Supplemental Technical Specification for

SEEDING

SCDOT Designation: SC-M-810-2(04/11)

1.0 Seeding

This Supplemental Specification replaces section 810, *Seeding*, in the *South Carolina Department of Transportation*(SCDOT) *Standard Specifications for Highway Construction*, 2007 Edition.This supplemental specification replaces Supplemental Technical Specification SC-M-810.

1.1 Description

This work consists of permanent cover, permanent grassing for small projects, temporary cover, liming and fertilizing (when specified), and applying mulch on all areas shown on the Plans or where directed by the Resident Construction Engineer (RCE) in accordance with these Specifications. The Contractor coordinates seeding with the construction of fill and cut slopes. In order to limit the area of erodible material, the RCE may require that partially completed slopes be brought to the required slope and the Contractor perform permanent or temporary cover operations at that time.

Small Projects are defined as projects which do not require coverage under the NPDES Construction General Permit SCR100000. In additionprojects consisting of improving shoulders with a width of less than six feet due to backfill from resurfacing or upgrading deficient shoulders are also exempt from NPDES requirements and are classified as Small Projects.

1.2 Materials

1.2.1 General

The Contractor shall, at the time of delivery, furnish the RCE invoices and or documentation of all materials received in order to determine the application rate of materials.

1.2.2 Seed

Use seed that conforms to all state laws and all requirements and regulations of the South Carolina Department of Agriculture (SCDA). Seeds containing species designated by the State Crop Pest Commission as a plant pest (i.e., noxious weeds) are not permitted. Use seed that is individually packaged or bagged and tagged. Each tag must clearly state:

- Net weight
- Botanical name
- Common name
- Variety
- Grower name
- Grower lot number
- Percent purity
- Percent germination
- Percent other crop seed
- Percent inert matter
- Percent weed seed (if weed seed is present, provide a list of species by botanical name)
- Origin

When mixtures of different types of seed are called for in the seeding schedule the Contractor may use pre-blended mixtures that are individually packaged or bagged and tagged with the tag specifying the botanical and common name of each species contained in the blend, and the percentages of each species.

When pre-blended seed mixtures are not used, each species shall be weighed and mixed in the proper proportions on-site in the presence of the RCE or a member of the RCE's staff.

SCDOT reserves the right to test, reject, or approve all seed before seeding.

1.2.2.1 Seeding Schedule

Unless otherwise provided, select seed from Table 1, Perennials, and Table 2, Annuals, for the UpperState and the LowerState as applicable to the project. The LowerState consists of all counties east of and including Aiken, Lexington, Richland, Kershaw, and ChesterfieldCounties. The UpperState consists of all counties west of the LowerState, i.e. all the remaining counties (see Figure 1).

If the seed listed in the tables is not available, the Contractor may select the most practicable alternative seed available as a substitute. The Contractor must submit data to the RCE showing that the substitute seed is appropriate for the specific application.

Select a minimum of two (2) seed types from Table 1 for all permanent cover and permanent grassing for small projects based on the specific application and the availability of the seed. A minimum of one (1) of the seed types selected must be a turf-type species. The Contractor mustalso add a minimum of one (1) acceptable annual nurse crop species from Table 2 at the rate shown in Table 2, or a mix of two (2) or more annual nurse crops species from Table 2 with one species applied at a minimum rate of approximately 75% of the rate shown in Table 2 and the other species applied at a rate that does not exceed approximately 50% of the rate shown in Table 2.

When the seeding schedule utilizes more than two (2) perennial seed types from Table 1, apply the primary turf type species at the rate shown in Table 1 and the Contractor may apply the additional perennial seeds at a rate less than the rate shown in Table 1.

The exceptions for selecting a minimum of two (2) permanent cover species from Table 1 are:

- Medians: Use a minimum of one (1) turf-type species from Table 1 and one (1) acceptable annual nurse crop from Table 2 for medians in the UpperState and LowerState.
- Shoulders in LowerState: Use a minimum of one (1) turf-type species from Table 1 and the Contractor may add an acceptable annual nurse crop from Table 2 for Shoulder work in the LowerState.

Select a minimum of one (1) seed type from Table 2 for all temporary cover by seeding based on the specific application and the availability of the seed.

If the Common Name of the seed listed in Table 1 or Table 2 is not available, use seed with the listed Botanical Name.

1.2.2.2 Seeding Plan

Prepare and submit a seeding plan to the RCE utilizing the seeding schedule for all temporary cover by seeding and permanent cover applications. The RCE will approve all seeding plans before temporary cover by seeding and permanent cover applications are initiated.

FIGURE 1: UPPER AND LOWER STATE MAP

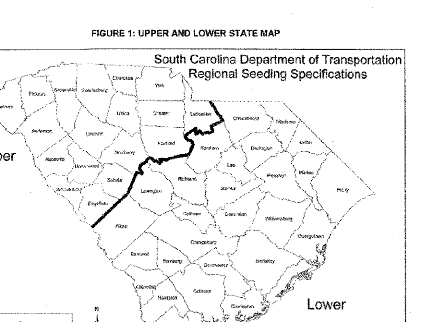

TABLE 1: PERRENIALS ** Months shaded in gray represent applicable planting dates.*

