Specifications

Harnett County - Anderson Creek C&D Landfill Expansion
Harnett County, North Carolina

Prepared for:

Harnett County Solid Waste Department
Lillington, North Carolina

July 2025

NC LIC. NO. F-1370 (ENGINEERING)

SMITH+GARDNER

14 N. Boylan Avenue, Raleigh NC 27603 | 919.828.0577

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S+G Project No. HARNETT-AC-20-1

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7/31/2025

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Harnett County
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Specifications

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SECTION 01025

MEASUREMENT AND PAYMENT

A. General

This section includes the units and methods of measurement and the basis of payment for work done under this Contract. The work required for each item shall be as required and/or reasonably implied by the Contract Documents to complete the work. Note that all measurement work shall be subject to verification (surveyed or otherwise) by the Owner.

B. Measurement and Payment

1. Section 02110: Site Preparation:

   All work required for Site Preparation shall be included for payment in the Contractor's Lump Sum Price for this work, wherein no measurement will be made.

2. Section 02222: Excavation:

   All work required for Excavation shall be included for payment in the Contractor's Lump Sum Price for Earthwork, wherein no measurement will be made except for the following item:

   a. Overexcavation and Backfill, which includes the overexcavation of unsuitable soils, the backfilling of the excavation with structural fill, and the stockpiling of unsuitable soils where designated by the Owner shall be included for payment in the Contractor's Unit Price Bid for this work, per cubic yard in-place. Measurement of this quantity shall be made by the Contractor with oversight and approval by the Owner's representative.

3. Section 02223: Embankment:

   All work required for Embankment shall be included for payment in the Contractor's Lump Sum Price for Earthwork, wherein no measurement will be made except for the following item:

   b. Overexcavation and Backfill, which includes the overexcavation of unsuitable soils, the backfilling of the excavation with structural fill, and the stockpiling of unsuitable soils where designated by the Owner shall be included for payment in the Contractor's Unit Price Bid for this work, per cubic yard in-place. Measurement of this quantity shall be made by the Contractor with oversight and approval by the Owner's representative.

4. Section 02270: Erosion and Sedimentation Control:

All work required for Erosion and Sedimentation Control, which is not otherwise covered under related sections of these Specifications, shall be included for payment in the Contractor's Unit Price Bid for the following items:

a. Temporary Gravel Construction Entrance/Exit, which includes related earthwork and materials, shall be paid on the basis of the Unit Price Bid for this work, per each entrance/exit in-place.

b. Silt Fence, which includes related earthwork and materials, shall be paid on the basis of the Unit Price Bid for this work, per linear foot in-place.

c. Stone Filter Fence, which includes related earthwork and materials (including fencing, stone, etc.), shall be paid on the basis of the Unit Price Bid for this work, per linear foot in-place.

d. Filter Berms, which includes related earthwork and materials, shall be paid on the basis of the Unit Price Bid for this work, per each berm in-place.

e. Diversion and Drainage Channels, which includes related earthwork and materials (including RECPs), shall be paid on the basis of the Unit Price Bid for this work, per linear foot of each channel in-place. Measurement of channels shall be made by the Contractor's surveyor based on the horizontal projected length. No adjustments will be made in the length for slopes, uneven contours, repairs, or wasted material.

f. Rip Rap Aprons, which includes related earthwork and materials (including rip rap and Type GT-S geotextile), shall be paid on the basis of the Unit Price Bid for this work, per each apron in-place.

g. Erosion Control Blanket, which includes related earthwork and materials, shall be paid on the basis of the Unit Price Bid for this work, per square yard of material in-place. Measurement of erosion control blanket shall be made by the Contractor's surveyor (or as field measured by the Contractor and Owner's representative). No adjustments will be made in the area for overlaps, seams, anchor trenches, repairs, or wasted material.

5. Section 02720: Stormwater Systems:

All work required for Stormwater Systems shall be shall be included for payment in the Contractor's Unit Price Bid for the following item:

a. Corrugated Polyethylene Pipe, which includes related earthwork and materials, shall be paid on the basis of the Unit Price Bid for this work, per linear foot of each size and type pipe in-place.

6. Section 02930: Revegetation:

All work required for Revegetation shall be included for payment in the Contractor's Unit Price Bid for this work, per acre in-place. Measurement of this area shall be made by the Contractor's surveyor based on the horizontal projected area. No adjustments will be made in the area for slopes, uneven contours, repairs, or wasted material.

7. Surveying:

This work shall consist of all surveying and control work required to complete the construction. This includes establishment of appropriate local site benchmarks, baseline surveys, location of utilities, and the stakeout of elevation and positional information. The Contractor shall coordinate with the Owner's surveyor (via Engineer), who will perform the record survey of the completed landfill subgrade.

All work required for Surveying shall be included for payment in the Contractor's Lump Sum Price for this work, wherein no measurement will be made.

8. Bonds, Mobilization, and Insurance:

This work shall consist of securing the appropriate bonds (if required) and insurance policies for the project, performance of preparatory construction operations, and performance of project closeout activities including the movement of personnel and equipment to and from the project site, safety equipment, and other facilities to begin work on a substantial phase of the Contract. All work required for Bonds, Mobilization, and Insurance shall be included for payment in the Contractor's Lump Sum Price for this work, wherein no measurement will be made. The amount of this item shall be limited to a maximum of four percent of the total Bid price. At least twenty (20) percent of this item must be allocated for demobilization at the end of the project.

END OF SECTION

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SECTION 01400

QUALITY CONTROL AND QUALITY ASSURANCE

A. General

1. Definitions:

   a. Construction Quality Control (CQC)

      Construction Quality Control refers to actions taken by manufacturers, fabricators, installers, and/or the Contractor to ensure that the materials and the workmanship meet the requirements of the Contract Documents. CQC is provided by the Contractor at no additional cost to the Owner. The Contractor shall follow CQC procedures as required by the Contract Documents and the Project CQA Manual.

   b. Construction Quality Assurance (CQA)

      Construction Quality Assurance is defined as a planned and systematic program employed by the Owner to assure conformity of the construction with the Contract Documents. CQA is provided by the CQA Engineer as a representative of the Owner and is independent from the Contractor and all manufacturers. The CQA program is designed to provide adequate confidence that items or services meet contractual and regulatory requirements and will perform satisfactorily in service.

