

## SEEDING

SCDOT Designation: SC-M-810 (11/08)

### 1.0 Seeding

This Supplemental Specification replaces section 810, *Seeding*, in the *South Carolina Department of Transportation Standard Specifications for Highway Construction*, 2007 Edition.

#### 1.1 Description

This work consists of permanent cover, 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.

#### 1.2 Materials

##### 1.2.1 General

The Contractor will, 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

The Department reserves the right to test, reject, or approve all seed before seeding. Mixtures of different types of seed called for in the seeding schedule will be weighed and mixed in the proper proportions on-site in the presence of the RCE or a member of the RCE's staff.

### 1.2.2.1 Seeding Schedule

Unless otherwise provided, select seed from Table 1 (Permanent Cover (Perennials)), Table 2 (Permanent Cover Nurse Crops (Annuals)) and/or Table 3 (Temporary Cover (Annuals)) for the Upper State and the Lower State as applicable to the project. The Lower State consists of all counties east of and including Aiken, Lexington, Richland, Kershaw, and Chesterfield Counties. The Upper State consists of all counties west of the Lower State, 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 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 may add an acceptable permanent cover nurse crop from Table 2.

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

- Medians in the Upper State and Lower State will utilize a minimum of one (1) turf-type species from Table 1 and one (1) acceptable permanent cover nurse crop from Table 2.
- Shoulder work in the Lower State will utilize a minimum of one (1) turf-type species from Table 1 and the Contractor may add an acceptable permanent cover nurse crop from Table 2.

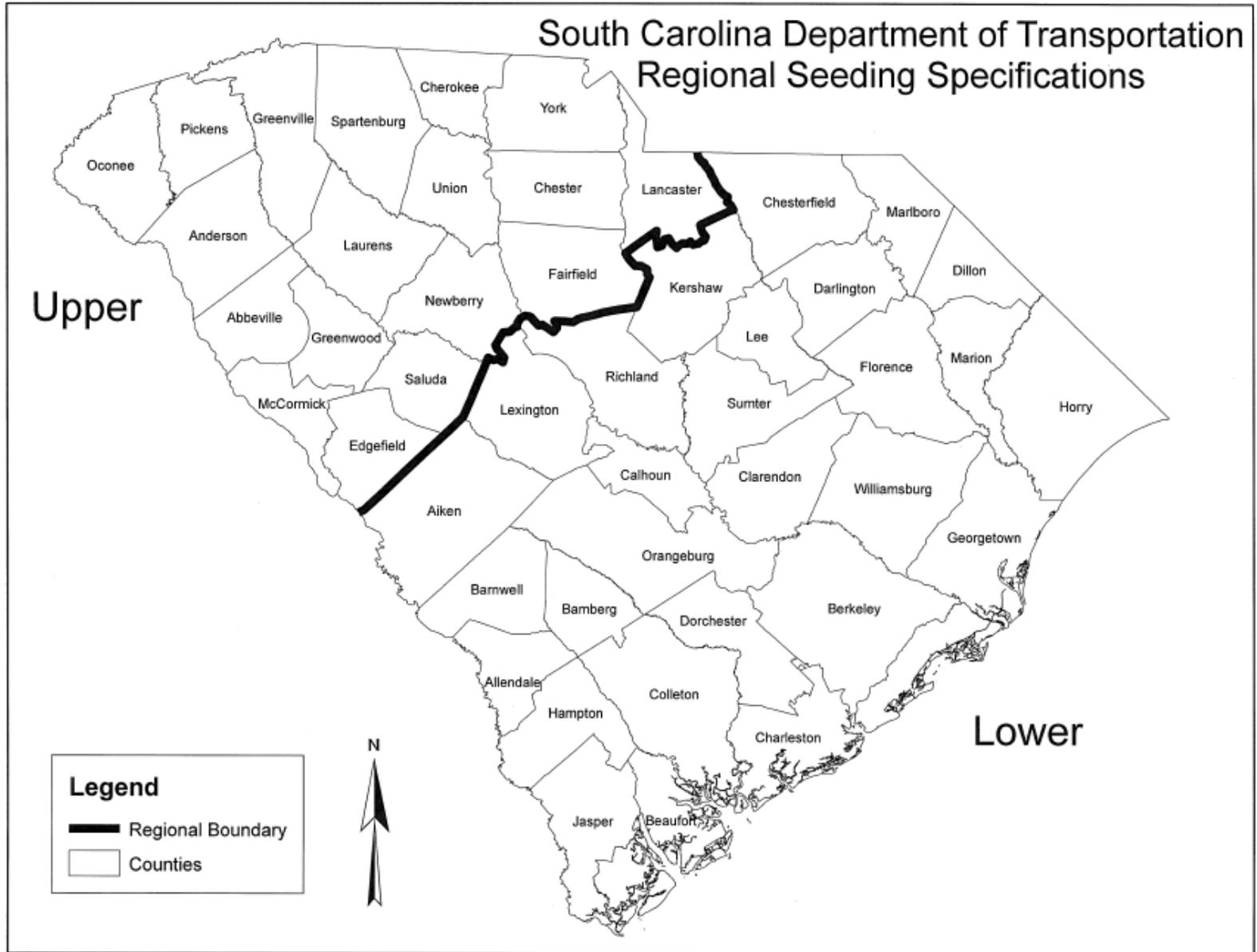
Select a minimum of one (1) seed type from Table 3 for all temporary cover based on the specific application and the availability of the seed.