COMMON NAME[5]	BOTANICAL NAME	APPROVED SITE(S)	PLANTING RATE (lbs/acre)	PLANTING LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TURF-TYPE GRASSES (SELECT ONE)																
Bahiagrass[1]	Paspalumnotatum	Slopes	30	UpperState / LowerState												
Common Bermudagrass[2] (hulled = hull absent)	Cynodondactylon	Shoulders, Slopes, or Medians	25	UpperState / LowerState												
Common Bermudagrass[2] (unhulled = hull present)	Cynodondactylon	Shoulders, Slopes, or Medians	30	UpperState / LowerState												
Carpet Grass	Axonopusaffinis	Shoulders, Slopes or Medians	15	UpperState / LowerState												
Tall Fescue	Festucaarundinacea	Shoulders, Slopes, or Medians	50	UpperState / LowerState												
Centipedegrass	Eremochloaophiuroides	Shoulders, Medians	10	UpperState / LowerState												
GRASSES																
Weeping Lovegrass	Eragrostiscurvula	Slopes	5	UpperState / LowerState												
Indiangrass	Sorghastrumnutans	Slopes	10	UpperState / LowerState												
Little Bluestem	Andropogonscoparius	Slopes	10	UpperState / LowerState												
Coastal Panicgrass	Panicumamarum	Slopes	20	UpperState / LowerState												
Switchgrass	Panicumvirgatum	Slopes	10	UpperState / LowerState												
Perennial Rye Grass[3]	Loliumperenne	Shoulders, Slopes, or Medians	15	UpperState / LowerState												
Virginia Wild Rye	Elymusvirginicus	Shoulders, Slopes, or Medians	6	UpperState / LowerState												
LEGUMES[4]																
White Clover	Trifoliumrepens	Shoulders, Slopes	5	UpperState / LowerState												
Sericea Lespedeza (Scarified seed)	Lespedeza cuneata	Slopes	60	UpperState / LowerState												
Sericea Lespedeza (Unscarified seed)	Lespedeza cuneata	Slopes	80	UpperState / LowerState												

[1]Bahiagrass:Bahiagrass may be used as an optional turf-type permanent cover at the discretion of the RCE. ** Months shaded in gray represent applicable planting dates*
[2]Common Bermudagrass: *Do not use Giant Bermudagrass(NK-37).*
[3]Perennial Rye Grass: *Do not use Annual Italian Rye grass (Loliummultiflorum).*
[4]Only use pre-inoculated legumes or use an appropriate inoculant with the seed at planting.
[5]If the Common Name of the seed listed in Table 1 is not available, use seed with the listed Botanical Name.

TABLE 2: ANNUALS ** Months shaded in gray represent applicable planting dates.*

COMMON NAME[3]	BOTANICAL NAME	APPROVED SITE(S)	NURSE CROP RATE (lbs/acre)	TEMP COVER RATE (lbs/acre)	PLANTING LOCATION	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Crimson Clover[1]	Trifoliumincarnatum	Shoulders, Slopes, or Medians	20	20	UpperState / LowerState												
Korean Lespedeza[1]	Lespedeza stipulacea	Shoulders, Slopes	30	NA	UpperState / LowerState												
Korean Lespedeza[1] (unhulled = hull present)	Lespedeza stipulacea	Shoulders, Slopes	30	60	UpperState / LowerState												
Kobe Lespedeza[1]	Lespedeza striata	Shoulders, Slopes	30	NA	UpperState / LowerState												
Kobe Lespedeza[1](unhulled = hull present)	Lespedeza striata	Shoulders, Slopes	30	60	UpperState / LowerState												
Browntop Millet	Panicumramosum	Shoulders, Slopes, or Medians	10	50	UpperState / LowerState												
German Millet (Foxtail Millet)	Setariaitalica	Shoulders, Slopes, or Medians	25	40	UpperState / LowerState												
Japanese Millet	Echinochloacrusgalli	Slopes	10	50	UpperState / LowerState												
Oats	Avena sativa	Slopes	65	110	UpperState / LowerState												
Hairy Vetch[1]	Viciavillosa	Shoulders, Slopes, or Medians	15	50	UpperState / LowerState												
Pearl Millet	Pennisetumglaucum	Slopes	15	50	UpperState / LowerState												
Sudangrass	Sorghum bicolor	Shoulders, Slopes, or Medians	30	60	UpperState / LowerState												
Barley	Hordeumvulgare	Shoulders, Slopes	55	110	UpperState / LowerState												
Wheat	Triticum spp.	Shoulders, Slopes	75	110	UpperState / LowerState												
Rye Grain[2]	Secalecereale	Shoulders, Slopes	75	110	UpperState / LowerState												

[1]Only use pre-inoculated legumes or an appropriate inoculant with the seed at planting.
[2]Rye Grain: *Do not use Annual Italian Rye Grass (Loliummultiflorum).*
[3]If the Common Name of the seed listed in Table 2 is not available, use seed with the listed Botanical Name.
** Months shaded in gray represent applicable planting dates.*

1.2.3 Lime

1.2.3.1 Agricultural Granular Lime

Use solid agricultural granular lime for all permanent cover applications that is agricultural grade, standard ground limestone conforming to the current *Rules, Regulations, and Standards of the Fertilizer Board of Control*. These rules, regulations, and standards are promulgated and issued by the Fertilizer Board of Control at ClemsonUniversity in accordance with Section 16 of the *South Carolina Liming Materials Act*. Ensure that each bag has affixed in a conspicuous manner a tag or label, or in the case of bulk sales, a delivery slip showing brand or trade name, calcium carbonate equivalent, percent by weight passing prescribed U. S. Standard Sieves, and other pertinent information to identify lime as being agricultural grade, standard ground limestone.

1.2.3.2 Fast Acting Lime

Use fast acting liquid forms and/or dry forms of lime for all temporary cover by seeding and permanent cover applications that meet all of the requirements of agricultural grade granular lime specified herein, except percent by weight passing U.S. Standard Sieves.

1.2.4 Fertilizer and Biological Growth Stimulants

1.2.4.1 Granular Fertilizer

Use granular fertilizer for all permanent cover applications that complies with state fertilizer laws. In a mixed fertilizer such as 10-10-10, the first number represents the percent of nitrogen required, the second number represents the percent of available phosphoric acid required, and the third number represents the percent of water soluble potash required in the fertilizer. **Use fertilizer that incorporates a minimum of 50% water insoluble (slow release) nitrogen.** Use fertilizer that has a package slip clearly stating the percentage of nitrogen, water insoluble nitrogen, percentage of phosphoric acid, and percentage of potash along with the weight (pounds) of nitrogen, weight (pounds) of phosphoric acid, and weight (pounds) of potash. Animal by-product or municipal waste fertilizers are not acceptable under this Specification.