2. On this Project, the Owner will provide for the services of a CQA Engineer on-site to selectively test materials and monitor compliance with the requirements of the Contract Documents. The Contractor will afford these representatives access to the job site for the performance of earthwork testing.

3. CQA test methods and frequency of testing are summarized in Tables 1 and 2 of this section. Note that the Engineer will perform the tests shown.

B. Testing Laboratory Services

Not Used.

C. Imperfect Work, Equipment, or Materials

1. Any work, equipment, or materials furnished by the Contractor not in conformance with the Contract Documents which is discovered before the final acceptance of the work, as established by the date of Final Payment, or during the Contractor's guarantee period, shall be removed, replaced, and/or corrected to conform to the Contract Documents immediately even though it may have been overlooked by the Engineer and estimated for payment.

2. Any equipment or materials condemned or rejected by the Engineer shall be tagged as such and shall be immediately removed from the site. Satisfactory work or materials shall be substituted for that rejected.

3. The Engineer may order tests of work, equipment, or materials which appear to be in non-conformance with the Contract Documents to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the Contractor; and the nature, tester, extent, and supervision of the tests will be as determined by the Engineer. If the results of the tests indicate that the required functional capability of the work, equipment, or material was not impaired, consistent with the final general appearance of same, the work, equipment, or materials may be deemed acceptable. If the results of such tests reveal that the required functional capability of the questionable work, equipment, or materials has been impaired, then such work, equipment, or materials shall be deemed imperfect and shall be replaced. The Contractor may elect to replace the imperfect work, equipment, or material in lieu of performing the tests.

D. Inspection and Tests

1. The Contractor shall allow the Engineer ample time and opportunity for testing materials and equipment to be used in the work. The Contractor shall at all times furnish the Engineer and their representatives, facilities including labor, and allow proper time for inspecting and testing materials, equipment, and workmanship.

2. The Contractor must anticipate possible delays that may be caused in the execution of their work due to the necessity of materials and equipment being inspected and accepted for use.

3. The Contractor shall furnish, at their own expense, all samples of materials required by the Engineer for testing.

4. Where other tests or analyses are specifically required in other sections of these Specifications, the cost thereof shall be borne by the party so designated in such sections.

5. The Owner will bear the cost of all tests, inspections, or investigations undertaken by the order of the Engineer for the purpose of determining conformance with the Contract Documents if such tests, inspections, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby.

Table 1: CQA Testing Program for Embankment Material Approval (See Note 1)

Property	Test Method	Minimum Test Frequency
Control Tests:		
Visual Classification	ASTM D 2488	Each Soil
Moisture-Density Relationship	ASTM D 698	5,000 CY per Each Soil

Table 2: CQA Testing Program for Compacted Embankment (See Note 1)

Property	Test Method	Minimum Test Frequency
Control Tests: (See **Table 1**)		
Record Tests:		
Lift Thickness	-----	Each Soil
In-Place Density	ASTM D 6938[2]	20,000 ft^2 per Lift & 1 per 500 LF/Lift of Berms (< 200 ft. Base Width)
Moisture Content	ASTM D 6938[3]	
Verification of Subgrade Soil Type (Soil within 2 Vertical Feet of Finished Subgrade Elevations) (See Note 4):		
Visual Classification	ASTM D 2488	10,000 ft^2
Atterberg Limits	ASTM D 4318	40,000 ft^2
Grain Size Analysis	ASTM D 6913	40,000 ft^2

Notes:

1. The Engineer will perform the tests shown.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device.
3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every 10 nuclear moisture tests perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Conduct subgrade verification using hand augered boring or test pit.

END OF SECTION

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SECTION 02110

SITE PREPARATION

Site Preparation: Site Preparation includes clearing, grubbing, and stripping operations which precede the proposed construction.

A. Description

1. General:

   a. The Contractor shall furnish all labor, material, and equipment to complete Site Preparation in accordance with the Contract Drawings and these Specifications.

   b. Principal items of work include:

      1. Notifying all authorities owning utility lines running to or on the property. Protect and maintain all utility lines to remain and cap 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 clearing limits, including removal of grass, brush, shrubs, trees, loose debris, and other encumbrances except for trees to remain.

      3. Boxing and protecting all areas to be preserved.

      4. Disposing from the site all debris resulting from work under this Section.

2. Related Work:

   Related Contract Work is described in the following sections of the Specifications:

Work	Section
Excavation	02222
Embankment	02223

B. Materials

Not Used.

C. Submittals

Not Used.

D. Construction

1. Clearing of the Site:

   a. Clearing limits, as shown on the Contract Drawings, shall be established by the Contractor's Surveyor. Once established, the clearing limits shall be inspected and approved by the Engineer prior to clearing the affected areas.

   b. Before removal of topsoil, and start of excavation and grading operations, the areas within the clearing limits shown on the Contract Drawings shall be cleared and grubbed.

   c. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, fallen timber, brush, bushes, rubbish, fencing, and other perishable and objectionable material.

      Should it become necessary to remove a tree, bush, brush, or other plants outside the clearing limits, the Contractor shall do so only after permission has been granted by the Engineer.

   d. Excavation resulting from the removal of trees, roots, and the like shall be filled with suitable material, as approved by the Engineer, and thoroughly compacted per the requirements contained in Section 02223, Embankment, of these Specifications.

   e. 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 their opinion, they are too close to the work to be maintained or have become damaged due to the Contractor's operations.

2. Stripping and Stockpiling Existing Topsoil:

   a. Existing topsoil and sod on the site within areas designated on the Contract 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.

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

3. 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.

4. Disposal of Cleared and Grubbed Material:

   No open burning of clearing debris will be allowed on this project. Air curtain burning will be allowed only by permit if permitted or approved by State Solid Waste and Air Quality regulators and the local Fire Department and in accordance with 15A NCAC 02D.1904 (Air Curtain Burners). Any material other than plant growth shall not be burned. Otherwise, all trees, stumps, roots, bushes, etc. shall be taken to the on-site yard waste processing area, as directed by the Owner.