If the Common Name of the seed listed in Table 1, Table 2 or Table 3 is not available, use seed with the listed Botanical Name.

### 1.2.2.2 Seeding Plan

Prepare and submit a seeding plan utilizing the seeding schedule to the RCE 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: PERMANENT COVER (PERENNIALS)**

COMMON NAME <sup>5</sup>	BOTANICAL NAME	APPROVED SITE(S)	PLANTING RATE (lbs/acre)	PLANTING LOCATION	Planting Dates*											
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<b>TURF-TYPE GRASSES (SELECT ONE)</b>																
Bahigrass <sup>1</sup>	Paspalum notatum	Slopes	30	Upper State												
				Lower State												
Common Bermudagrass <sup>2</sup> (hulled = hull absent)	Cynodon dactylon	Shoulders, Slopes, or Medians	25	Upper State												
				Lower State												
Common Bermudagrass <sup>2</sup> (unhulled = hull present)	Cynodon dactylon	Shoulders, Slopes, or Medians	30	Upper State												
				Lower State												
Carpet Grass	Axonopus affinis	Shoulders, Slopes or Medians	15	Upper State												
				Lower State												
Tall Fescue	Festuca aruninacea	Shoulders, Slopes, or Medians	50	Upper State												
				Lower State												
Centipedegrass	Eremochloa ophiuroides	Shoulders, Medians	10	Upper State												
				Lower State												
<b>GRASSES</b>																
Weeping Lovegrass	Erograstis curvula	Slopes	5	Upper State												
				Lower State												
Indiangrass	Sorghastrum nutans	Slopes	10	Upper State												
				Lower State												
Little Bluestem	Andropogon scoparius	Slopes	10	Upper State												
				Lower State												
Coastal Panicgrass	Panicum amarum	Slopes	20	Upper State												
				Lower State												
Switchgrass	Panicum virgatum	Slopes	9	Upper State												
				Lower State												
Perennial Rye Grass <sup>3</sup>	Lolium perrene	Shoulders, Slopes, or Medians	15	Upper State												
				Lower State												
Virginia Wild Rye	Elymus virginicus	Shoulders, Slopes, or Medians	6	Upper State												
				Lower State												
<b>LEGUMES<sup>4</sup></b>																
White Clover	Trifolium repens	Shoulders, Slopes	5	Upper State												
				Lower State												
Sericea Lespedeza (Scarified seed)	Lespedeza cuneta	Slopes	50	Upper State												
				Lower State												
Sericea Lespedeza (Unscarified seed)	Lespedeza cuneta	Slopes	80	Upper State												
				Lower State												

<sup>1</sup>Bahigrass: Bahigrass may be used as an optional turf-type permanent cover at the discretion of the RCE.

\* Months shaded in gray represent applicable planting dates.

<sup>2</sup>Common Bermudagrass: Do not use Giant Bermudagrass (NK-37).

<sup>3</sup>Perennial Rye Grass: Do not use Annual Italian Rye grass (Lolium multiflorum).

<sup>4</sup>Only use pre-inoculated legumes or use an appropriate inoculant with the seed at planting.