1.2.4.2 Biological Growth Stimulants

Provide biological growth stimulants for all permanent cover and temporary cover by seeding applications. Use biological growth stimulants that provide an immediate seedbed adjustment to help stimulate seed germination, improve the availability of nutrients to the grass, increase the number and depth of root development, and generate robust plant growth which is more tolerant of changes in environmental conditions.

Use biological growth stimulants that:

- Provide natural plant hormones, auxins and cytokinins that encourage nutrient uptake, nitrogen metabolism, and carbohydrates storage.
- Improve fertilizer utilization in the soil by increasing the enzymatic and microbial nutrient conversion activity.
- Improve photosynthetic production resulting in greater root mass and improved disease resistance.
- Contains endo-mychorizae to improve nutrient and water uptake by the plant.

Provide biological growth stimulants that contain compounds such as

- humic acid (humates)

- cold water processed seaweed extract
- cytokinins
- gibberllins
- auxins (growth hormones)
- endo-mycorrhizae.

Provide biological growth stimulants that:

- Contain plant growth hormones which act as a stimulant to improve vegetative growth and intake of micro nutrients and can reduce damage from disease and insect infestation.
- Contain humic acid and/or other components that increases biological activity in the soil to improve stress tolerance/drought resistance, reduces sodium uptake in sandy soils, provides more phosphorus availability, and increases cation exchange capacity resulting in earlier germination and better root establishment.

Animal by-products or municipal waste products are not acceptable biological growth stimulants under this specification. Liquid fertilizers are not acceptable as biological growth stimulants under this specification.

Provide biological growth stimulants composed of non-toxic materials.

Provide Biological Growth Stimulants that have no germination or growth inhibiting factors and do not form a water-resistant crust that can inhibit plant growth. Furnish biological growth stimulants where all components are pre-packaged by the manufacturer to assure material performance and compliance with the minimum requirements in Table 3.

Table 3: Minimum Biological Growth Stimulant Requirements

BGS Property	Test Method[1]	Required Value
Physical		
Humate/Humic Acid		1% minimum
Acute Toxicity	ASTM 7101 EPA 2021.0-1	Non Toxic
Performance		
Seed Germination	ASTM D7322[2]	200% minimum
Plant Height	ASTM D7322[2]	200% minimum
Plant Mass	ASTM D7322[2]	110% minimum

[1] Alternative Test Methods from independent 3rd party testing facilities will be accepted until January 31, 2012.
[2] ASTM test methods developed for Rolled Erosion Control Products (RECPs) that have been modified for comparison to control between 14 and 21 days.

Provide biological growth stimulants from a manufacturer listed on the most recent edition of the *SCDOT Qualified Product List 74* and provide documentation of testing at an approved independent laboratory demonstrating performance based on enhanced plant germination.

1.2.5 Mulch

Mulch is required for all permanent cover and temporary cover applications except for shoulder work and resurfacing projects that have a disturbed width less than six (6) feet and seeding is compacted using a culti-packer or light roller. Compaction is not necessary if seeds are planted by mechanical seed drills that perform a compaction procedure. Only use mulch that is certified weed free. Mulch is used for temporary cover by mulch applications. Wood chip mulch is not acceptable for seeding applications.

1.2.5.1 Straw or Hay Mulch with Tackifier

Use straw or hay mulch material that consists of certified weed free straw or hay. Use straw that consists of stalks of wheat, rye, barley, oats, or other approved straw. Use hay that consists of Timothy, Peavine, Alfalfa, Coastal Bermuda, or other grasses from approved sources. Use materials that are reasonably dry and reasonably free from mature seed-bearing stalks, roots, or bulblets of Johnson grass, Nutgrass, Sandburg, Wild Garlic, Wild Onion, Wild Mustard, Crotolaria, Pigweed, Witchweed, and Cocklebur. Comply with all state and federal domestic plant quarantine regulations. Straw mulch is not to be used in urban areas or in areas adjacent to sidewalks, guardrails, curbs, curb and gutters, or concrete medians.

Do not use straw or hay mulch with tackifiers for temporary cover by mulch applications on slopes steeper than 4H:1V.

Anchor straw mulch material using one of the following tacking agents:

1.2.5.1.1 Organic or Chemical Tackifier

Use an organic or chemical tackifier that consists of guar gum, plantago, polysaccharides, polymer synthetic resin, polypectate, liquid latex, or other material that will give similar adhesive properties as asphalt emulsion when sprayed on straw mulches. Organic or chemical tackifiers require approval by the RCE.

1.2.5.1.2 Hydraulic Straw Tackifiers

Use hydraulic straw tackifiers that meet the requirements of this Specification. Apply hydraulic erosion control products at the manufacturer's recommended rate for straw binding.

1.2.5.1.3 Emulsified Asphalt

Use Emulsified Asphalt that meets the requirements of Subsection **407.2.4**. Dilute Emulsified Asphalt at the manufacturing plant with water, if necessary, to provide a homogenous and satisfactory material for spraying.

1.2.5.2 Hydraulic Erosion Control Products(HECPs)

Refer to *SCDOT Supplemental Specification for* HECP *(SC-M-815-11) or latest revision*for HECP description, materials, and construction requirements.

1.2.5.3 Compost Mulch

Refer to *SCDOT Supplemental Specification for Compost(SC-M-815-3)or latest revision*for Compost Mulch description, materials, and construction requirements.

1.2.5.4 Temporary Erosion Control Blankets (ECBs)

Refer to *SCDOT Supplemental Specification for Rolled Erosion Control Products (RECP) (SC-M-815-9) or latest revision*for Temporary Erosion Control Blanket (ECB) description, materials, and construction requirements.