END OF SECTION

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SECTION 02222

EXCAVATION

Excavation: Excavation includes excavating, sealing, hauling, scraping, undercutting, removal of accumulated surface water or ground water, stockpiling, and all necessary and incidental items as required for bringing the landfill and related structures to the specified lines and grades.

A. Description

1. General:

The Contractor shall furnish all labor, material, and equipment required to complete Excavation of the project area in accordance with the Contract Drawings and these Specifications, except as noted below:

a. Clearing and grubbing and removal of topsoil is addressed in Section 02110, Site Preparation, of these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

Work	Section
Site Preparation	02110
Embankment	02223
Erosion and Sedimentation Control	02270

3. Quality Assurance:

Quality Assurance during Excavation will be provided by the Owner as described in Section 01400, Quality Control and Quality Assurance, of these Specifications.

4. Definitions:

a. Excavation: shall consist of the removal and satisfactory disposal and/or stockpiling of all materials (borrow and/or unsuitable materials included) located with the limits of construction including widening cuts and shaping of slopes necessary for the preparation of roadbeds, slope areas, cutting of any ditches, channels, waterways, entrances, and other work incidental thereto.

b. Borrow: shall consist of approved on-site material required for the construction of embankments/fills or for other portions of the work.

c. Select Borrow (Where Applicable): shall consist of approved off-site material required for the construction of embankments/fills, roadway subgrade, backfilling, or for other portions of the work as shown on Contract Drawings or in

these Specifications. The Contractor shall make their own arrangements for obtaining select borrow and pay all costs involved.

d. Unsuitable Material: is any in-place or excavated material which contains undesirable materials or is in a state which is not appropriate, in the opinion of the CQA Engineer, for the intended use or support of planned structures, embankment, or excavation. This may include but not be limited to organic material, waste/refuse, soft, or wet material not meeting required specifications, etc.

e. Unsuitable Material Overexcavation: shall consist of the removal and satisfactory disposal of all unsuitable material located within the limits of construction and below subgrade elevations shown or indicated on the Contract Drawings. Where excavation to the subgrade elevations results in a subgrade or slopes of unsuitable material, the Contractor shall overexcavate such material to below the grades shown or indicated on the Contract Drawings or as otherwise directed by the Engineer and CQA Engineer.

B. Materials

Excavation shall include the removal of all soil, weathered rock, boulders, conduits, pipe, unsuitable material, and all other obstacles encountered and shown or indicated on the Contract Drawings and/or specified herein.

C. Submittals

Not Used.

D. Construction

1. The Contractor shall conduct Excavation activities in such a manner that erosion of disturbed areas and off site sedimentation is absolutely minimized as outlined in Section 02270, Erosion and Sedimentation Control, of these Specifications.

2. The Contractor shall excavate to the lines and grades shown on the Contract Drawings and stockpile all suitable excavated materials. As the excavation is made, the materials will be examined and identified to the CQA Engineer.

   The Contractor will perform all surveys necessary to establish and verify lines and grades for all Excavation, including pipe excavations, soil overexcavation, and anchor trenches.

3. Stockpiling:

   The Contractor shall stockpile the materials in appropriate stockpiles as approved by the CQA Engineer.

   Stockpiles shall be properly sloped and the surfaces sealed by the Contractor at the end of each working day, or during the day in the event of heavy rain, to the satisfaction of the Engineer.

4. The Contractor shall protect all existing facilities and structures including, but not limited to, existing utilities, monitoring wells, signs, grade stakes, etc. during the grading and stockpiling operations.

5. 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 sheeting, timbering, pumping, and drainage as may be required.

6. The Contractor shall be responsible for the control of surface and subsurface water when necessary. Except for certain erosion and sedimentation control measures and other areas designated to impound water, all areas shall be graded to drain.

7. Excavation slopes shall be flat enough to avoid sloughs and slides that will cause disturbance of the subgrade or damage of adjacent areas. 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 directed by the Engineer at no additional cost to the Owner.

8. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded. All protruding roots and other vegetation shall be removed from slopes.

9. The bottom of all excavations for structures and pipes shall be examined by the CQA Engineer for bearing value and the presence of unsuitable material. If, in the opinion of the CQA Engineer, additional Excavation is required due to the low bearing value of the subgrade material, or if the in-place materials are soft, yielding, pumping and wet, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted structural fill, or material directed by the CQA Engineer. No payment will be made for subgrade disturbance caused by inadequate Dewatering or improper construction methods.

10. Any areas excavated below design subgrade elevations by the Contractor, unless directed by the CQA Engineer, shall be brought back to design elevations at no cost to the Owner. The Contractor shall place and compact such material in accordance with Section 02223, Embankment, of these Specifications.

11. The Contractor shall dispose of excess or unsuitable excavation materials on-site at location(s) approved by the Owner.

12. The Contractor shall properly level-off bottoms of all excavations. Proof-rolling shall be conducted with appropriate equipment.

13. Upon reaching subgrade elevations shown in excavation areas, the Contractor shall scarify subgrade soils to a minimum depth of 6" and obtain the CQA Engineer's approval of quality. If unsuitable materials are encountered at the subgrade elevation, perform additional excavations as approved by the CQA Engineer to remove unsuitable materials.

14. Overexcavation and Backfill:

    a. Where subgrade materials are determined to be unsuitable, such materials shall be removed by the Contractor to the lengths, widths, and depths approved by the Engineer and CQA Engineer in advance and backfilled with compacted Embankment in accordance with Section 02223, Embankment, of these Specifications.

    b. No additional payment will be made for such overexcavation and backfill 1 foot or less than the finished subgrade (or pre-existing grades where pre-existing grades are lower than finished subgrade) as this is considered superficial.

    c. Where overexcavation of unsuitable material is greater than 1 foot beneath the finished subgrade (or pre-existing grades where pre-existing grades are lower than finished subgrade), payment shall be made on a unit price basis for overexcavation and backfill and the measured quantity shall include the entire excavation quantity below the finished subgrade (or pre-existing grades where pre-existing grades are lower than finished subgrade) elevations. The unit price for overexcavation and backfill shall include disposal of unsuitable materials.

