA, SHALL BE ROUGH RAKED TO REMOVE STONES, ROOTS, AND RUBBISH OVER 4-INCH IN SIZE, AND OTHER DELETERIOUS MATERIALS AND DISPOSE OF SAME OFF THE SITE.

3. NO SEEDING SHOULD BE UNDERTAKEN IN WINDY OR UNFAVORABLE WEATHER, WHEN THE GROUND IS TOO WET TO RAKE EASILY, WHEN IT IS IN A FROZEN CONDITIONS, OR TOO DRY. ANY BARE SPOTS SHOWN IN TWO TO THREE WEEKS SHALL BE RE-CULTIVATED, FERTILIZED AT HALF THE RATE, RAKED, SEEDED, AND MULCHED AGAIN BY MECHANICAL OR HAND BROADCAST METHOD ACCEPTABLE TO THE OWNER.

TEMPORARY SEEDING SCHEDULE:

SPECIES	RATE (LB/AC)	SEEDING DATES
GERMAN MILLET	40	SUMMER: APRIL 15TH - AUGUST 15TH
RYE (GRAIN)	120	FALL: AUGUST 15TH - DECEMBER 30TH (SEE NOTE 1)
RYE (GRAIN)	120	WINTER: JANUARY 1ST - APRIL 15TH

NOTES:
1. TOP DRESS WITH 50 LB/AC NITROGEN IN MARCH.
2. APPLY 2,000 LB/AC GROUND AGRICULTURAL LIMESTONE AND 750 - 1,000 LB/AC 10-10-10 FERTILIZER. APPLICATION RATES AND CHEMICAL ANALYSIS SHALL BE CONFIRMED OR ESTABLISHED BY SOIL TEST.
3. APPLY 4,000 LB/AC SMALL GRAIN STRAW MULCH.
4. TACK MULCH BY APPLYING ASPHALT TACK AT A RATE OF 0.10 GAL/YR² (10 GAL/1,000 FT²).
5. RE-FERTILIZE IF GROWTH IS NOT FULLY ADEQUATE. RESEED, RE-FERTILIZE, AND MULCH IMMEDIATELY FOLLOWING EROSION OR OTHER VISIBLE SIGNS OF DAMAGE.

PERMANENT SEEDING SCHEDULE:

SPECIES	RATE (LB/AC)	SEEDING DATES
BERMUDA GRASS	25	APRIL 1ST - JULY 15TH
GERMAN MILLET	10	ADD BETWEEN APRIL 15TH AND AUGUST 15TH
RYE (GRAIN)	40	ADD BETWEEN AUGUST 15TH AND APRIL 15TH

NOTES:
1. APPLY LIME AND FERTILIZER ACCORDING TO SOIL TESTS, OR APPLY 4,000 LB/AC GROUND AGRICULTURAL LIMESTONE AND 1,000 LB/AC 10-10-10 FERTILIZER.
2. LIME AND FERTILIZER ARE TO BE DISKED INTO THE SOIL SURFACE TO A MINIMUM DEPTH OF 4 INCHES.
3. APPLY 4,000 LB/AC GRAIN STRAW OR EQUIVALENT COVER OF ANOTHER SUITABLE MULCH.
4. ANCHOR BY TACKING WITH ASPHALT (0.10 GAL/YD^2), ROVING, OR NETTING OR BY CRIMPING WITH A MULCH ANCHORING TOOL.
5. RESEED, FERTILIZE, AND MULCH DAMAGED AREAS IMMEDIATELY

REV	ISSUED FOR	DATE	BY
1			

PROJECT ENGINEER: T. SCHUELER
DESIGNED BY: J. MCSWAIN
DRAWN BY: J. MCSWAIN
CHECKED BY: T. SCHUELER
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER

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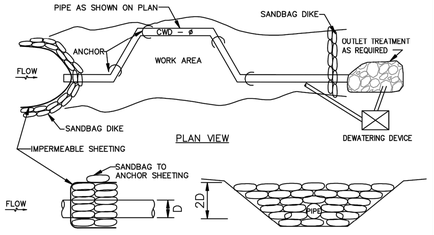
RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

EROSION & SEDIMENT CONTROL DETAILS AND NOTES

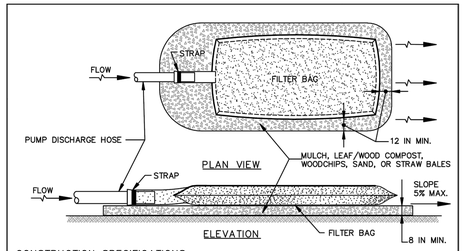
DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: ESC-02



CONSTRUCTION SPECIFICATIONS

1. FLEXIBLE PIPE IS PREFERRED. HOWEVER, CORRUGATED METAL PIPE OR EQUIVALENT PVC PIPE CAN BE USED. MAKE ALL JOINTS WATERTIGHT.
2. FOR SANDBAGS USE MATERIALS THAT ARE RESISTANT TO ULTRA-VIOLENT RADIATION, TEARING, AND PUNCTURE AND WOVEN TIGHTLY ENOUGH TO PREVENT LEAKAGE OF FILL MATERIAL.
3. USE 10 MIL OR THICKER, UV RESISTANT, IMPERMEABLE SHEETING OR OTHER APPROVED MATERIAL THAT IS IMPERMEABLE AND RESISTANT TO PUNTURING AND TEARING.
4. PLACE IMPERMEABLE SHEETING SUCH THAT UPGRADE PORTION OVERLAPS DOWNGRADE PORTION BY A MINIMUM OF 18 INCHES.
5. SET HEIGHT OF SANDBAG DIKE AT TWICE THE PIPE DIAMETER. MAINTAIN HEIGHT ALONG LENGTH OF SANDBAG DIKE. PLACE DOUBLE ROW OF SANDBAGS.
6. AT A MINIMUM, SECURELY ANCHOR DIVERSION PIPE AT EACH DOWNGRADE JOINT.
7. SET OUTLET END OF DIVERSION PIPE LOWER THAN INLET END.
8. PROVIDE OUTLET PROTECTION AS REQUIRED ON APPROVED PLAN.
9. DEWATER WORK AREA USING AN APPROVED EROSION AND SEDIMENT CONTROL PRACTICE AS SPECIFIED ON APPROVED PLAN.
10. KEEP POINT OF DISCHARGE FREE OF EROSION. MAINTAIN WATER TIGHT CONNECTIONS AND POSITIVE DRAINAGE. REPLACE SANDBAGS AND IMPERMEABLE SHEETING IF TORN.

CLEAR WATER DIVERSION PIPE



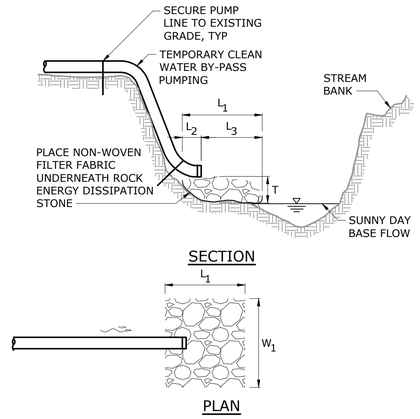
CONSTRUCTION SPECIFICATIONS

1. TIGHTLY SEAL SLEEVE AROUND THE PUMP DISCHARGE HOSE WITH A STRAP OR SIMILAR DEVICE.
2. PLACE FILTER BAG ON SUITABLE BASE (E.G., MULCH, LEAF/WOOD COMPOST, WOODCHIPS, SAND, OR STRAW BALES) LOCATED ON A LEVEL OR 5% MAXIMUM SLOPING SURFACE. DISCHARGE TO A STABILIZED AREA. EXTEND BASE A MINIMUM OF 12 INCHES FROM EDGES OF BAG.
3. CONTROL PUMPING RATE TO PREVENT EXCESSIVE PRESSURE WITHIN THE FILTER BAG IN ACCORDANCE WITH THE MANUFACTURER RECOMMENDATIONS. AS THE BAG FILLS WITH SEDIMENT, REDUCE PUMPING RATE.
4. REMOVE AND PROPERLY DISPOSE OF FILTER BAG UPON COMPLETION OF PUMPING OPERATIONS OR AFTER BAG HAS REACHED CAPACITY, WHICHEVER OCCURS FIRST. SPREAD THE DEWATERED SEDIMENT FROM THE BAG IN AN APPROVED UPLAND AREA AND STABILIZE WITH SEED AND MULCH BY THE END OF THE WORK DAY. RESTORE THE SURFACE AREA BENEATH THE BAG TO ORIGINAL CONDITION UPON REMOVAL OF THE DEVICE.
5. USE NONWOVEN GEOTEXTILE WITH DOUBLE STITCHED SEAMS USING HIGH STRENGTH THREAD. SIZE SLEEVE TO ACCOMMODATE A MAXIMUM 4 INCH DIAMETER PUMP DISCHARGE HOSE. THE BAG MUST BE MANUFACTURED FROM A NONWOVEN GEOTEXTILE THAT MEETS OR EXCEEDS MINIMUM AVERAGE ROLL VALUES (MARV) FOR THE FOLLOWING:

GRAB TENSILE	250 LB	ASTM D-4632
PUNCTURE	150 LB	ASTM D-4833
FLOW RATE	70 GAL/MIN/FT²	ASTM D-4491
PERMITTIVITY (SEC^{-1})	1.2 SEC^{-1}	ASTM D-4491
UV RESISTANCE	70% STRENGTH @ 500 HOURS	ASTM D-4355
APPARENT OPENING SIZE (AOS)	0.15-0.18 MM	ASTM D-4751
SEAM STRENGTH	90%	ASTM D-4632

6. REPLACE FILTER BAG IF BAG CLOGS OR HAS RIPS, TEARS, OR PUNCTURES. DURING OPERATION KEEP CONNECTION BETWEEN PUMP HOSE AND FILTER BAG WATER TIGHT. REPLACE BEDDING IF IT BECOMES DISPLACED.

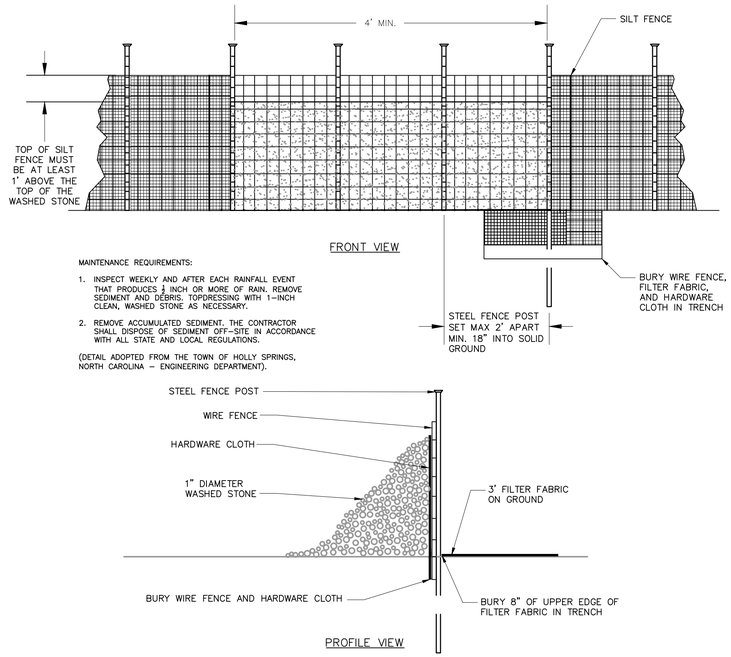
FILTER BAG



ROCK OUTLET PROTECTION (ROP) DETAIL

NTS

ROCK OUTLET PROTECTION (ROP) SCHEDULE								
ID	LOCATION	L1 (FT)	L2 (FT)	L3 (FT)	T (IN)	W1 (FT)	ROCK SIZE (IN)	NCDOT DESIGNATION
ROP-1	DOWNSTREAM OF WORK AREA	10	3	7	18	6.5	8	CLASS B

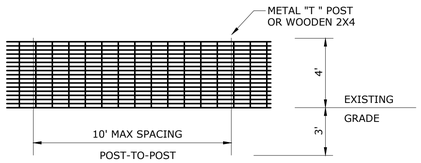


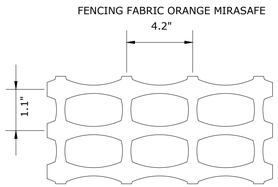
MAINTENANCE REQUIREMENTS:

1. INSPECT WEEKLY AND AFTER EACH RAINFALL EVENT THAT PRODUCES ½ INCH OR MORE OF RAIN. REMOVE SEDIMENT AND DEBRIS. TOPDRESSING WITH 1-INCH CLEAN, WASHED STONE AS NECESSARY.
2. REMOVE ACCUMULATED SEDIMENT. THE CONTRACTOR SHALL DISPOSE OF SEDIMENT OFF-SITE IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS.

(DETAIL ADOPTED FROM THE TOWN OF HOLLY SPRINGS, NORTH CAROLINA – ENGINEERING DEPARTMENT).

SILT FENCE





TC MIRAFI MIRASAFE OR AN APPROVED EQUAL. STAPLE TO VERTICAL 2X4 OR TIE TO METAL "T" POSTS.

NOTES:

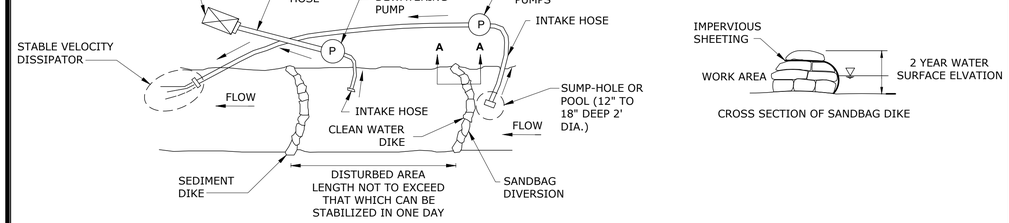
1. PEDESTRIAN SAFETY FENCE SHALL CONSIST OF A PLASTIC, OPEN-MESH FENCING MATERIAL, WHICH SHALL BE BRIGHT ORANGE IN COLOR, AND MOUNTED ON POSTS BY MEANS OF ADJUSTABLE BELTS OR LOOPS OR OTHER MEANS THAT WILL SECURELY HOLD THE FENCING IN AN UPRIGHT POSITION.
2. POSTS MAY BE ANY TYPE OF MATERIAL THAT WILL ADEQUATELY SERVE THE INTENDED PURPOSE FOR THE DURATION OF THE PROJECT.
3. FENCE MATERIAL SHALL WEIGH AT LEAST 12 POUNDS PER 100 FOOT LONG ROLL (FOUR FOOT WIDE ROLL) {5.4KG PER 30 METER LONG ROLL} ({1.21 METER WIDE ROLL}).
4. THE ALDOT HAS ESTABLISHED A LIST (LIST V-7) OF ACCEPTABLE SAFETY FENCES. THE CONTRACTOR MAY FURNISH ANY OF THE SAFETY FENCES ON THIS LIST. THE LIST IS GIVEN IN THE DEPARTMENTS MANUAL, "MATERIAL, SOURCES, AND DEVICES WITH SPECIAL ACCEPTANCE REQUIREMENTS.
5. THE FENCE SHALL BE CONTINUOUS, FOUR FEET IN HEIGHT ABOVE THE GROUND SURFACE, AND SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS WITH A MINIMUM 6 INCH {150MM} OVERLAP. THE MAXIMUM SPACING BETWEEN POSTS SHALL BE 10 FEET {3 METERS}.
6. THE CONTRACTOR SHALL MAINTAIN THE INTEGRITY OF THE FENCE AS LONG AS THE ENGINEER DEEMS NECESSARY AND WHILE CONSTRUCTION OR ASSOCIATED ACTIVITIES ARE ONGOING IN THE VICINITY OF THE AREA ENCLOSED OR DELINEATED BY THE FENCE.
7. THE CONTRACTOR SHALL ROUTINELY INSPECT THE FENCE AND CORRECT ANY DEFICIENCIES IMMEDIATELY. THE FENCE SHALL REMAIN IN PLACE UNTIL THE ENGINEER DIRECTS THAT IT BE REMOVED. THE FENCE MATERIALS SHALL REMAIN IN THE PROPERTY OF THE CONTRACTOR AND MAY BE REUSED AT OTHER LOCATIONS, PROVIDED THEY ARE IN SATISFACTORY CONDITION FOR REUSE.
8. POSTS AND THE HARDWARE FOR ATTACHING THE SAFETY FENCE TO THE POSTS SHALL BE CONSIDERED A NECESSARY REQUIREMENT OF THE PEDESTRIAN SAFETY FENCE INSTALLATION AND NO DIRECT PAYMENT WILL BE MADE FOR SUCH.