1.2.5.5 Turf Reinforcement Matting (TRMs)

Refer to *SCDOT Supplemental Specification for Rolled Erosion Control Products (RECP)(SC-M-815-9) or latest revision* for Turf Reinforcement Matting (TRM) description, materials, and construction requirements.

1.2.5.6 Slope Interruption Devices

The maximum allowable continuous slope length for all straw and hay mulch, HECP, compost mulch, and ECB applications is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. Refer to *SCDOT Supplemental Specification for Inlet Structure Filters Type F – Non Weighted (SC-M-815-8) or latest revision* for slope interruption device description, materials, and construction requirements.

1.3 Construction Requirements

1.3.1 Seeding Dates and Rates of Application

Perform seeding during the periods and at the rates specified in the seeding tables of this Specification. Do not use temporary cover by seeding, permanent cover, and permanent grassing for small projects when the ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit. Do not use temporary cover by seeding, permanent cover, and permanent grassing for small projects when the ground is excessively wet. Do not conduct seeding work when the ground is excessively dry (periods of drought) unless watering is specified in the Contract or directed by the DCE. During periods of drought conditions, use temporary stabilization by mulch according to this Specification.

1.3.2 Seedbed Preparation

Ensure that the areas to be seeded are uniform and conform to the finished grade and cross-section shown on the Plans or as otherwise directed by the RCE. Perform minor shaping and evening of uneven and rough areas outside of graded sections as directed by the RCE in order to provide for more effective erosion control and for ease of subsequent mowing operations.

Loosen the seedbed (including cut slopes) to a minimum depth of three (3) inches before compost, agricultural lime, fertilizer, mulch, or seed is applied. An acceptable method of preparing the seedbed on slopes is vertically tracking the seedbed up and down the slope with proper equipment.

Remove stones larger than two and one-half (2½) inches in any dimension, large clods, roots, or other debris brought to the surface.

Use compost as directed by the RCE for shoulders and slopes if good seedbed material is not located on site.

1.3.3 Soil Amendments

1.3.3.1 Compost

For seedbeds that have little or no topsoil, and are determined to be deficient from the results of the soil analysis, furnish, place, and mix certified weed free compost to a minimum depth of 3 inches into the seedbedin order to ensure a good stand of grass. Refer to *SCDOT Compost Specification* (SC-M-815-3) *or latest revision* for description, materials, and construction requirements.

As directed by the RCE, provide compost when seedbeds are excessively nutrient deficient to the extent of requiring costly fertilizer additions and or have excessively low pH values (lower than 5.0) to the extent of requiring costly lime additions.

1.3.3.2 Select Material

For seedbeds that have little or no topsoil, are determined to be deficient from the results of the soil analysis, furnish,place, and mix select material to a minimum depth of 3 inches into the seedbed in order to ensure a good stand of grass.

As directed by the RCE, provide select material for seedbeds that are excessively nutrient depleted to the extent of requiring costly fertilizer additions and or have excessively low pH values (5.0 or lower) to the extent of requiring costly lime additions

Select material consists of a friable material containing grass roots and is comparatively porous, capable of growing grass, and stable in nature. When compacted,select material will resist erosion and be capable of supporting vehicles when relatively wet.

1.3.4 Soil Analysis

A soil analysis is not required for permanent grassing on Small Projects and temporary cover by seeding. A soil analysis is required prior to all permanent cover applications. A soil analysis is required on all representative soil types for the specified vegetation species prior to agricultural granular lime and granular fertilizer applications. The RCEdetermines where distinguishable representative soil types are located on the project site. Representative soil types include existing predominate soils on the project site, cut slopes, fill material, and areas of exposed subsoil.

Collect one (1) soil sample for each distinguishable representative soil type. One (1) sample consists of mixing ten (10) sub-samples taken uniformly over each distinguishable representative soil type. Soil samples should be taken from stockpiles where the material will be the top six (6) inches of the seedbed. Take each sub-sample within the top four (4) to six (6) inches of the soil surface.

Submit a separate soil sample for each representative soil type to a SCDOT certified soil testing laboratory.

The soil analysis determines the need and rate of lime and fertilizer applications. At a minimum, a standard soil test includes pH, buffer pH, extractable phosphorus, potassium, lime requirements and recommendations, calculations for CEC (cation exchange capacity), and fertilizer requirements and recommendations.

1.3.5 Applying Lime

1.3.5.1 Agricultural Granular Lime

A soil analysis is required prior to agricultural granular lime applications. The soil analysis determines the need and rate of granular lime application for a given application area. Based on the results of the soil analysis, furnish granular lime to provide a long term pH adjustment. Following advance preparation and placing of soil amendments when called for in the Contract or directed by the RCE, uniformly spread lime over the designated areas.Thoroughly mix agricultural granular lime with the soil to a depth of approximately two (2) inches. Mixing is not required when spreading lime with hydraulic methods.

Adequately scarify all slopes subject to slides and inaccessible to power equipment. Lime may be applied by approved mechanical spreaders or by hydraulic methods as a mixture of lime and seed.

Apply all agricultural granular lime at a rate that is within **±10%** of the weight recommendation of the soil analysis.

Agricultural granular lime is not required for temporary cover by seeding applications unless a soil analysis is requested by the RCE and indicates a pH below 5.0.

1.3.5.2 Fast Acting Lime

Fast acting liquid and dry lime provides an immediate pH adjustment. Use fast acting liquid or fast acting dry forms of lime for all temporary cover by seeding and permanent cover by seeding applications. Apply fast acting liquid lime at a rate of 5 gallons per acre or per the manufacturer's recommendations. Apply fast acting dry lime at a rate of 100 pounds per acre or per the manufacturer's recommendations.

1.3.6 Applying Fertilizer and Biological Growth Stimulants

1.3.6.1 Agricultural Granular Fertilizer

A soil analysis is required prior to agricultural granular fertilizer applications. The soil analysis determines the need and rate of fertilizer applications for the specific vegetation species. Following advance preparation and placing of soil amendments when called for in the Contract or directed by the RCE, uniformly spread fertilizer over the designated areas.