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

16. The Contractor shall protect finished lines and grades of completed excavation against excessive erosion, damage from trafficking, or other causes and shall repair any damage at no additional cost to the Owner.

17. Trench Excavation:

    a. All pipe Excavation and trenching shall be done in strict accordance with these Specifications, all applicable parts of the OSHA Regulations, 29 CFR 1926, Subpart P, and other applicable regulations. In the event of any conflicts in this information, safe working conditions as established by the appropriate OSHA guidelines shall govern.

    b. The minimum trench widths shall be as indicated on the Contract Drawings. Enlargements of the trench shall be made as needed to give ample space for operations at pipe joints. The width of the trench shall be limited to the maximum dimensions shown on the Contract Drawings, except where a wider trench is needed for the installation of and work within sheeting and bracing.

    c. Except where otherwise specified, excavation slopes shall be flat enough to avoid slides which will cause disturbance of the subgrade, damage to adjacent areas, or endanger the lives or safety of persons in the vicinity.

    d. Hand excavation shall be employed wherever, in the opinion of the Engineer, it is necessary for the protection of existing utilities, poles, trees, pavements, obstructions, or structures.

e. No greater length of trench in any location shall be left open, in advance of pipe laying, than shall be authorized or directed by the Engineer and, in general, such length shall be limited to approximately one hundred (100) feet.

f. Pipe Bedding: All pipe bedding shall be as shown on the Contract Drawings, unless otherwise specified herein, or shall be approved by the Engineer.

18. Sheeting and Bracing:

a. The Contractor shall furnish, place, and maintain such sheeting and bracing which may be required to support sides of Excavation or to protect pipes and structures from possible damage and to provide safe working conditions in accordance with current OSHA requirements. 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 sole expense of the Contractor. The Contractor shall be responsible for the adequacy of all sheeting and bracing used and for all damage resulting from sheeting and bracing failure or from placing, maintaining, and removing it.

b. The Contractor shall exercise caution in the installation and removal of sheeting to ensure that excessive or unusual loadings are not transmitted to any new or existing structure. The Contractor shall promptly repair at their expense any and all damage that can be reasonably attributed to sheeting installation or removal.

c. All sheeting and bracing shall be removed upon completion of the work.

19. 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 at the Contractor's sole expense.

END OF SECTION

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SECTION 02223

EMBANKMENT

Embankment: Embankment is the on-site compacted fill that provides the foundation and the berms for the containment area, the subgrade for some access roadways and structures, and backfill around structures and piping.

A. Description

1. General:

The Contractor shall furnish all labor, material, and equipment to complete Embankment including borrowing, hauling, screening, discing, drying, compaction, control of surface and subsurface water, final grading, sealing, and all necessary and incidental items as detailed or required to complete the Embankment, all in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

Work	Section
Excavation	02222
Erosion and Sedimentation Control	02270

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these Specifications.

ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
ASTM D 2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
ASTM D 2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
ASTM D 2937	Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method.
ASTM D 6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

4. Quality Assurance:

Quality Assurance during placement of Embankment will be provided by the Owner as described in Section 01400, Quality Control and Quality Assurance, of these Specifications.

5. Definitions:

a Embankment: Shall include construction of all site earthwork including roadways, subgrade, perimeter berm embankments, including preparation of the areas upon which materials are to be placed. Embankment may also be referred to as structural and/or controlled fill. All Embankment materials may be either (off-site) Select Borrow or (on-site) Borrow unless otherwise noted on Contract Drawings or specified by the Engineer.

b. Prepared Subgrade: The ground surface after clearing, grubbing, stripping, excavation, scarification, and/or compaction, and/or proof rolling to the satisfaction of the CQA Engineer.

c. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes. Well-graded does not define any numerical value that must be placed on the coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters. Well-graded is used to define a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

d. Unclassified Fill: The nature of materials to be used is not identified or described herein but must be approved by the Engineer prior to use.

B. Materials

1. Embankment materials shall consist of clean well-graded natural soil containing no topsoil or other deleterious material.

   a. General Embankment soils shall be classified as SP, SW, SM, SC, ML, or CL (ASTM D 2487).

   b. Soils within two (2) feet of the landfill subgrade shall be SM, SC, ML, MH, CL, or CH.

   Other material classifications may be approved by the Engineer.

2. Stones or rock fragments shall not exceed one half the maximum lift thickness as compacted in any dimension. Isolated rocks shall be a maximum of 24-inches in any dimension.

C. Submittals

Not Used.

D. Construction

1. The Contractor shall conduct Embankment activities in such a manner that erosion of disturbed areas and off-site sedimentation is absolutely minimized as outlined in Section 02270, Erosion and Sedimentation Control, of these Specifications.

2. All placement and compaction of Embankment shall be performed only when the CQA Engineer is informed by the Contractor of intent to perform such work.

3. Embankment shall be placed and compacted to the lines and grades shown on the Contract Drawings. Placement of Embankment outside the construction limits shall occur only as directed and approved by the Engineer.

   The Contractor will perform all surveys necessary to establish and verify lines and grades for all Embankment.

4. The Contractor shall protect all existing facilities including, but not limited to, utilities and monitoring wells.

5. Subgrade Preparation:

   a. The CQA Engineer shall inspect the exposed subgrade prior to placement of Embankment to assure that all rocks, topsoil, vegetation, roots, debris, or other deleterious materials have been removed.

   b. Prior to placement of Embankment, the exposed subgrade shall be proofrolled using a static smooth-drum roller, loaded tandem axle dump truck, or other suitable equipment in the presence of the CQA Engineer. Any soft or unsuitable materials revealed before or during the in-place compaction shall be removed as directed by the CQA Engineer and replaced with suitable Embankment.

6. 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.

7. The Contractor shall be responsible for preparing the materials for the Embankment, including but not limited to, in-place drying or wetting of the soil necessary to achieve the compaction criteria of these Specifications.