MAINTENANCE REQUIREMENTS:

1. INSPECT WEEKLY AND AFTER EACH RAINFALL PRODUCING ½ INCH OR MORE OF RAIN.
2. REPAIR OR RELACE DAMAGED FENCING IMMEDIATELY.
3. REPLACE ANY DAMAGED SIGNAGE IMMEDIATELY AS NEEDED.

PEDESTRIAN SAFETY FENCE DETAIL

NTS



DESCRIPTION:
THE WORK SHOULD CONSIST OF INSTALLING A TEMPORARY PUMP AROUND AND SUPPORTING MEASURES TO DIVERT FLOW AROUND THE WORK AREA AND DEWATER WORK AREA.

NOTES:

1. THE CONTRACTOR SHOULD STAY WITHIN THE LIMITS OF THE DISTURBANCE AS SHOWN ON THE PLANS AND MINIMIZE DISTURBANCE WITHIN THE WORK AREA WHENEVER POSSIBLE.
2. THE CONTRACTOR SHOULD ONLY BEGIN WORK IN AN AREA WHICH CAN BE COMPLETED BY THE END OF THE DAY. AT THE END OF EACH WORK DAY, THE WORK AREA MUST BE STABILIZED AND THE PUMP AROUND REMOVED.
3. SANDBAG DIKES SHOULD BE SITUATED AT THE ENDS OF THE WORK AREA AS SHOWN ON THE PLANS, AND CLEAN STREAM FLOW SHOULD BE PUMPED AROUND THE WORK AREA. THE PUMP SHOULD DISCHARGE ONTO A STABLE VELOCITY DISSIPATER MADE OF RIPRAP OR SANDBAGS.
4. WATER FROM THE WORK AREA SHOULD BE PUMPED TO A SEDIMENT FILTERING MEASURE SUCH AS A DEWATERING BASIN, SEDIMENT BAG, OR OTHER APPROVED SOURCE. THE MEASURE SHOULD BE LOCATED SUCH THAT THE WATER DRAINS DOWNSTREAM OF THE WORK AREA.
5. FOR STREAMWORK REPAIR PROJECTS LONGER THAN 4OO LINEAR FEET, MULTIPLE WORK AREAS SHALL BE ESTABLISHED IN SUCCESSION. ONCE AN AREA IS COMPLETED AND STABILIZED, THE CLEAN WATER DIKE SHOULD BE REMOVED. AFTER THE FIRST SEDIMENT FLUSH, A NEW CLEAN WATER DIKE WOULD BE ESTABLISHED FROM THE OLD SEDIMENT DIKE. FINALLY, UPON ESTABLISHMENT OF A NEW SEDIMENT DIKE BELOW THE OLD ONE, THE OLD SEDIMENT DIKE SHOULD BE REMOVED.
6. A PUMP AROUND MUST BE INSTALLED ON ANY TRIBUTARY OR STORM DRAIN OUTFALL WHICH CONTRIBUTES BASEFLOW TO THE WORK AREA. THIS SHOULD BE ACCOMPLISHED BY LOCATING A SANDBAG DIKE AT THE DOWNSTREAM END OF THE TRIBUTARY OR STORM DRAIN OUTFALL AND PUMPING THE STREAM FLOW AROUND THE WORK AREA. THIS WATER SHOULD DISCHARGE ONTO THE SAME VELOCITY DISSIPATER USED FOR THE MAIN STEM PUMP AROUND.
7. ALL SANDBAG DIVERSIONS TO BE BUILT TO EXISTING TOP OF BANK.

PUMP AROUND DETAIL

NTS

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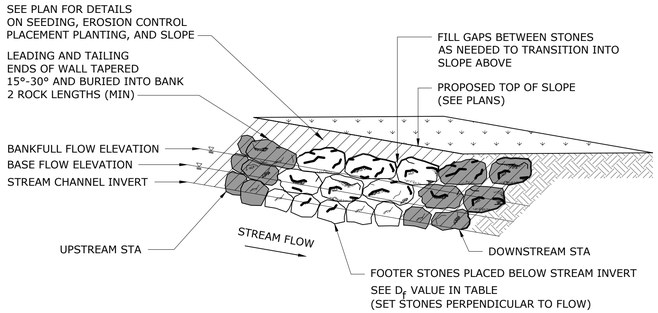
HAVELOCK, NORTH CAROLINA

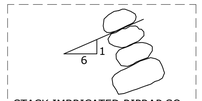
OAKWOOD DRIVE STREAMBANK STABILIZATION

EROSION & SEDIMENT CONTROL DETAILS

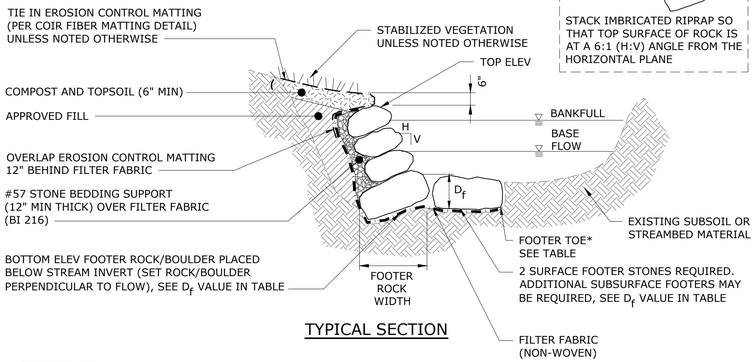
DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: ESC-03