<sup>5</sup>If the Common Name of the seed listed in Table 1, Table 2 or Table 3 is not available, use seed with the listed Botanical Name.

**TABLE 2: PERMANENT COVER NURSE CROPS (ANNUALS)**

COMMON NAME <sup>2</sup>	BOTANICAL NAME	APPROVED SITE(S)	PLANTING RATE (lbs/acre)	PLANTING LOCATION	Planting Dates*											
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<b>SELECT ONE</b>																
<b>Crimson Clover<sup>1</sup></b>	Trifolium incarnatum	Shoulder, Slopes	20	Upper State												
				Lower State												
<b>Korean Lespedeza<sup>1</sup></b>	Lespedeza stipulacea	Shoulders, Slopes	30	Upper State												
				Lower State												
<b>Korean Lespedeza<sup>1</sup> (unhulled = hull present)</b>	Lespedeza stipulacea	Shoulders, Slopes	30	Upper State												
				Lower State												
<b>Kobe Lespedeza<sup>1</sup></b>	Lespedeza striata	Shoulders, Slopes	30	Upper State												
				Lower State												
<b>Kobe Lespedeza<sup>1</sup> (unhulled = hull present)</b>	Lespedeza striata	Shoulders, Slopes	30	Upper State												
				Lower State												
<b>Browntop Millet</b>	Panicum ramosum	Slopes	10	Upper State												
				Lower State												
<b>German Millet (Foxtail Millet)</b>	Setaria italica	Slopes	25	Upper State												
				Lower State												
<b>Japanese Millet</b>	Echinochloa crusgalli	Slopes	10	Upper State												
				Lower State												
<b>Oats</b>	Avena sativa	Slopes	10	Upper State												
				Lower State												
<b>Hairy Vetch<sup>1</sup></b>	Vicia villosa	Shoulders, Slopes, or Medians	1	Upper State												
				Lower State												

<sup>1</sup>Only use pre-inoculated legumes or an appropriate inoculant with the seed at planting.

<sup>2</sup>If the Common Name of the seed listed in Table 1, Table 2 or Table 3 is not available, use seed with the listed Botanical Name.

\* Months shaded in gray represent applicable planting dates.

**TABLE 3: TEMPORARY COVER (ANNUALS)**

COMMON NAME <sup>3</sup>	BOTANICAL NAME	APPROVED SITE(S)	PLANTING RATE (lbs/acre)	PLANTING LOCATION	Planting Dates*											
					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<b>SELECT ONE</b>																
<b>Crimson Clover<sup>1</sup></b>	Trifolium incarnatum	Shoulders, Slopes, or Medians	20	Upper State												
				Lower State												
<b>Korean Lespedeza<sup>1</sup> (unhulled = hull present)</b>	Lespedeza stipulacea	Shoulders, Slopes	60	Upper State												
				Lower State												
<b>Kobe Lespedeza<sup>1</sup> (unhulled = hull present)</b>	Lespedeza striata	Shoulders, Slopes	60	Upper State												
				Lower State												
<b>Browntop Millet</b>	Panicum ramosum	Slopes	50	Upper State												
				Lower State												
<b>German Millet (Foxtail Millet)</b>	Setaria italica	Slopes	40	Upper State												
				Lower State												
<b>Oats</b>	Avena sativa	Slopes	150	Upper State												
				Lower State												
<b>Hairy Vetch<sup>1</sup></b>	Vicia villosa	Shoulders, Slopes, or Medians	50	Upper State												
				Lower State												
<b>Pearl Millet</b>	Pennisetum glaucum	Shoulders, Slopes, or Medians	50	Upper State												
				Lower State												
<b>Sudangrass</b>	Sorghum bicolor	Shoulders, Slopes, or Medians	60	Upper State												
				Lower State												
<b>Barley</b>	Hordeum vulgare	Shoulders, Slopes, or Medians	190	Upper State												
				Lower State												
<b>Wheat</b>	Triticum spp.	Shoulders, Slopes, or Medians	100	Upper State												
				Lower State												
<b>Rye Grain<sup>2</sup></b>	Secale cereale	Shoulders, Slopes, or Medians	55	Upper State												
				Lower State												

<sup>1</sup>Only use pre-inoculated legumes or an appropriate inoculant with the seed at planting.