8. The Contractor shall be responsible for the control of surface and subsurface water when necessary. Except for certain erosion and sedimentation control measures and other areas designated to impound water, all areas shall be graded to drain.

9. Embankment materials shall be placed in a manner permitting drainage and in continuous, approximately horizontal layers.

10. Compaction Requirements:

    a. The Contractor shall compact Embankment in accordance with the requirements shown in Table 1 of this section. If Embankment does not meet the specified requirements, the Contractor shall rework the material, as may be necessary and continue compaction to achieve these requirements, or remove and replace the material to achieve the specified requirements, at Contractor's expense.

    b. Each lift shall be compacted prior to placement of succeeding lifts. In confined areas, mechanical equipment, suitable for small areas and capable of achieving the density requirements, shall be required.

    c. Lift compaction shall be performed with an appropriately heavy, properly ballasted, penetrating-foot or smooth-drum vibratory compactor depending on soil type. Compaction equipment shall be subject to approval by the CQA Engineer.

11. Embankment that becomes excessively eroded, soft, or otherwise unsuitable shall be removed or repaired by the Contractor as directed by the CQA Engineer, at no cost to the Owner.

12. The exposed surface of Embankment shall be rolled with a smooth-drum roller at the end of each work day to protect from adverse weather conditions.

13. Where Embankment is to be placed and compacted on slopes that are steeper than 3H:1V, the subgrade shall be benched to a minimum depth of 6 inches and the Embankment shall be placed in horizontal lifts.

14. Backfilling for Structures and Piping:

    a. All structures, including manholes and pipes shall be backfilled with Embankment as shown in the Contract Drawings and as described in these Specifications.

    b. Where sheeting is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures

when sheeting is removed. If significant volumes of soil cannot be prevented from clinging to the extracted sheets, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that sheeting will be driven in similar soil conditions or employ other appropriate means to prevent loss of support.

c. When backfilling around structures, do not backfill until concrete has sufficiently cured (as determined by the CQA Engineer) and is properly supported. Place backfill in a manner to avoid displacement or damage of structures.

Table 1: Required Embankment Properties

Item	Required % Standard Proctor (ASTM D698)[2]	Required Moisture Content[3]	Maximum Lift Thickness (Compacted) (inches)
Embankment Beneath Structures and Roads[1]	100	+/- 2% of Optimum (std. Proctor)	8
Embankment	95	As Required for Compaction	8
Backfill Around Structures	95		8
Backfill in Pipe Trenches	95		6
Unclassified Fill	N/A	N/A	N/A

Notes:

1. Embankment 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. Embankment beneath roads shall be considered to include all embankment placed within 2 vertical feet of the final wearing surface and shall also include shoulders.
2. Determine field density using ASTM D 6938, ASTM D 1556, ASTM D 2167, or ASTM D 2937.
3. Determine field moisture content using ASTM D 6938, ASTM D 2216, ASTM D 4643, or ASTM D 4959.
4. The Engineer may allow exceptions to the above criteria for areas outside of the containment area which are not subject to significant long-term loads.

END OF SECTION

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SECTION 02270

EROSION AND SEDIMENTATION CONTROL

Erosion and Sedimentation Control: Erosion and Sedimentation Control is a system of construction and engineered measures (devices, structures, practices, etc.) which act to minimize surface water induced erosion of disturbed areas and the resulting off-site sedimentation.

A. Description

1. General:

The Contractor shall furnish all labor, material, and equipment to complete installation of and maintain Erosion and Sedimentation Control measures and related work in accordance with the Contract Drawings and these Specifications.

All Erosion and Sedimentation Control work shall be in accordance with the latest edition of the North Carolina Erosion and Sediment Control Planning and Design Manual as well as applicable regulations.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

Work	Section
Stormwater Systems	02720
Revegetation	02930

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM) and the North Carolina Department of Transportation (NCDOT) are hereby made a part of these Specifications.

ASTM D 3786	Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.
ASTM D 4355	Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
ASTM D 4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
ASTM D 4533	Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

ASTM D 4632	Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
ASTM D 4751	Standard Test Method for Determining Apparent Opening Size of a Geotextile.
ASTM D 4833	Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
NCDOT	Standard Specifications for Roads and Structures.

B. Materials

1. Permanent Sediment or Detention Basins:

   Permanent sediment or detention basins shall be constructed as shown on the Contract Drawings.

2. Permanent Drainage Channels, Diversions, Swales, and Ditches:

   Permanent drainage channels, diversions, swales, and ditches shall be constructed as shown on the Contract Drawings.

3. Silt Fence:

   Silt fences shall be constructed as shown on the Contract Drawings and as needed, based on the Contractor's discretion and Engineer's approval. The silt fence is a permeable barrier erected within and downgradient of small disturbed areas to capture sediment from sheet flow. It is made of filter fabric buried at the bottom, stretched, and supported by posts and wire mesh backing. Silt fence shall conform to the following properties:

   a. Posts: Posts shall be 1.33 lb/linear foot steel (preferred) or wood with a minimum length of 5 feet. Steel posts shall be "U" or "T"-type. Wood posts shall have a minimum diameter of 4-inches.

   b. Filter Fabric: Filter fabric shall be a woven geotextile made specifically for sediment control. Filter fabric shall conform to the properties listed in Table 1 of this section.

4. Stone Filter Fence:

   Stone filter fence shall be constructed as shown on the Contract Drawings.

5. Geotextiles:

   Where shown on the Contract Drawings, Type GT-S Geotextile shall be a nonwoven spunbonded or nonwoven needlepunched synthetic fabric (average weight of 5.5 oz/SY or greater) consisting of polyester or polypropylene manufactured in a manner approved by

the Engineer. Woven fabrics may be used in certain applications if approved in advance by the Engineer.

6. Rip Rap:

Rip Rap shall be of the size indicated on the Contract Drawings and shall conform to NCDOT Section 1042, Rip Rap Materials.

7. Filter Berms:

Filter berms shall be constructed as shown on the Contract Drawings.