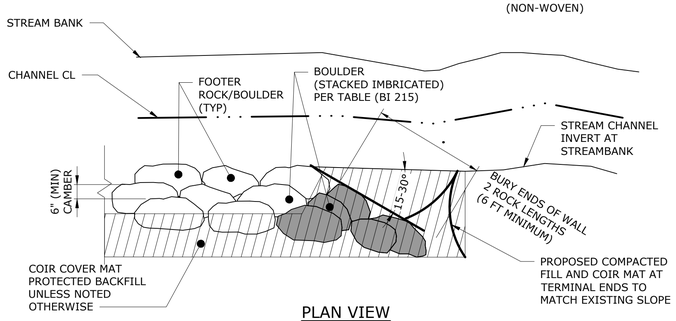
ISOMETRIC VIEW



STACK IMBRICATED RIPRAP SO THAT TOP SURFACE OF ROCK IS AT A 6:1 (H:V) ANGLE FROM THE HORIZONTAL PLANE

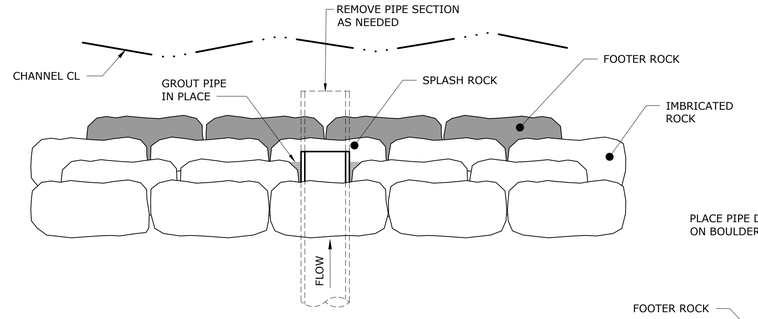


TYPICAL SECTION

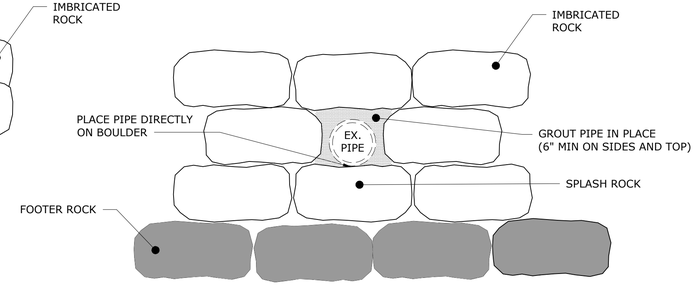


PLAN VIEW

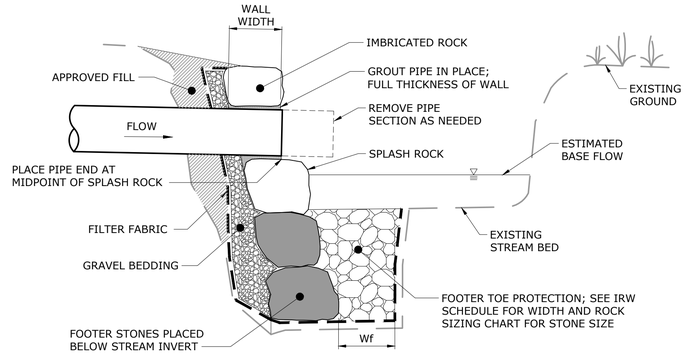
IMBRICATED ROCK WALL (IRW) DETAIL
NTS



PLAN VIEW



SECTION VIEW



PROFILE VIEW

NOTES:
1. SEE IMBRICATED ROCK WALL DETAIL FOR WALL CONSTRUCTION
2. ROCK SIZES IN ROCK SIZING CHART SUPERSEDE THIS DETAIL
3. USE NCDOT TYPE 1 (3000 PSI) GROUT AS PER SECTION 1003, "GROUT PRODUCTION AND DELIVERY" OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES

ROCK WALL PIPE OUTFALL DETAIL
NTS

IMBRICATED ROCK WALL (IRW) SCHEDULE **

STRUCTURE #	UPSTREAM STA	UPSTREAM OFFSET AT FOOTER TOE * (FT)	TOP ELEV (UPSTREAM)	BOTTOM ELEV * (UPSTREAM)	DOWNSTREAM STA	DOWNSTREAM OFFSET AT FOOTER TOE * (FT)	TOP ELEV (DOWNSTREAM)	BOTTOM ELEV * (DOWNSTREAM)	LENGTH * (FT)	WALL SLOPE (H:V)	FOOTER TOE WIDTH Df (FT)	FOOTER DEPTH Df (FT)
IRW-1	0+10.0	8.0	20.0	8.0	0+40.0	8.0	20.0	8.0	30.0	1:1	3.0	3.0

* OFFSET, ELEVATION AND LENGTH MEASURED AT TOE OF FOOTER STONE (SEE TYPICAL SECTION)
** SEE ROCK SIZING CHART FOR STONE SIZE

ROCK SIZING CHART - OAKWOOD DRIVE STREAMBANK STABILIZATION ALONG CAPPS BRANCH

TYPE OF REVETMENT	SUBCOMPONENT	PURPOSE	MATERIAL	D50 (INCHES)	NCDOT CLASS	NOTES	DETAIL REFERENCE	GRADING TOLERANCE
IMBRICATED ROCK WALL (IRW)	BASE STONE	BANK PROTECTION	RIPRAP	30	CLASS 2+	FLAT, STACKABLE	DETAILS DWG D-01	0.5' +/- HORIZ; 0.1' +/- VERT
	FOOTER STONE	GRADE CONTROL	RIPRAP	36	CLASS 2+	FLAT, STACKABLE		0.5' +/- HORIZ; 0.1' +/- VERT
	FOOTER TOE STONE	GRADE CONTROL	RIPRAP	4	CLASS A			NA
	CHINKING STONE	STABILITY	RIPRAP	4	CLASS A			NA
	BEDDING STONE	STABILITY	GRAVEL	3/4 INCH GRAVEL	NA			NA

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HAVELOCK, NORTH CAROLINA

OAKWOOD DRIVE STREAMBANK STABILIZATION

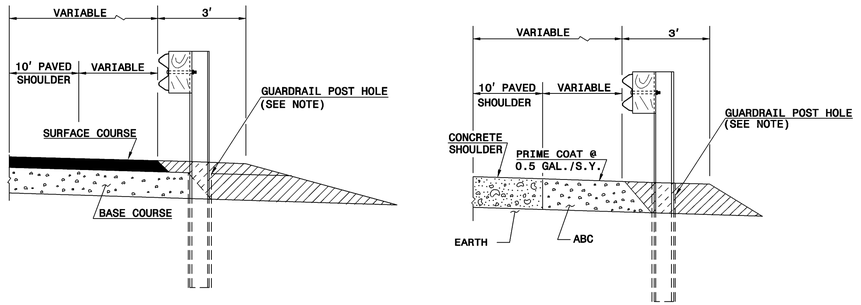
DETAILS

DATE: DECEMBER 2018
HAZEN NO.: 30906-018
CONTRACT NO.:
DRAWING NUMBER: D-01

STATE OF NORTH CAROLINA
DEPT. OF TRANSPORTATION
DIVISION OF HIGHWAYS
RALEIGH, N.C.

7-06

ENGLISH STANDARD DRAWING FOR
GUARDRAIL PLACEMENT



FLEXIBLE PAVED SHOULDER

CONCRETE PAVED SHOULDER

EARTH MATERIAL

NOTE:
WHEN WOODEN GUARDRAIL POSTS ARE USED, DRILL HOLES THROUGH EARTH MATERIAL AND BASE COURSE.THE POST MAY THEN BE DRIVEN TO THE PROPER DEPTH. DRILL THE HOLE OF SUFFICIENT SIZE TO ACCOMMODATE THE PARTICULAR POST BEING USED. BACKFILL AND TAMP HOLES USING THE EXCAVATED MATERIAL.

SHEET 10 OF 11
862.01

STATE OF NORTH CAROLINA
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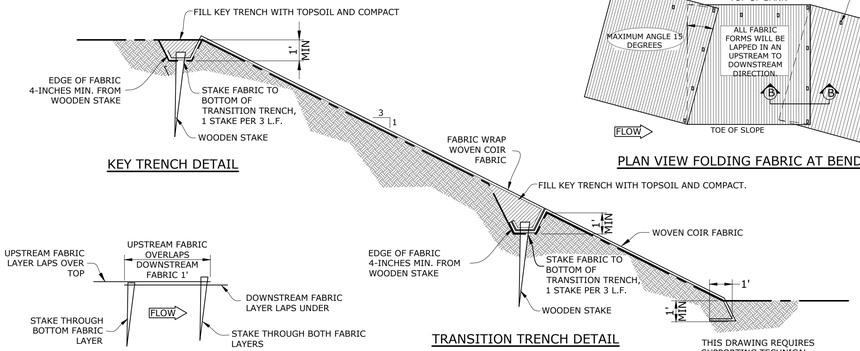
7-06

ENGLISH STANDARD DRAWING FOR
GUARDRAIL PLACEMENT

SHEET 10 OF 11
862.01

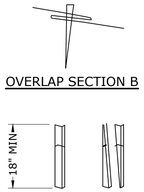


KEY TRENCH DETAIL

TRANSITION TRENCH DETAIL

PLAN VIEW FOLDING FABRIC AT BENDS

OVERLAP SECTION A

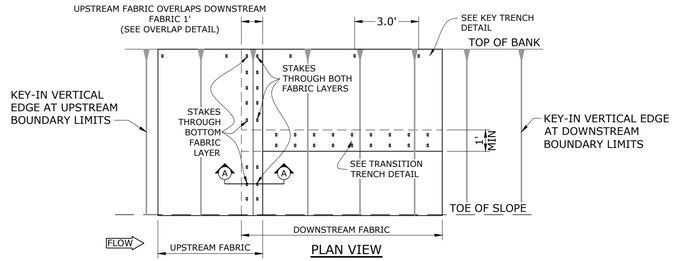


OVERLAP SECTION B

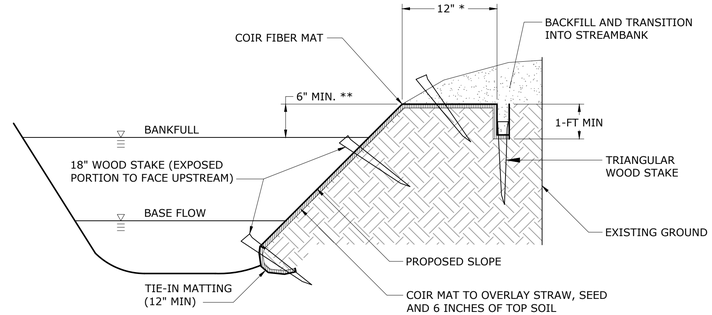
TYPICAL DETAIL STAKE

TOE SLOPE PROTECTION TO BE PROVIDED AS IDENTIFIED ON DETAIL.