<sup>2</sup>**Rye Grain:** *Do not use Annual Italian Rye Grass (Lolium multiflorum).*

<sup>3</sup>If the Common Name of the seed listed in Table 1, Table 2 or Table 3 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 Clemson University 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

#### 1.2.4.1 Granular Fertilizer

Use granular fertilizer that complies with state fertilizer laws. In a mixed fertilizer such as 10-10-10, the first number represents the minimum percent of nitrogen required, the second number represents the minimum percent of available phosphoric acid required, and the third number represents the minimum percent of water soluble potash required in the fertilizer. Use fertilizer that has a package slip clearly stating the percentage of 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 Liquid Fertilizer

Use liquid forms of fertilizer for all temporary cover by seeding and permanent cover applications. Provide certified equivalency/ratio tables from the manufacturer for each of the three components. Animal by-product or municipal waste fertilizers are not acceptable under this Specification.

### 1.2.5 Mulch

Mulch is required for all seeding applications except for permanent seeding for shoulder work and resurfacing projects that have a disturbed width less than six (6) feet. Only use mulch that is certified weed free. Mulch may also be used for temporary stabilization applications. Note that 100% 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.

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 hydro mulch 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 Mulch (HM)

Refer to the current *SCDOT HM Specification* (SC-M-815-7) for HM description, materials, and construction requirements.

#### 1.2.5.3 Stabilized Mulch Matrix (SMM)

Refer to the current *SCDOT SMM Specification* (SC-M-815-6) for SMM description, materials, and construction requirements.

#### 1.2.5.4 Bonded Fiber Matrix (BFM)

Refer to the current *SCDOT BFM Specification* (SC-M-815-5) for BFM description, materials, and construction requirements.

#### 1.2.5.5 Fiber Reinforced Matrix (FRM)

Refer to the current *SCDOT FRM Specification* (SC-M-815-4) for FRM description, materials, and construction requirements.

#### 1.2.5.6 Erosion Control Blankets (ECBs)

Refer to the current *SCDOT Rolled Erosion Control Products (RECP) Specification* for Erosion Control Blanket (ECB) description, materials, and construction requirements.

#### 1.2.5.7 Turf Reinforcement Matting (TRMs)

Refer to the current *SCDOT Rolled Erosion Control Products (RECP) Specification* for Turf Reinforcement Matting (TRM) description, materials, and construction requirements.

### 1.3 Construction Requirements

#### 1.3.1 Seeding Dates and Rates of Application

Perform seeding work during the periods and at the rates specified in the seeding tables of this Specification. Do not conduct seeding work when the ground is frozen or excessively wet. Do not conduct seeding work when the ground is excessively dry (periods of drought) unless watering is specified in the Contract. During periods of adverse conditions, temporary stabilization by mulch may be used 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, 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 Compost

For seedbeds that have little or no topsoil, the Contractor may furnish and place certified weed free compost on the seedbed or mix compost with the seedbed in order to ensure a good stand of grass. Refer to the current *SCDOT Compost Specification* (SC-M-815-3) 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 (5.0 or lower) to the extent of requiring costly lime additions.

#### 1.3.4 Soil Analysis

A soil analysis is not required for permanent cover of shoulder work and resurfacing projects. A soil analysis is required prior to all other permanent cover operations. 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 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.

Collect one (1) soil sample per one (1) acre surface area of representative soil type. One (1) sample consists of mixing ten (10) sub-samples taken uniformly over the one acre. Representative soil types include existing predominate soils on the project site, cut slopes, fill material, and areas of exposed subsoil. The RCE will determine where distinguishable representative soil types are located on the project site. Soil

samples should be taken from stockpiles or borrow pits 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 from each representative soil type to a SCDOT certified soil testing laboratory.

### 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 selected material for shoulders and slopes when called for in the Contract, uniformly spread lime over the designated areas and thoroughly mix 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  $\pm 10\%$  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. However, it may be desirable to apply lime during temporary cover by seeding applications for the benefit of permanent cover applications that follow the temporary cover.

#### 1.3.5.2 Fast Acting Lime

Fast acting liquid and dry lime provides an immediate pH adjustment. Use fast acting liquid and 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

#### 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 selected material for shoulders and slopes when called for in the Contract, 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  $\pm 10\%$  of the weight recommendation of the soil analysis. Apply fertilizer that is within  $\pm 2$  percentage points of the percentage recommendation of nitrogen, percentage of phosphoric acid, and percentage of potash from the soil analysis.