Adequately scarify all slopes subject to slides and inaccessible to power equipment. Fertilizer may be applied by approved mechanical spreaders or by hydraulic methods as a mixture of fertilizer and seed. When fertilizer is applied with combination seed and fertilizer drills, no further incorporation is necessary. Apply the fertilizer and seed together when hydraulic methods of seeding are used.

Apply all fertilizer at a rate that is within **±10%** of the weight recommendation of the soil analysis. Apply fertilizer that is within ±2 percentage points of the recommendation of the soil analysis.

The required application of nitrogen includes a minimum of 50% water insoluble (slow release) nitrogen under this Specification.

When a fertilizer blend meeting the soil analysis requirements is not readily available, the Contractor may combine fertilizers of different compositions to meet the soil analysis composition requirements. Apply the fertilizer at a rate to achieve the amount of nitrogen, phosphoric acid, and potash that would have been accomplished by utilizing the fertilizer specified by the soil analysis.

In all cases, under the guidelines of this Specification, apply nitrogen and phosphorus at a rate that does not exceed the soil analysis recommendation while keeping the actual nitrogen and phosphorus rate as close to the soil analysis recommended rate to the maximum extent practicable.

Payment is made for the number of pounds of fertilizer applied as required by the soil analysis. Use a separate payment for each of the three fertilizer components (nitrogen, phosphoric acid, and potash).

1.3.6.2 Biological Growth Stimulants

Use biological growth stimulants for all permanent cover and temporary cover by seeding applications. Apply biological growth stimulants strictly at the manufacturer's recommended rates. Ensure that all biological growth stimulant applications strictly follow the manufacturer's recommendations to avoid damage or burning of the seedbed. Use approved hydraulic methods to apply biological growth stimulants.

Deliver materials and products sealed in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures, and construction operations.

Degradation of biological growth stimulants can be expected to occur as a result of mechanical degradation, chemical degradation, biological hydrolysis, sunlight, salt, and temperature. Where necessary, reapply biological growth stimulants in accordance with the manufacturer's instructions. Reapplication is not required unless biological growth stimulant treated soils are disturbed or turbidity or water quality shows the need for an additional application. If biological growth stimulant treated soils are left undisturbed, the necessity of reapplication will be determined by the RCE. The Department will not pay for the reapplication of biological growth stimulants within 45 days of the initial application unless the reapplication is approved by the RCE.

1.3.7 Temporary Cover

Perform temporary cover by mulch or temporary cover by seeding within seven (7) days when a site will not be worked for 21 days up to a maximum of 60 days. If the site will not be worked for a period longer than 60 days, then temporary cover by seeding is required.

Do not use temporary cover by seeding when the ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit.

Scarify all temporary cover areas before fill is placed on top of the temporary cover area.

1.3.7.1 Temporary Cover by Mulch

Use an appropriate mulch as listed in this Specification. Apply the mulch with a minimum continuous soil coverage of 95% that is maintained across the entire application area.

Temporary cover by mulch may be used on isolated problem areas or where it is not feasible or practicable to bring an area to final slope and grade. Finish the surface so that permanent cover can be performed without subsequent serious disturbance by additional grading.

1.3.7.2 Temporary Cover by Seeding

Following the preparation of the seedbed according to this Specification, sow seed prior to a rainfall event that compacts the seedbed. Using the seed specified in the seeding tables in Section 1.2, the Contractor will determine all rates of application necessary to produce the required results and follow the application procedures as specified herein. Uniformly sow seed at the rate specified by the use of approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or any other type of equipment that produces a uniform seed application.

After sowing temporary seed, apply an appropriate mulch as listed in this Specificationprior to a rainfall event that compacts the seedbed. On small areas inaccessible to machinery, the seed may be covered by hand rakes or other methods satisfactory to the RCE. When required by the RCE, add fertilizer and lime as directed by a soil analysis.

Temporary cover by seeding may be used in isolated problem areas or where it is not feasible or practicable to bring an area to final slope and grade. Finish the surface so that permanent cover can be performed without subsequent serious disturbance by additional grading.

1.3.8 Acceptance of Temporary Cover

Before acceptance of temporary cover, the Contractor will be required to produce temporary cover sufficient to control erosion for a given area and length of time before the next phase of construction or the establishment of permanent cover is to commence.

If the temporary cover is disturbed by the prime, grading, or other contactor before acceptable temporary cover is established, the temporary cover will be re-established at no cost to the SCDOT.

The Contractor will be required to produce a satisfactory stand of temporary cover meeting the requirements of this Specificationregardless of the time of the year the work is performed.

1.3.9 Permanent Cover

Perform permanent cover with seeding within 21 days of when the site was last worked. Following the application of fertilizer and preparation of seedbed according to this Specification, perform permanent cover within 5 working days and/or prior to a rainfall event that compacts the prepared seedbed. Using the seed specified in the seeding tables in section 1.2, the Contractor will create a seeding plan and determine

all rates of application necessary to produce the required stand of grass and follow the application procedures as specified herein.Uniformly sow seed at the rate specified by the use of approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or any other type of equipment that produces a uniform seed application.

After sowing permanent seed, apply an appropriate mulch as listed in this Specification within 5 working days and/or prior to a rainfall event that compacts the prepared seedbed. On small areas inaccessible to machinery, the seed may be covered by hand rakes or other methods satisfactory to the RCE. Add fertilizer and lime as directed by a soil analysis.

1.3.10 Mulch

Apply mulch according to Table 4.