THIS DRAWING REQUIRES SUPPORTING TECHNICAL DOCUMENTATION PRIOR TO USE AND MUST BE ADAPTED TO THE SPECIFIC SITE.



PLAN VIEW



COIR FIBER MATTING DETAIL
NTS

GENERAL NOTES

1. COCONUT EROSION CONTROL BLANKET SHALL BE 'ROLANKA BIO-D 70' OR APPROVED EQUAL, ABLE TO WITHSTAND 12 FPS WATER VELOCITIES AND 4.5 PSF SHEAR STRESS. FABRIC EMBEDMENT 3.0 FT.
2. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER AND SEED.
3. BEGIN AT THE BOTTOM OF THE SLOPE, WORKING FROM DOWNSTREAM UP, AND ANCHOR FIBER MATTING IN A 12" DEEP INITIAL ANCHOR TRENCH. BACKFILL TRENCH AND TAMP EARTH FIRMLY.
4. OVERLAP EDGES OF ADJACENT PARALLEL ROLLS 12" AND ANCHOR AT 12" CENTERS WITH THE UPPER ROLL OVERLAPPING THE TOP OF THE LOWER ROLL.
5. WHEN FIBER MAT MUST BE SPLICED, PLACE END OVER END (SHINGLE STYLE IN DIRECTION OF FLOW) WITH 12" OVERLAP AND ANCHOR USING TWO STAGGERED ROWS OF STAKES AT 6" CENTERS. ADDITIONAL FASTENING MAY BE REQUIRED WHERE MATTING IS CUT TO INSTALL PLANTINGS.
6. LAY FIBER MAT LOOSELY AND ANCHOR SUFFICIENTLY TO MAINTAIN DIRECT CONTACT WITH THE SOIL - DO NOT STRETCH.
7. FOR SLOPES 2:1 AND STEEPER USE A MINIMUM OF (3) 18-INCH WOOD STAKES PER SQUARE YARD AND FOR SLOPES FLATTER THAN 2:1 USE A MINIMUM OF (2) 18-INCH WOOD STAKES PER SQUARE YARD. PROVIDE ADDITIONAL STAKING ALONG CHANNEL BOTTOM WHERE COIR MAT FORMS TOE OF SLOPE.
8. WOOD STAKES SHALL BE ANGLED SUCH THAT EXPOSED PORTION (2"-4") FACES UPSTREAM.
9. ANCHOR, FILL, AND COMPACT END OF FIBER MATTING IN 12"x6" TERMINAL ANCHOR TRENCH (MIRROR IMAGE OF INITIAL TRENCH).
10. * ANCHORING DIMENSIONS TO BE REDUCED IN AREAS OF NATURAL RESOURCES TO BE PROTECTED.
11. ** EROSION CONTROL MATTING MAY BE EXTENDED UP STREAM BANK AS DIRECTED.

STATE OF NORTH CAROLINA
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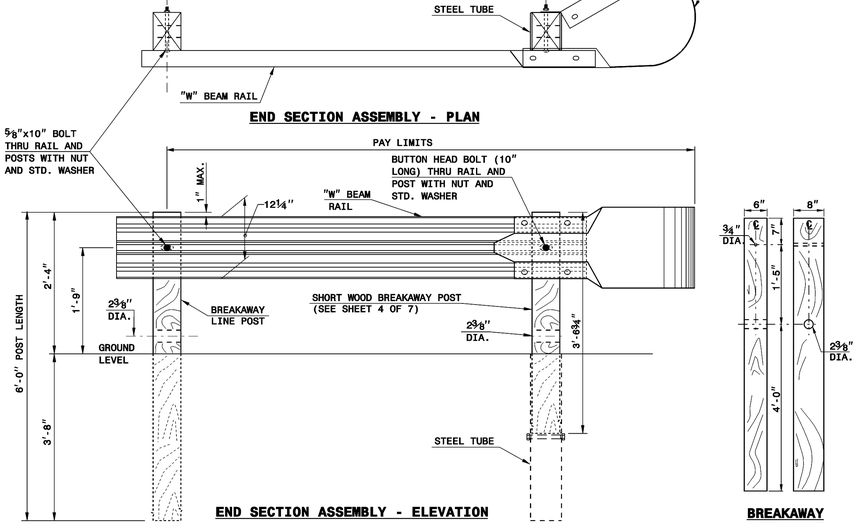
RALEIGH, N.C.

7-06

ENGLISH STANDARD DRAWING FOR
GUARDRAIL INSTALLATION



END SECTION ASSEMBLY - PLAN

END SECTION ASSEMBLY - ELEVATION

A.T.-1 SYSTEM

BREAKAWAY LINE POST

SHEET 2 OF 7
862.02

STATE OF NORTH CAROLINA
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RALEIGH, N.C.

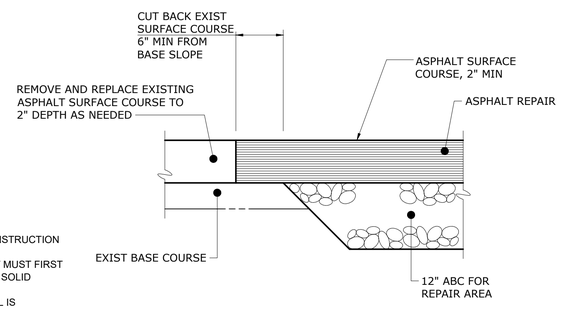
7-06

ENGLISH STANDARD DRAWING FOR
GUARDRAIL INSTALLATION

SHEET 2 OF 7
862.02

NOTES:

1. REMOVE AND REPLACE ANY PAVEMENT DAMAGED DURING CONSTRUCTION
2. BEFORE ANY NEW PAVEMENT IS PLACED, DAMAGED PAVEMENT MUST FIRST BE REMOVED TO A POINT WHERE EXISTING PAVEMENT BASE IS SOLID
3. ONCE EXCAVATION AND REMOVAL OF ANY UNSTABLE MATERIAL IS COMPLETE, CONTRACTOR SHALL REBUILD SUBGRADE WITH SELECT FILL WHERE NEEDED, ADD BASE COURSE, AND PAVE PER DETAIL ABOVE



TYPICAL PAVEMENT REPAIR
0251301R

REV	ISSUED FOR	DATE	BY
1			

PROJECT ENGINEER:	T. SCHUELER
DESIGNED BY:	J. MCSWAIN
DRAWN BY:	J. MCSWAIN
CHECKED BY:	T. SCHUELER

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE (0, 1/2", 1")