8. Rolled Erosion Control Products (RECPs):

Rolled Erosion Control Products (RECPs) shall be as follows:

a. Erosion Control Blanket (ECB): ECB shall consist of a machine-produced mat of straw or wood excelsior fiber covered on the top side with a photodegradable extruded plastic or woven biodegradable netting and sewn together with degradable thread. ECB shall be EroNet S75, as manufactured by North American Green, CURLEX I, as manufactured by American Excelsior Company, LANDLOK S1, as manufactured by Propex GeoSolutions, or approved equal.

b. Turf Reinforcement Mat (TRM): TRM shall consist of a dense web of crimped and interlocking polypropylene fibers positioned between two biaxially oriented nets and mechanically bound together by parallel stitching with polypropylene thread. TRM shall be designed to accelerate seedling emergence, exhibit high resiliency, and possess strength and elongation properties to limit stretching in a saturated condition. TRM shall be stabilized against chemical and UV degradation which are normally found in a natural soil environment and shall have no biodegradable components. TRM shall be LANDLOK 435, as manufactured by Propex GeoSolutions, or approved equal.

9. Other Work:

In addition to the Erosion and Sedimentation Control measures shown on the Contract Drawings, the Contractor shall provide adequate means to prevent any sediment from entering any storm drains, drop inlets, 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 off-site areas. 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. All paved areas shall be scraped and swept as necessary to prevent the accumulation of dirt and debris. Work associated with this provision shall be considered incidental to the project and no separate payment will be made.

10. Temporary and Permanent Ground Cover:

Unless State/local requirements are stricter, the Contractor shall provide temporary or permanent soil stabilization on denuded areas within 7 days after final grade is reached

on any portion of the site. The Contractor shall provide temporary soil stabilization within 7 days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. The Contractor shall provide permanent stabilization to all remaining denuded areas and/or areas with temporary stabilization upon completion of construction.

C. Submittals

The Contractor shall submit the following to the Engineer:

1. Submit information, prior to installation, that all Erosion and Sedimentation Control materials manufactured for the project have been produced in accordance with these Specifications.

2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.

D. Construction

1. Establishment of Erosion and Sedimentation Control Measures:

   a. All Erosion and Sedimentation Control measures will be constructed according to the Contract Drawings and these Specifications.

   b. Due to the nature of the work required by this Contract, it is anticipated that the location and nature of the Erosion and Sedimentation Control measures may need to be adjusted to reflect the current phase of construction.

   c. Erosion and Sedimentation Control measures shall be established prior to the work in a given area. Where such practice is not feasible, the Erosion and Sedimentation Control measure(s) shall be established immediately following completion of the clearing operation.

   d. The construction schedule adopted by the Contractor will impact the placement and need for specific measures required for the control of erosion. The Contractor shall develop and implement such additional techniques as may be required to minimize erosion and prevent or correct the discharge of sediment outside the limits of construction (unless controlled by other on-site measure(s)).

   e. The location and extent of Erosion and Sedimentation Control measures shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from construction areas. All deviations from the control provisions shown on the Contract Drawings shall have the prior approval of the Engineer.

2. Inspection and Maintenance of Erosion and Sedimentation Control Measures:

   a. The Contractor shall furnish the labor, material, and equipment required for the inspection and maintenance of all Erosion and Sedimentation Control measures.

Maintenance shall be scheduled as required for a particular measure to maintain the removal efficiency and intent of the measure.

b. All Erosion and Sedimentation Control measures shall be inspected at least once every seven calendar days and within 24 hours after any storm event of greater than 0.5 inches of rain per 24 hour period and appropriate maintenance conducted. A rain gauge shall be maintained on the site and a record of the rainfall amounts and dates shall be kept properly.

c. Maintenance shall include, but not be limited to:

(1) The removal and satisfactory disposal of trapped or deposited sediments from basins, traps, barriers, filters, and/or drainage features/devices;

(2) Replacement of filter fabrics used for silt fences upon loss of efficiency; and

(3) Replacement of any other components which are damaged or cannot serve the intended use.

d. The Contractor shall accept and maintain any existing sediments that are included in existing sediment basins and traps that accept or will accept stormwater flow and or sediment accumulation from all areas within the Contractor's limits of construction. All of these sediment basins and/or traps shall be cleaned of sediments accumulated during the performance of this project.

e. Sediments removed from Erosion and Sedimentation Control measures shall be disposed of in locations that will not result in off-site sedimentation as approved by the Engineer.

f. All Erosion and Sedimentation Control measures shall be maintained to the satisfaction of the Engineer until the site has been stabilized.

3. Graded Slopes and Fills:

The angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetated cover or other adequate measures.

4. Placing Rip Rap:

Rip Rap shall be placed in accordance with NCDOT Section 876, Rip Rap.

5. Finish Grading:

All disturbed areas shall be uniformly graded to the lines, grades, and elevations shown on the Contract Drawings. Except for certain erosion and sedimentation control measures and other areas designated to impound water, all areas shall be graded to drain. Finished surfaces shall be reasonably smooth, compacted, and free from irregular surface changes. Unless otherwise specified, the degree of finish shall be that ordinarily

obtainable from either blade or scraper operations. Areas shall be finished to a smoothness suitable for application of topsoil.

6. RECP Installation - Channels:

RECPs installed in channels shall be unrolled parallel to the direction of water flow. The first roll shall be centered longitudinally in the channel and anchored with staples. Subsequent rolls shall be installed outward to the edges of the channel and be lapped to allow installation of a common row of anchors. RECP ends shall be overlapped with the upstream ends on top ("shingled"). Refer to the Manufacturer's installation guidelines/instructions for installation details.

7. RECP Installation - Slopes:

RECPs installed on slopes shall be oriented in vertical strips and anchored. Subsequent rolls shall be installed outward to the edge(s) of the original roll and be lapped to allow installation of a common row of anchors. RECP ends shall be shingled. Refer to the Manufacturer's installation guidelines/instructions for installation details.

8. Revegetation:

Revegetation shall conform to the requirements of Section 02930, Revegetation, of these Specifications.

9. Cleanup:

a. The Contractor shall remove from the site all debris from their work 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.