The Contractor may combine fertilizers of different compositions to meet the composition requirements of the soil analysis. If a different fertilizer is used, apply the fertilizer at a rate per acre to achieve, but not

exceed, the amount of nitrogen, phosphoric acid, and potash that would have been accomplished by utilizing the fertilizer specified by the soil analysis.

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 Liquid Fertilizer

Liquid fertilizer provides an immediate seedbed adjustment. Use liquid fertilizer for all temporary cover by seeding and permanent cover by seeding applications. Apply liquid fertilizer at a rate of 5 gallons per acre or per the manufacturer's recommendations.

#### 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.

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

Sow seed within 24 hours following the preparation of the seedbed according to this Specification. 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.

Apply an appropriate mulch as listed in this Specification within 24 hours of sowing temporary seed. 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 contractor before acceptable temporary cover is established, the temporary cover will be re-established at no cost to the SCDOT.

Using the seed specified in the seeding tables, the Contractor will determine all rates of application necessary to produce the required results and follow the application procedures as specified herein. The Contractor will be required to produce a satisfactory stand of temporary cover meeting the requirements of this Specification regardless 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. Perform permanent cover within 24 hours following the application of fertilizer and preparation of seedbed according to this Specification. 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.

Apply an appropriate mulch as listed in this Specification within 24 hours of sowing permanent seed. 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 or in accordance with the manufacturer's recommended application rates.

**Table 4: Mulch**

Mulch*	Max Slope	Max Continuous Slope Length (ft)	Temporary Cover by Mulch (no seed) Application Rate (lbs/acre)	Temporary Cover by Seeding Application Rate (lbs/acre)	Permanent Cover Application Rate (lbs/acre)	Min Slope Height (ft)
Straw or Hay with Tackifier	5:1	30	2,000	2,000	2,000	N/A
	4:1	25	2,000	2,000	2,000	
Hydraulic Mulch (HM)	5:1	30	NA	1,500	1,500	N/A
	4:1	25	NA	1,500	2,000	
	3:1	20	NA	1,500	2,500	
Stabilized Mulch Matrix (SMM)	5:1	70	1,800	1,200	1,800	N/A
	4:1	60	2,000	1,500	2,000	
	3:1	50	2,500	1,800	2,500	
	2:1	25	3,000	2,000	NA	
Bonded Fiber Matrix (BFM)	4:1	70	2,500	1,500	2,500	N/A
	3:1	60	3,000	1,800	3,000	
	2:1	50	3,500	2,000	3,500	
	1:1	35	4,000	2,500	N/A	
Fiber Reinforced Matrix (FRM)	4:1	100	2,500	1,500	2,500	N/A
	3:1	85	3,000	1,800	3,000	
	2:1	75	3,500	2,000	3,500	
	1:1	50	4,000	2,500	N/A**	
When site constraints exceed the acceptable application for mulch, use erosion control blankets (ECBs) and turf reinforcement matting (TRMs).						
Type A Erosion Control Blanket (ECB)	2:1	Per RECP Specification	N/A	N/A	N/A	5
Type 3 Turf Reinforcement Mat (TRM)	1:1	Per RECP Specification	N/A	N/A	N/A	5

\*A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, payment is for the mulch specified.

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

### 1.3.10.1 Straw 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.

#### 1.3.10.1.1 Organic 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 hydro mulch at 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 gallons 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 Mulch (HM)

Refer to the current *SCDOT HM Specification (SC-M-815-7)* for HM construction requirements.

#### 1.3.10.3 Stabilized Mulch Matrix (SMM)

Refer to the current *SCDOT SMM Specification (SC-M-815-6)* for SMM construction requirements.

#### 1.3.10.4 Bonded Fiber Matrix (BFM)

Refer to the current *SCDOT BFM Specification (SC-M-815-5)* for BFM construction requirements.

#### 1.3.10.5 Fiber Reinforced Matrix (FRM)

Refer to the current *SCDOT FRM Specification (SC-M-815-4)* for FRM construction requirements.

#### 1.3.10.6 Compost

Refer to the current *SCDOT Compost Specification (SC-M-815-3)* for construction requirements.