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

NORTH CAROLINA PROFESSIONAL SEAL 33505 ENGINEER TIMOTHY C. SCHUELER 12/14/18

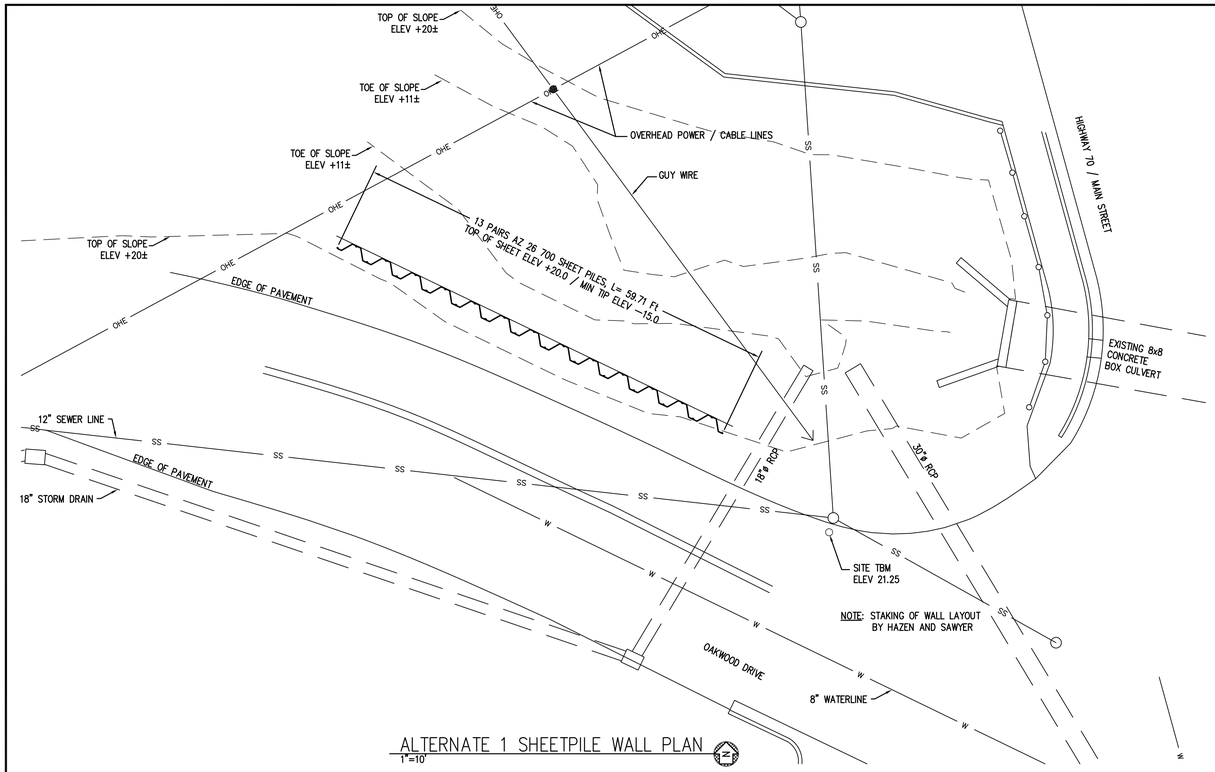
Hazen
HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO.: C-0381

HAVELOCK, NORTH CAROLINA

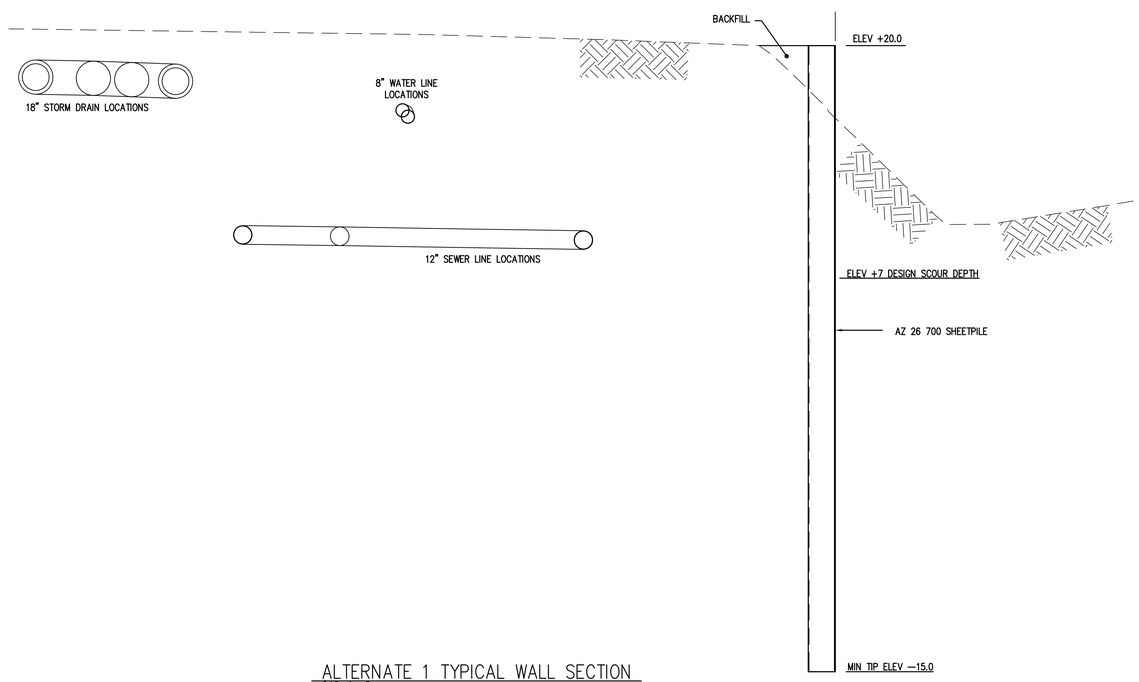
OAKWOOD DRIVE STREAMBANK STABILIZATION

DETAILS

DATE:	DECEMBER 2018
HAZEN NO.:	30906-018
CONTRACT NO.:	
DRAWING NUMBER:	D-02



ALTERNATE 1 SHEETPILE WALL PLAN
1"=10'



ALTERNATE 1 TYPICAL WALL SECTION
1/4"=1'-0"

GENERAL NOTES

GENERAL

THESE NOTES CONTAIN GENERAL INFORMATION AND ARE NOT COMPLETE FOR CONSTRUCTION PURPOSES.

A. CONSTRUCTION LAYOUT & ELEVATIONS
BASE MAPS FOR DEVELOPMENT OF CONSTRUCTION PLANS WERE OBTAINED FROM HAZEN AND SAWYER. VERTICAL DATUM IS NAVD88.

B. DIMENSIONS
THE CONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING THE DIMENSIONS OF THE STRUCTURAL DRAWINGS. ADVISE ENGINEER OF ANY DIFFERENCES.

C. SAFETY REGULATIONS AND METHODS OF CONSTRUCTION SHALL BE CONTRACTORS RESPONSIBILITY.

STRUCTURAL

A. DESIGN LOADS
1. DEAD LOADS: THE WEIGHT OF ALL MATERIALS OF CONSTRUCTION
2. UNIFORM LIVE LOADS:
GENERAL SURCHARGE 250 PSF BEHIND WALL
3. RETAINED WATER 3.0 FEET w/o SEEPAGE GRADIENT

B. SOIL PRESSURES AND SUPPORT BASED ON DATA PROVIDED IN SOIL BORINGS B-1 AND B-2 AND RECOMMENDED PARAMETERS BY GEOTECHNOLGIES INC (PROJECT NUMBER 1-18-0577-EA) DATED 8/2/2018.

MATERIALS AND INSTALLATION

A. SHEET PILING
SHEET PILING SHALL BE DRIVEN TO MINIMUM TIP ELEVATION INDICATED. TEMPLATES SHALL BE INSTALLED FOR PLACEMENT OF THE SHEETING.

1. STEEL
STEEL SHEETING SHALL CONFORM TO ASTM A572, GRADE 50 AND SHALL BE FOLLOWING SECTIONS, OR EQUAL, PROVIDING THE FOLLOWING MINIMUM PROPERTIES PER FOOT OF WALL FOR RESPECTIVE ALTERNATE.

SECTION	AREA sq.in./ ft	SECTION MODULUS in^3/ft	MOMENT OF INERTIA in^4/ft
AZ26 700N	8.84	48.4	437.3
SCZ 18N	5.31	18.08	90.48

ALTERNATE SHEETING SHALL HAVE A MAXIMUM DEPTH < 18.5 INCHES FOR AZ26 AND 10 INCHES FOR SCZ18N.