Table 1: Required Silt Fence Filter Fabric Properties

Property	Test Method	Units	Value[1]
Grab Tensile Strength[2]	ASTM D 4632	lbs	90 x 90
Grab Elongation	ASTM D 4632	%	20 (Max.)
Ultraviolet Resistance (500 hrs)	ASTM D 4355	%	80
Apparent Opening Size (AOS)	ASTM D 4751	U.S. Sieve	30+
Permittivity	ASTM D 4491	sec^{-1}	0.05

Notes:
1. Minimum Average Roll Value (MARV).
2. Values for machine and cross machine direction (MD x XD), respectively.

END OF SECTION

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SECTION 02720

STORMWATER SYSTEMS

Stormwater Systems: Stormwater Systems shall include all piping, pipe fittings, flared end sections, drop inlets, manholes, and other appurtenances designated to convey stormwater.

A. Description

1. General:

The contractor shall furnish all labor, material, and equipment to complete installation of Stormwater Systems in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

Work	Section
Excavation	02222
Embankment	02223
Erosion and Sedimentation Control	02270

3. Reference Standards:

The latest revision of the following standards of the American Society of Testing and Materials (ASTM), the American Association of State Highway and Transportation Officials (AASHTO), and the North Carolina Department of Transportation (NCDOT) are hereby made a part of these specifications.

ASTM C 76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
ASTM C 150	Standard Specification for Portland Cement.
ASTM D 1248	Standard Specification for Polyethylene Plastics Molding and Extrusion Materials For Wire and Cable.
ASTM D 2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
ASTM D 3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

AASHTO M 36	Specification for Corrugated Steel Pipe.
AASHTO M 252	Specification for Corrugated Polyethylene Drainage Tubing, 3 to 10 Inch Diameter.
AASHTO M 294	Specification for Corrugated Polyethylene Pipe, 12 to 36 Inch Diameter.
NCDOT	Standard Specifications for Roads and Structures and Roadway Standard Drawings.

B. Materials

1. Reinforced Concrete Pipe (RCP):

   a. All reinforced concrete pipe shall be manufactured in accordance with ASTM C 76, Wall Type B or C, and shall be of the class that equals or exceeds the pipe class as shown on the Contract Drawings. All pipe shall be aged at the manufacturing plant for at least fourteen (14) days before delivery to the job site.

   b. Minimum pipe laying lengths shall be four (4) feet.

   c. Joints for reinforced concrete pipe shall have tongue and groove or bell and spigot ends with leak-resistant mastic joint sealant. Joint sealant shall be ConSeal type, or approved equal.

2. Corrugated Metal Pipe (CMP):

   a. Corrugated metal pipe and fittings shall be of the sizes shown or specified and shall conform to every aspect of AASHTO M 36.

   b. Corrugated metal pipe shall be fabricated from aluminized steel Type 2 sheets. Corrugation profile shall be 2⅔ inch crest to crest and ½ inch crest to valley, and sheet thickness shall be 16 gage/.064 inch minimum.

   c. Pipe sections shall be helically corrugated with each pipe end rerolled to obtain no less than two (2) annular corrugations.

   d. Coupling Bands: CMP shall be firmly joined by coupling bands in accordance with the manufacturer's recommendations. These bands shall be not more than two nominal sheet thicknesses lighter than the thickness of the pipe to be connected and in no case lighter than 0.052 inches.

   e. All CMP utilized for permanent installation shall have gasketed joints.

   f. Where required, asphaltic or bituminous coatings shall be applied in conformance with the manufacturer's requirements.

3. Corrugated Polyethylene (CPE) Pipe:

   CPE pipe and fittings shall be of the sizes and type shown on the Contract Drawings and shall conform to every aspect of AASHTO M 252 (3 to 10 inch diameters) or AASHTO M 294 (12 to 36 inch diameters). All Type S CPE pipe shall have watertight joints.

4. Flared End Sections:

   Flared end sections shall be reinforced and shall be fabricated from the same materials meeting the same requirements as the pipe to which they are connected. All reinforced concrete and corrugated metal flared end sections shall meet the requirements of the NCDOT. Corrugated polyethylene flared end sections shall be as recommended by the pipe manufacturer.

C. Submittals

The Contractor shall submit the following to the CQA Engineer:

1. Submit information, prior to installation, that all Stormwater Systems have been produced in accordance with these Specifications.

2. Furnish copies of the delivery tickets or other approved receipts as evidence for materials received that will be incorporated into construction.

D. Construction

1. All piping shall be installed by skilled workmen and in accordance with the best standards for piping installation. Proper tools and appliances for the safe and convenient handling and installation of the pipe and fittings shall be used.

2. All pieces shall be carefully examined for defects, and no piece shall be installed which is known to be defective. If any defective piece should be discovered after having been installed, it shall be removed and replaced at the Contractor's expense.

3. Prior to installation, the Contractor is responsible for checking the fit of design elevations for Stormwater Systems with existing conditions (i.e. conflicts with other structures, fit within existing drainage channels/features, ability to have minimum cover, etc.). The Contractor shall notify the Engineer of any conflicts and/or necessary field adjustments prior to installation for resolution or concurrence.

4. Excavation and backfilling of pipe trenches shall be as described in Section 02222, Excavation and Section 02223, Embankment, respectively, of these Specifications.

5. Following proper preparation of the trench subgrade, pipe and fittings shall be carefully lowered into the trench so as to prevent dirt and other foreign substances from gaining entrance into the pipe and fittings. Proper facilities shall be provided for lowering sections of pipe into trenches. No materials shall be dropped or dumped into the trench.

6. Water shall be kept out of the trench until jointing and backfilling are completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no water, earth, or other substance will enter the pipes, fittings, or valves. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as required.

7. All Stormwater Systems shall be installed to accurate lines and grades with no abrupt changes in line or grade.

8. The full length of each section of pipe shall rest solidly upon the bed of the trench, with recesses excavated to accommodate bells, couplings, joints, and fittings. Before joints are made, each pipe shall be well bedded on a solid foundation. No pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Pipe that has the grade or joint disturbed after laying shall be taken up and re-laid by the Contractor at their own expense.

9. The laying of reinforced concrete pipe shall conform to the current recommendations of the American Concrete Pipe Association for Installation Type 1 or 2.