TABLE 4: MULCH

Mulch[1]	Applicable Slopes[2]	Minimum Application Rate (lbs/acre -dry)[3]	Min Slope Height (ft)
Straw or Hay with Tackifier	≤ 4:1	2,000	N/A
HECP Type 1 - Tracer under RECP	Per RECP	1000	N/A
HECP Type 1	≤ 4:1	2,000	N/A
HECP Type 2	4:1< S ≤ 3:1	2,500	N/A
HECP Type 3	3:1< S ≤ 2:1	3,000	N/A
HECP Type 4	2:1< S ≤ 1:1	3,500	N/A
	>1:1	4,000 (temp cover only)[4]	
Compost Mulch	≤ 2:1	200 CY/acre	N/A
When site constraints exceed the acceptable application for mulch use Rolled Erosion Control Products (RECPs), Erosion Control Blankets (ECB) or Turf Reinforcement Matting (TRM)			
Temporary ECB or Type 1 TRM	≤ 2:1	N/A	5
Type 2 TRM	≤ 1.5:1	N/A	5
Type 3 TRM	≤ 1:1	N/A	5

1 A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is to be applied at the specified mulch rate for the actual slope conditions of the site in accordance with the mulch tables.Payment will be made for themulch specified not the higher level mulch.

2 The maximum allowable continuous slope length for all mulch and ECB applications is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet.

3 Strictly comply with the manufacturer's mixing recommendations and installation instructions for the actual slope steepnessand the actual continuous slope length of the application.

4 HECP Type 4 may be used for permanent cover applications on slopes 1:1 or greater at a minimum rate of 4,500 pounds per acre as directed by the RCE only when proper TRM installation is not practicable due to site constraints.

1.3.10.1Straw or Hay Mulch with Tackifier

Uniformly apply straw or hay mulch material at the rate of 2000 pounds per acre. Straw mulch may be spread either by hand, by appropriate mechanical spreaders, or by blowers. Apply straw mulch to allow sunlight penetration, air circulation, partial shading of the ground, and conservation of soil moisture. Secure newly laid straw mulch with an approved tackifier. Replace all straw mulch displaced during the tackifier application process.

1.3.10.1.1Organic or Chemical Tackifier

These tackifiers consist of guar gum, plantago, polysaccharides, polymer synthetic resin, polypectate, liquid latex, or other material that will give adhesive properties when sprayed on straw mulches. Applications should be heavier at edges, in valleys, and at crests of banks and other areas where the straw mulch may be moved by wind or water. All other areas must have a uniform application of the tackifier. Use tacking agents approved by the RCE, and apply them at the manufacturer's recommended rate.

1.3.10.1.2 Hydraulic Straw Tackifiers

Apply hydraulic tackifiersat the manufacturer's recommended rate for straw binding.

1.3.10.1.3 Emulsified Asphalt

Dilute Emulsified Asphalt at the manufacturing plant with an equal amount of water and uniformly apply it over the straw mulch material as a film. Apply the film at approximately 0.20 gallon of dilution per square yard to sufficiently bond together the straw mulch and prevent wind erosion without creating a heavy coating of asphalt material.

Emulsified Asphalt is not applicable for use in urban areas or along sidewalks, curb and gutters, bridges, and water bodies.

1.3.10.2 Hydraulic Erosion Control Product(HECPs)

Refer to *SCDOT Supplemental Specification for HECPs (SC-M-815-11) or latest revision* for HECP construction requirements.

1.3.10.3 Compost

Refer to *SCDOT Supplemental Specification for Compost(SC-M-815-3) or latest revision* for construction requirements.

1.3.10.4Temporary Erosion Control Blankets (ECBs)

Refer to *SCDOT Supplemental Specification for Rolled Erosion Control Products (RECP) (SC-M-815-9) or latest revision* for Erosion Control Blanket (ECB) construction requirements. For permanent cover applications using hydraulic methods for seed application, apply seed with HECP Type 1 as a tracer at a minimum rate of 1000 pounds/acre prior to RECP installation. Payment for the application of HECPType 1 as a tracer is a separate bid item.

1.3.10.5 Turf Reinforcement Matting (TRMs)

Refer to *SCDOT Supplemental Specification for Rolled Erosion Control Products (RECP)(SC-M-815-9) or latest revision* for Turf Reinforcement Matting (TRM) construction requirements. For permanent cover applications, when using hydraulic methods for seed application, apply seed with HECP Type 1 as a tracer at a minimum rate of 1000 pounds/acre prior to RECP installation. Payment for the application of HECP Type 1 as a tracer is a separate bid item.

1.3.10.6 Slope Interruption Devices

Refer to *SCDOT Supplemental Specification for Inlet Structure Filters Type F – Non Weighted (SC-M-815-8) or latest revision* for slope interruption device description, materials, and construction requirements.

1.3.11 Permanent Grassing for Small Projects

Select seed in accordance with Section 1.2 of this specification. Using the seed specified in the seeding tables, the Contractor will create a seeding plan and determine all rates of application necessary to produce the required stand of grass and follow the application procedures as specified herein.

Select nutrients based on experience and past success. Soil samples, watering and any other section of this seeding specification can be used to obtain better results but are not required. If granular fertilizer and lime are used, sow seed within 24 hours following the application and preparation of the seedbed. Uniformly sow seed at the rate specified by the use of approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or any other type of equipment that produces a uniform seed and nutrient application.

Permanent grassing for small projects does not require the application of mulch when the width of the seeding application is less than six (6) feet and seeding is compacted using a culti-packer or light roller. Compaction is not necessary if seeds are planted by mechanical seed drills that perform a compaction procedure. Track slopes inaccessible to compaction equipment prior to seeding. Stabilize slopes that cannot be tracked with the appropriate mulch.

1.3.12 Acceptance of Permanent Cover and Permanent Grassing for Small Projects

Before acceptance of permanent cover or permanent grassing for small projects, a uniform perennial vegetative cover with a density of 70% of each square yard of the seeded area is required by the Contractor. A well developed root system must be established to sufficiently survive dry periods and winter weather and be capable of reestablishment in the spring.