IF ALTERNATE SHEETING USED HAS DIFFERENT DRIVING WIDTH, CONTRACTOR IS RESPONSIBLE FOR ADJUSTING LENGTH OF WALL AND SUBMITTING AFFECTED DETAILS TO ENGINEER FOR APPROVAL PRIOR TO INSTALLATION.

B. EPOXY COATING
COATING SHALL CONSIST OF A TWO COMPONENT EPOXY PRIMER APPLIED WITH A MINIMUM DRY FILM THICKNESS OF 1.5 MILS. TOP COAT SHALL BE A TWO COMPONENT CATALYZED EPOXY WITH A MINIMUM DRY FILM THICKNESS OF 24 MILS. SURFACE PREPARATION AND APPLICATION OF MATERIALS SHALL BE IN ACCORDANCE WITH COATING MANUFACTURER'S RECOMMENDATIONS.

PRIMER — INTERLINE 982 EPOXY BY INTERNATIONAL PAINT OR APPROVED EQUAL

TOP COAT — INTERZONE 485 EPOXY BY INTERNATIONAL PAINT OR APPROVED EQUAL

INSTALL EPOXY COATING PRIOR TO INSTALLATION OF SHEETING PILING. REMOVE COATING IN FIELD AS REQUIRED FOR WELDING. AFTER COMPLETION OF WELDING, TOUCH UP ALL LOCATIONS AS NECESSARY.

STEEL SHEETING SHALL BE PROVIDED WITH MARINE EPOXY COATING TO FOLLOWING LIMITS:

WATERSIDE FACE— FROM ELEV +20'-0" TO ELEV +0'-0"
LANDSIDE FACE — FROM ELEV +20'-0" TO ELEV +10'-0"

C. WALL BACKFILL
SATISFACTORY SOIL MATERIALS SHALL BE SAND HAVING A UNIFIED SOIL CLASSIFICATION OF SP, SM OR SC AND SHALL BE FREE OF ROCK OR GRAVEL LARGER THAN 2 INCHES IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION AND OTHER DELETERIOUS MATTER.

SUITABLE BACKFILL IS NOT AVAILABLE ON SITE.

AFTER SHEETING INSTALLATION, BACKFILL WITH GRANULAR MATERIAL IN 24 INCH LIFTS AND COMPACT TO 95% OF ASTM D698 PROCTOR.

CONTRACTOR MAY BID EITHER OR BOTH ALTERNATES

GARY GREENE ENGINEERS
Post Office Box 99213 • Raleigh, North Carolina 27624

ALTERNATE 1 SHEETPILE WALL
OAKWOOD DRIVE SLOPE STABILIZATION
HAZEN AND SAWYER
HAVELOCK, NORTH CAROLINA

REVISION	DATE	DESCRIPTION	BY

NORTH CAROLINA PROFESSIONAL SEAL 10961 ENGINEER GARY K. GREENE

PROJECT No.
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DESIGNED BY
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DRAWN BY
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CHECKED BY
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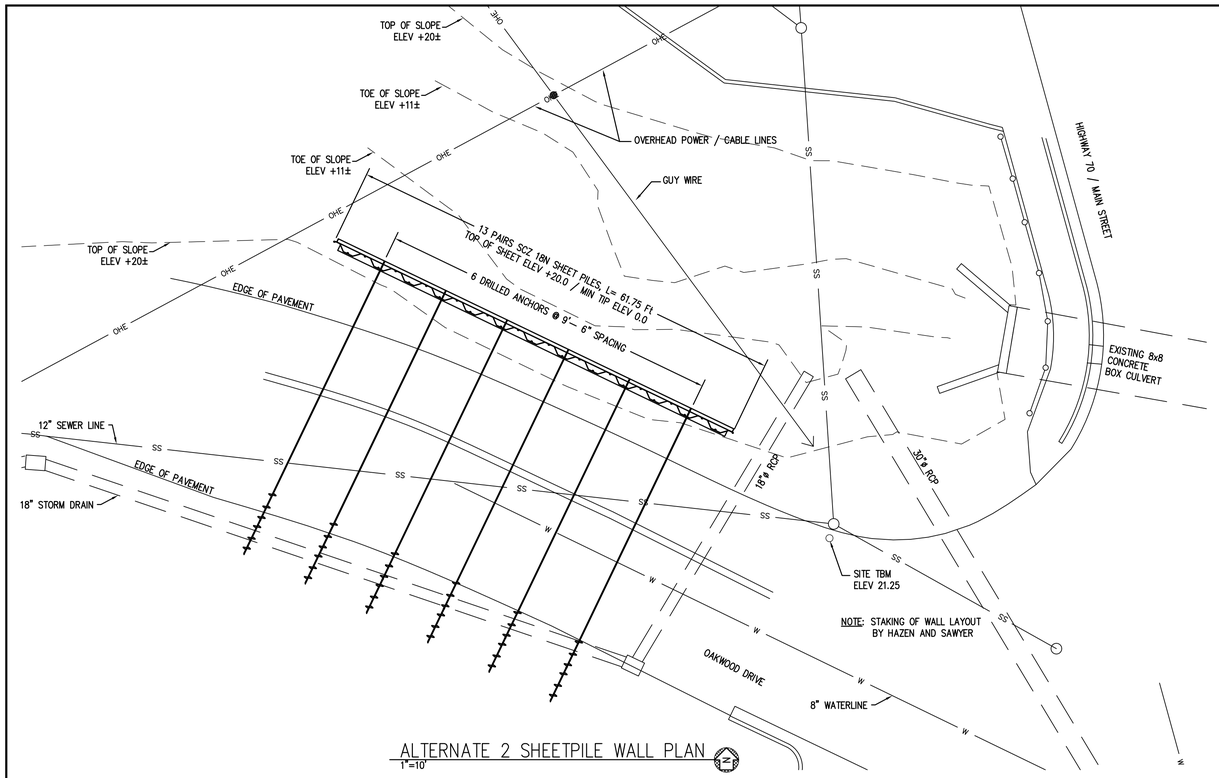
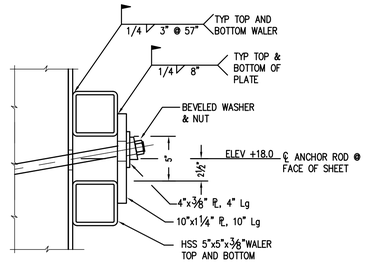
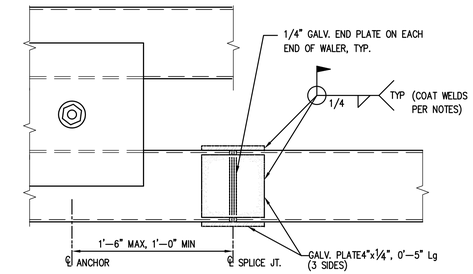
DATE
9/2018
SCALE
AS NOTED
SHEET NO.
S1
OF 2