END OF SECTION

SECTION 02930

REVEGETATION

Revegetation: Revegetation includes permanent Revegetation of all site areas disturbed by the Contractor whether inside the Contract Limits or not.

A. Description

1. General:

The Contractor shall furnish all labor, material, and equipment to complete Revegetation in accordance with the Contract Drawings and these Specifications.

2. Related Work:

Related Contract Work is described in the following sections of the Specifications:

Work	Section
Excavation	02222
Embankment	02223
Erosion and Sedimentation Control	02270

3. Correction Period:

The Contractor shall be responsible for the satisfactory establishment and growth of a permanent stand of vegetation as judged by the Engineer during the correction period of the Contract (Alternatively, if no correction period is defined in the Contract, the correction period shall be 3 months after substantial completion of the project.). During this period, the Contractor shall be responsible for the maintenance items described in Paragraph D.4 (Maintenance) of this Specification.

B. Materials

1. Limestone: Unless otherwise defined by specific soil tests, supply agricultural grade ground limestone conforming to the current "Rules, Regulations, and Standards of the Fertilizer Board of Control."

2. Fertilizer: Unless otherwise defined by specific soil tests, supply commercial fertilizer meeting applicable requirements of State and Federal law. Do not use cyanamic compounds of hydrated lime. Deliver fertilizer in original containers labeled with content analysis.

3. Grass Seed: Supply fresh, clean, new-crop seed. Do not use seed which is wet, moldy, or otherwise damaged. Deliver seed in standard sealed containers labeled with producer's name and seed analysis, and in accord with US Department of Agriculture Rules and Regulations under Federal Seed Act.

4. Mulch: Supply clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, or other locally available mulch material.

   a. Do not use mulch containing a quantity of matured, noxious weed seeds or other species that will be detrimental to seeding, or provide a menace to surrounding land.

   b. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass.

5. Binder: Supply emulsified asphalt or synthetic binder.

6. Water: Supply potable, free of substances harmful to growth.

7. Application rates, seed types, and other requirements shall be in accordance with Table 1 of this section.

C. Submittals

The Contractor shall submit the following to the Engineer:

1. Results of soil tests performed and proposed modifications, if any, to the specified requirements.

2. Certificates for each grass seed mixture, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed. Certify that each container of seed delivered is fully labeled in accordance with Federal Seed Act and equals or exceeds specification requirements.

3. Copies of invoices for fertilizer, showing grade furnished and total quantity applied.

D. Construction

1. The Contractor shall establish a smooth, healthy, uniform, close stand of grass from the specified seed. Prior to Revegetation, the Contractor shall adequately test the soils to be revegetated to ensure the adequacy of the specified requirements. Any modifications to these requirements deemed necessary after the review of soil test results, shall be at the Contractor's sole expense. The Engineer will perform the observations to determine when successful Revegetation is achieved.

2. Soil Preparation:

   a. Limit preparation to areas which will be planted soon after preparation.

   b. Loosen surface to minimum depth of four (4) inches.

   c. Remove stones, sticks, roots, rubbish and other extraneous matter over three (3) inches in any dimension.

d. Spread lime uniformly over designated areas at the rate specified in Table 1 of this section.

e. After application of lime, prior to applying fertilizer, loosen areas to be seeded with double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.

f. Distribute fertilizer uniformly over areas to be seeded at the rate specified in Table 1 of this section.

(1) Use suitable distributor.

(2) Incorporate fertilizer into soil to depth of at least two (2) inches.

(3) Remove stones or other substances which will interfere with turf development or subsequent mowing.

g. Grade seeded areas to smooth, even surface with loose, uniformly fine texture.

(1) Roll and rake, remove ridges and fill depressions, as required to meet finish grades.

(2) Fine grade just prior to planting.

3. Seeding:

a. Use approved mechanical power driven drills or seeders, mechanical hand seeders, or other approved equipment.

b. Distribute seed evenly over entire area at the rate specified in Table 1 of this section.

c. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds, excessive moisture, or other factors.

d. Resume work only when favorable condition develops, or as directed by the Engineer.

e. Lightly rake seed into soil followed by light rolling or cultipacking.

f. Immediately protect seeded areas against erosion by mulching or placing Rolled Erosion Control Products in accordance with Section 02270 of these Specifications, where applicable.

(1) Spread mulch in a continuous blanket at the rate specified in Table 1 of this section.

(2) Immediately following spreading mulch, secure with evenly distributed binder at the rate specified in Table 1 of this section.

(3) For slopes not steeper than 3H:1V and as an option to using binder to secure mulch, use a mulch anchoring tool operated along the contour of the slope.

4. Maintenance:

The Contractor shall be responsible for maintaining all seeded areas through the end of their warranty period. The Contractor shall provide, at their expense, protection of all seeded areas against damage at all times until acceptance of the work. Maintenance shall include, but not be limited to, the following items:

a. Regrade and revegetate all eroded areas until adequately stabilized by grass.

b. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

c. Replant bare areas using same materials specified.

Table 1: Seeding Schedule

Material	Seed Type	Application Rate (See Note 1)
Lime	-----	4,000 lbs/acre
Fertilizer (10-20-10)	-----	1,000 lbs/acre
Seed:		
Permanent:	Common Bermuda[3] Pensacola Bahiagrass Kobe Lespedeza[4] Seasonal Nurse Crop[2]	30 lbs/acre 50 lbs/acre 80 lbs/acre See Note 2
Temporary:	Seasonal Nurse Crop[2]	See Note 2
Mulch	-----	4,000 - 5,000 lbs/acre
Binder	-----	400 gallons/acre

Notes:

1. Application rates and/or chemical analysis shall be confirmed or established by a soil test(s).
2. Use seasonal nurse crop in accordance with seeding dates as stated below:
   - April 15 - August 15: 10 lbs/acre German Millet or 15 lbs/acre Sudangrass
   - August 16 - April 14: 40 lbs/acre Rye (grain).
3. Half hulled and half un-hulled.
4. Place Kobe Lespedeza on slopes steeper than or equal to 4H:1V.

END OF SECTION

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