1.3.13 Protection of Structures

Cover any parts of bridges, culverts, guardrails, signs, sidewalks, curb and gutters, catch basins, pipe ends, and other structures as necessary to prevent discoloration before spraying organic or chemical tackifiers.

1.3.14 SelectiveWatering for Vegetation

Note: Selective Watering for Vegetation is to be used to establish a bid price per gallon of water in the event that the District Construction Engineer (DCE) determines that watering is necessary. Selective Watering for Vegetation is not intended to be used for all projects or an entire project site.

Selective Watering for vegetation consists of selectively applying water to seeded areas that are slow to develop or deficient in adequate density. Use Selective Watering to enhance germination and enhance root growth in poor growth areas.

When directed by the DCE use the following guidelines in areas where germination has not occurred within 21 days after seeding:

- Keep the soil moist but not excessively wet until the seed germinates.
- Water a minimum of three (3) days a week for two (2) weeks preferably watering two (2) or three (3) times a day in small quantities.
- Use fine spray and low pressure to avoid soil wash and to prevent uncovering buried seeds.
- When applicable, water during early morning hours or early evening hours.
- Do not water when rain is forecasted for the area.

When directed by the DCE, use the following guidelines in areas where adequate density is a problem after emergence:

- Apply one (1) inch of water per irrigation event. (Note: 1-acre-inch = 27,154 gallons. This is the volume of water necessary to cover one (1) acre one (1) inch deep.)
- During summer, water two (2) to three (3) days per week.
- During winter, water once every ten (10) to fourteen (14) days.
- If rainfall occurs, suspend watering according to rainfall amount.

Closely monitor the deficient areas to ensure *germination* and density of cover. Further analysis of the soil, application of soil amendments, or re-seeding may be necessary if the problem area persists.

1.3.15 Mowing

Mowing consists of mowing areas seeded or sodded under the Contract or other areas as necessary to provide adequate sight areas and to maintain the project in a satisfactory manner. Mowing will be performed by the Contractor where directed by the RCE and such mowing will commence within three (3) business days following verbal notification by the RCE. Failure of the Contractor to comply with the above may be grounds for stopping work on the project or withholding payment of the monthly construction estimate.

Mow shoulders and medians when vegetation reaches a height of approximately eighteen (18) to twenty four (24) inches. Use mowing equipment equipped with safety devices designed to prevent injury or property damage caused by flying debris propelled from under the mowing equipment. Keep all mowing equipment in good operating condition and keep the equipment maintained to provide a clean, sharp cut of vegetation at all times. If the RCE determines the equipment is defective to the point that the quality of work or safety is affected, immediately repair or replace the equipment.

Ensure that mowing results in a uniform vegetation height of four (4) to six (6) inches, unless otherwise directed by the RCE. Mow as closely as possible to all fixed objects exercising care not to damage trees, plants, shrubs, signs, delineators, or other appurtenances which are a part of the facility. Hand trimming around such objects may be required of the Contractor.

Remove litter and debris prior to beginning mowing operations. Immediately remove and properly dispose of all litter and debris resulting from mowing operations. Mowed grass is not normally removed unless it becomes a hazard as determined by the RCE.

Do not perform mowing when, in the opinion of the RCE, soil and weather conditions are such that rutting or other damage to the project may occur. The three-business-day period may be extended by the RCE until the soil and weather conditions become suitable for mowing on the project.

1.3.16 Inspection and Maintenance

Perform all maintenance necessary to keep permanent cover, permanent grassing for small projects, temporary coverby seeding, and temporary cover by mulch areas in a satisfactory condition until the work is finally accepted. This includes mowing, repairing areas of erosion and washes, and applying additional seed, fertilizer, and mulch to areas where a satisfactory stand of grass has not been achieved. Water seeded areas as directed by the DCE. The Contractor is not responsible for permanent cover, permanent grassing for small projects, temporary coverby seeding, and temporary cover by mulch areas damaged by insects, animals, or extreme rainfall events. An extreme rainfall event is defined as being a 25-year storm event or greater based on the inches of rain received per time interval (30-min, 1-hr, 2-hr, 24-hr etc.) for the particular location as determined from the current NOAA precipitation tables.

1.4 Measurement

Permanent Cover, Permanent Grassing for Small Projects and Temporary Cover - The quantity of permanent cover, permanent grassing for small projects, and temporary cover is the ground surface area with acceptable vegetation or stand of cover and is measured by the one-acre (acre) unit, complete and accepted.

Lime - The quantity of agricultural granular lime is the weight applied and is measured by the pound (lb), complete and accepted. Weights are determined by approved scales or by guaranteed weight of sacks shown on the manufacturer's tag. Furnish invoices or documentation of the materials received on the project to the RCE.

Fertilizer - The quantity of fertilizer is the weight applied and is measured by the pound (lb), complete and accepted. Quantities are measured for each of the three fertilizer components (nitrogen, phosphoric acid, and potash). Weights are determined by approved scales or by guaranteed weight of sacks shown on the manufacturer's tag. Furnish invoices or documentation of the materials received on the project to the RCE.

Mulch - The quantity of mulch is the ground surface area covered and is measured by the one-acre (acre) unit, complete and accepted. Furnish invoices of the materials received on the project to the RCE.

Selective Watering for Vegetation - The quantity of selective watering for vegetation is the amount of water applied as directed by the DCE and is measured in gallons (gal). This is measured by actual gallons utilized from a water tank equipped with a water meter, or by utilizing a measuring stick and volume tables for the tank, or the number of gallons applied by a pump based on the pump rating and the actual time the pump is operated.

Mowing - The quantity of mowing is the area of ground surface area mowed at the direction of the RCE and is measured by the one-acre (acre) unit, complete and accepted. Separate measurements will be made and added to the quantity for payment each time the area is mowed.