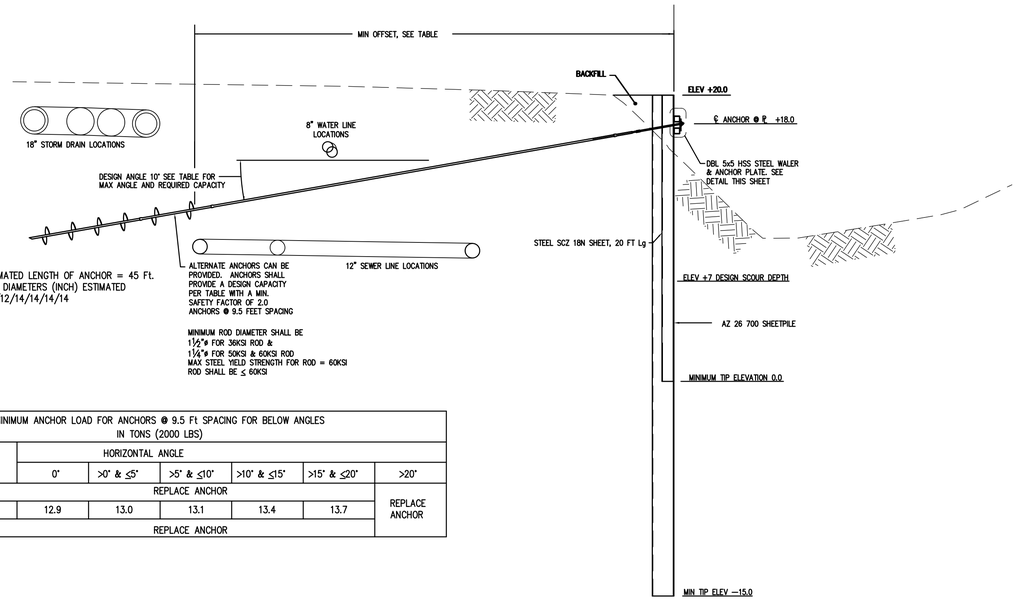
ALTERNATE 2 SHEETPILE WALL PLAN
1"=10'



HSS TUBE DBL WALER & ANCHOR PLATE DETAIL
NTS



HSS TUBE WALER SPLICE DETAIL
NTS



MINIMUM ROD DIAMETER SHALL BE
1½"ø FOR 36KSI ROD &
1¼"ø FOR 50KSI & 60KSI ROD
MAX STEEL YIELD STRENGTH FOR ROD = 60KSI
ROD SHALL BE ≤ 60KSI

MINIMUM ANCHOR LOAD FOR ANCHORS @ 9.5 Ft SPACING FOR BELOW ANGLES IN TONS (2000 LBS)							
VERTICAL ANGLE	MINIMUM OFFSET	HORIZONTAL ANGLE					
		0°	>0° & ≤5°	>5° & ≤10°	>10° & ≤15°	>15° & ≤20°	>20°
< 8°	REPLACE ANCHOR						REPLACE ANCHOR
>8° & ≤12°	20 Ft	12.9	13.0	13.1	13.4	13.7	
> 12°	REPLACE ANCHOR						

ALTERNATE 2 TYPICAL WALL SECTION
¼"=1'-0"

HELICAL ANCHORS

1. HELICAL ANCHORS SHALL BE BY A. B. CHANCE OR APPROVED EQUAL.
2. HELICAL ANCHOR DESIGN TENSION LOAD SHALL BE AS INDICATED IN TABLES ON THIS SHEET. ANCHORS SHALL BE INSTALLED TO AN ULTIMATE CAPACITY OF 2 TIMES THE ANCHOR DESIGN TENSILE LOAD FOR A FACTOR OF SAFETY = 2.0
3. ANCHOR DESIGN SHOWN ON DRAWINGS IS FOR REFERENCE ONLY. INSTALLED ANCHOR MAY VARY FROM THAT SHOWN. PRIOR TO INSTALLING ANY ANCHORS, THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH ALL THE NECESSARY DESIGN INFORMATION TO DEMONSTRATE THAT ANCHORS WILL BE INSTALLED TO THE ULTIMATE CAPACITY SPECIFIED. THIS INFORMATION INCLUDES, BUT IS NOT LIMITED TO, THE FOLLOWING:
   A. DESCRIPTION OF INSTALLATION EQUIPMENT.
   B. DESCRIPTION OF TORQUE MONITORING DEVICES.
   C. RECOMMENDED INSTALLATION TORQUE FOR THE GIVEN DESIGN LOAD ALONG WITH 3 INDIVIDUAL TEST RECORDS SHOWING CORRELATION BETWEEN THE INSTALLATION TORQUE, HELIX CONFIGURATION AND EMBEDMENT, AND THE ULTIMATE ANCHOR CAPACITY.

   REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
4. A MINIMUM OF 1 ANCHOR SHALL BE BE PERFORMANCE TESTED (LOCATION PER ENGINEER). ANCHORS TO BE TESTED PER SPECIFICATIONS.
5. THE CONTRACTOR SHALL EMPLOY A SKILLED, EXPERIENCED WORK FORCE WHO ARE FAMILIAR WITH THE REQUIREMENTS AND METHODS NECESSARY FOR PROPER PERFORMANCE OF THE WORK SPECIFIED. INSTALLATION EQUIPMENT SHALL BE IN GOOD WORKING CONDITION AND CAPABLE OF BEING OPERATED IN A SAFE MANNER.
6. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE LOCATION OF UNDERGROUND UTILITIES (GAS, ELECTRICITY, WATER, TELEPHONE, TV, ETC.) BEFORE STARTING CONSTRUCTION. NOTIFY THE ENGINEER OF ANY OBSTRUCTIONS FOR THE HELICAL ANCHORS FOR POSSIBLE MODIFICATIONS TO THE STRUCTURAL DRAWINGS.
7. WRITTEN INSTALLATION RECORDS SHALL BE KEPT BY THE CONTRACTOR FOR EACH HELICAL ANCHOR. THESE RECORDS SHALL BE TRANSMITTED TO THE ENGINEER AT THE END OF EACH WORKING DAY ON WHICH ANCHORS ARE INSTALLED. RECORDS SHALL INCLUDE REQUIREMENTS PER SPECIFICATIONS
8. HELICAL ANCHORS SHALL BE INSTALLED TO THE MINIMUM TORQUE VALUE AS SHOWN IN THE PRE-CONSTRUCTION ANCHOR DESIGN SUBMITTAL AND APPROVED BY THE ENGINEER. SEE ITEM 3.
9. THE MAXIMUM INSTALLATION TORQUE SHALL AT NO TIME EXCEED THETORQUE RATING OF THE HELICAL ANCHOR SHAFT.
10. THE HELICAL ANCHOR INSTALLATION SHALL BE TERMINATED PROVIDED BOTH THE MINIMUM INSTALLATION TORQUE AND MINIMUM OFFSET LENGTH REQUIREMENTS HAVE BOTH BEEN SATISFIED.
11. IF THE MINIMUM TORQUE REQUIREMENT HAS NOT BEEN SATISFIED AT THE MINIMUM OFFSET LEVEL, THE INSTALLER SHALL HAVE THE FOLLOWING OPTIONS:
    A. INSTALL THE ANCHOR FURTHER USING ADDITIONAL PLAIN EXTENSION MATERIAL UNTIL THE SPECIFIED TORQUE LEVEL IS OBTAINED.
    B. REMOVE THE EXISTING ANCHOR AND INSTALL AN ANCHOR WITHLARGER AND/OR MORE HELICES. THIS REVISED ANCHOR SHALL BE INSTALLED AT LEAST THREE FEET BEYOND THE TERMINATION LENGTH OF THE ORIGINAL ANCHOR.
12. IF THE MAXIMUM TORQUE RATING OF THE ANCHOR AND/OR INSTALLING UNIT HAS BEEN REACHED PRIOR TO SATISFYING THE MINIMUM OFFSET REQUIREMENT, THE INSTALLER SHALL HAVE THE FOLLOWING OPTIONS:
    A. TERMINATE THE INSTALLATION AT THE LENGTH OBTAINED WITH THE APPROVAL OF THE ENGINEER.
    B. REMOVE THE EXISTING ANCHOR AND INSTALL AN ANCHOR WITH SMALLER AND/OR FEWER HELICES. THE REVISED ANCHOR SHALL BE INSTALLED AT LEAST THREE FEET BEYOND THE TERMINATION LENGTH OF THE ORIGINAL ANCHOR.

GARY GREENE ENGINEERS
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ALTERNATE 2 SHEETPILE WALL
OAKWOOD DRIVE SLOPE STABILIZATION
HAZEN AND SAWYER
HAVELOCK, NORTH CAROLINA

BY	DESCRIPTION	DATE	REVISION

NORTH CAROLINA PROFESSIONAL SEAL 10961 ENGINEER GARY K. GREENE

PROJECT No. --
DESIGNED BY gg
DRAWN BY -
CHECKED BY .
DATE 9/2018
SCALE AS NOTED
SHEET NO. S2 OF 2