#### 1.3.10.7 Erosion Control Blankets (ECBs)

Refer to the current *SCDOT Rolled Erosion Control Products (RECP) Specification* for Erosion Control Blanket (ECB) construction requirements.

#### 1.3.10.8 Turf Reinforcement Matting (TRMs)

Refer to the current *SCDOT Rolled Erosion Control Products (RECP) Specification* for Turf Reinforcement Matting (TRM) construction requirements.

#### 1.3.11 Permanent Cover for Shoulder Work and Resurfacing Projects

These projects consist only of the tasks of improving shoulders either due to backfill from resurfacing or upgrading deficient shoulders. Sow seed within 24 hours following the application of lime and fertilizer and preparation of the seedbed as specified in this Specification. 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.

Permanent cover for shoulder work and resurfacing does not require the application of mulch when the width of the seeding application is less than six (6) feet. When site conditions allow, lightly compact all seeded areas by means of a cultipacker or light roller. Compaction will not be necessary if seeds are planted by mechanical seed drills that perform a compaction procedure. Slopes inaccessible to compaction equipment should be tracked by the Contractor prior to seeding. Stabilize slopes that cannot be tracked with the appropriate mulch.

#### 1.3.12 Acceptance of Permanent Cover

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

#### 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 Watering for Vegetation

Watering for vegetation consists of applying water to seeded areas to enhance germination and applying water to germinated areas to enhance root growth. When directed by the DCE, use watering for vegetation to establish a stand of cover. When watering, follow the following guidelines:

Immediately after seeding:

- Keep the soil moist but not excessively wet until the seed has germinated.
- 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.

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.
- Never apply at a rate faster than can be absorbed by the soil.
- When applicable, water during early morning hours or early evening hours.
- Do not water when rain is forecasted for the area.

### 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.

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 seeded 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 seeded 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 per hour received for the particular location as determined from the current NOAA precipitation tables.

## 1.4 Measurement

Temporary Cover and Permanent Cover - The quantity of temporary and permanent 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.

Watering for Vegetation - The quantity of 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 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 site 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.

## 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 all direct and indirect costs and expenses required for re-application.

Temporary Cover and Permanent Cover - Payment for temporary and permanent cover is full compensation for furnishing all materials (excluding agricultural granular lime, granular fertilizer, mulch, compost, selected material for shoulders and slopes, and watering for vegetation) and includes all other materials, fast acting lime, liquid fertilizer, labor, soil samples and analysis, equipment, tools, supplies, transportation, and incidentals necessary to fulfill the requirements of the pay item in accordance with the Plans, Specifications, and other terms of the Contract. Payment is 90% of the Contract unit price for temporary cover and permanent cover items until a satisfactory stand of grass meeting the requirements of this Specification is 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 necessary to 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 full compensation for furnishing and applying fertilizer as specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to 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 necessary to 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.

Watering for Vegetation - Payment for watering for vegetation is full compensation for furnishing and applying water as specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to 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 necessary to 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 underruns of this item.

Compost - Payment for compost is full compensation for furnishing and placing compost as specified or directed and includes all other materials, labor, equipment, tools, supplies, transportation, and incidentals necessary to 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**

<b>Bid Item Number</b>	<b>Description</b>	<b>Units</b>
8100100	PERMANENT COVER	ACRE
8100200	TEMPORARY COVER	ACRE
8101105	COMPOST	CY
8101110	STRAW OR HAY MULCH WITH TACKIFIER	ACRE
8101115	HYDRAULIC MULCH (HM)	ACRE
8101120	STABILIZED MULCH MATRIX (SMM)	ACRE
8104005	FERTILIZER (NITROGEN)	LB
8104010	FERTILIZER (PHOSPHORIC ACID)	LB
8104015	FERTILIZER (POTASH)	LB
8105005	AGRICULTURAL GRANULAR LIME	LB
8109050	WATERING	GAL
8109901	MOWING	ACRE
8151011	BONDED FIBER MATRIX (BFM)	ACRE
8151021	FIBER REINFORCED MATRIX (FRM)	ACRE
8151111	TEMPORAR.EROS.CONTRL.BLANKET(CL-A)	MSY
8151103	TURF REINF.MATTING (TRM)-TYPE 3	MSY

\*MSY= One Thousand Square Yards