Compost - The quantity of compost is the volume of compost placed on the siteas directed by the RCE and is measured by the cubic yard (CY), complete and accepted. The quantity of compost is the actual number of cubic yards measured and placed on site.

Select Material - The quantity of select material is the volume of select material placed on the site as directed by the RCE and is measured by the cubic yard (CY), complete and accepted.The quantity of select material is the actual number of cubic yards measured and placed on site.The Contractor may elect to base the quantity measured on the loose volume at the point of delivery by scaling and counting the loads, with a deduction of 35%made for shrinkage.

1.5 Payment

Payment for the accepted quantity for each pay item, measured in accordance with this Specification, is determined using the Contract unit bid price for the applicable pay item. The payment includes all direct and indirect costs and expenses necessary to complete the work. If the RCE determines that the Contractor implements all of the requirements of this Specification and a satisfactory stand of permanent cover or temporary cover meeting the requirements of the Specification is not established, the Contractor will receive payment for the permanent cover or temporary cover required for re-application.

Permanent Cover - Payment for permanent cover is full compensation for furnishing all materials (excluding agricultural granular lime, granular fertilizer, mulch, compost, select material, and watering for vegetation) and includes all other materials, seed, fast acting lime, biological growth stimulants, labor, soil samples and analysis, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. Payment is up to 90% of the Contract unit price for permanent cover items until a satisfactory stand of grass meeting the requirements of this Specificationis established.

Permanent Grassing for Small Projects - Payment for permanent grassing for small projects is full compensation for furnishing all materials includingseed, agricultural granular lime, fast acting lime, granular fertilizer, biological growth stimulants, mulch, compost, select material, water, labor, equipment, tools, supplies, transportation, all other materials, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. Payment is up to 90% of the Contract unit price for permanent grassing for small projects until a satisfactory stand of grass meeting the requirements of this Specificationis established.

Temporary Cover -

Payment for temporary cover by mulch is full compensation for furnishing all materials (excluding mulch) and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. Payment is 100% upon approval of acceptable application of mulch.

Payment for temporary cover by seeding is full compensation for furnishing all materials (excluding mulch, compost, select material, and watering for vegetation) and includes all other materials, seed, fast acting lime, biological growth stimulants, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. Payment is up to 90% of the Contract unit price for temporary cover until a satisfactory stand of grass meeting the requirements of this Specificationis established.

Agricultural Lime - Payment for agricultural granular lime is full compensation for furnishing and applying lime as specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract.

Granular Fertilizer - Payment for granular fertilizer is made for each of the three fertilizer components (nitrogen, phosphoric acid, and potash). Payment for granular fertilizer is full compensation for furnishing and applying fertilizer as specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract.

Mulch - Payment for mulch is full compensation for furnishing and applying mulch, as specified or directed, and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. If applicable, the installation must be accepted and certified by the manufacturer's representative or RCE prior to payment. When a higher level of mulch is applied than that specified on the Plans, Specifications, and other terms of the Contract, payment is for the mulch specified.

Selective Watering for Vegetation - Payment for selective watering for vegetation is full compensation for furnishing and applying water as specified or directed by the DCE and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract.

Mowing - Payment for mowing is full compensation for mowing vegetation to an acceptable height in areas specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. No adjustments in unit price will be made in case of overruns or under runs of this item.

Compost - Payment for compost is full compensation for furnishing and placing compost as directed by the RCE and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract.

Select Material - Payment for select material is full compensation for furnishing and placing select materialas directed by the RCE and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessaryto fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract.

Payment for each item includes all direct and indirect costs and expenses required to complete the work. Payment will be made under a bid item number per Table 5.

TABLE 5: BID ITEM NUMBER

Bid Item Number	Description	Units
8100100	Permanent Cover	ACRE
8100101	Permanent Grassing for Small Projects	ACRE
8100200	Temporary Cover	ACRE
8101100	Select Material	CY
8101105	Compost	CY
8101110	Straw or Hay Mulch with Tackifier	ACRE
8104005	Fertilizer (Nitrogen)	LB
8104010	Fertilizer (Phosphoric Acid)	LB
8104015	Fertilizer (Potash)	LB
8105005	Agricultural Granular Lime	LB
8109050	Selective Watering	GAL
8109901	Mowing	ACRE
8151101	Turf Reinforcement Matting (TRM)Type 1	MSY
8151102	Turf Reinforcement Matting (TRM)Type 2	MSY
8151103	Turf Reinforcement Matting (TRM)Type 3	MSY
8151110	Temporary Erosion Control Blanket (ECB)	MSY
8151201	Hydraulic Erosion Control Product (HECP)Type 1	ACRE
[illegible]	Hydraulic Erosion Control Product (HECP) Type1 as Tracer under RECP	ACRE
8151202	Hydraulic Erosion Control Product (HECP)Type 2	ACRE
8151203	Hydraulic Erosion Control Product (HECP)Type 2	ACRE
8151204	Hydraulic Erosion Control Product (HECP) Type 4	ACRE
[illegible]	Inlet Structure Filter Type F - Non-Weighted (Slope Interruption Devices)	LF

*MSY= One Thousand Square Yards

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PREPARED IN THE OFFICE OF:

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REV. #	COUNTY & SCDOT COMMENTS	DATE	DRAWN BY:	CHECKED BY:
1	COUNTY & SCDOT COMMENTS	08/26/19	MAT	MSL

CLIENT

CAROLINA RE HOLDINGS, LLC
300 GALLERIA PARKWAY - ATLANTA, GA 30339

PROJECT

BURGER KING - BEECH ISLAND, SC
BEECH ISLAND AVENUE & ATOMIC DRIVE
AIKEN COUNTY, SOUTH CAROLINA

SOUTH CAROLINA
LeCraw Engineering, Inc
No. 4400
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 29099
8/28/19
Mark S. LeCraw

DESIGN TEAM:

DRAWN BY:	MAT
DESIGNED BY:	MAT
REVIEWED BY:	MSL

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