APPENDIX Q

Pending Revisions

Nutrient Management Plan (NMP), SWPPP Special Provision, Construction Form C-45

NMP - Roadside Development Sheets

- **IIM-LD-122.12 Roadside Development**
- **Roadside Development Seeding Worksheet – Mountain Region**
- **Roadside Development Seeding Worksheet – Coastal Region**
- **Roadside Development Seeding Worksheet – Piedmont Region**
- **Nutrient Management for Active Construction**
- **Roadside Development NMP Summary**
- **Roadside Development Sheet- Lime and Fertilizer Calculations**

NMP - Other Tools for Implementation

- **Fertilizer Guidance for Active Construction Projects**
- **Fertilizer Guidance for Roadside Maintenance**
- **Determining Lime Requirements by On-site Soil Testing**
- **Quick Chart for Active Construction**
- **Quick Chart for Roadside Maintenance**

SWPPP Special Provision

- **S107F1C-0108, Storm Water Pollution Prevention Plan**

Construction Form C-45

- **S107G0B1-0108, SWPPP Contractor and Subcontractor Certification Statement**

VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: ROADSIDE DEVELOPMENT	NUMBER: IIM-LD-122.12
SPECIFIC SUBJECT: ROADSIDE DEVELOPMENT SHEET; COORDINATION; COMPUTING QUANTITIES/SUMMARIZATION	DATE: AUGUST 18, 2008
	SUPERSEDES: IIM-LD-122.11
DIVISION ADMINISTRATOR APROVAL: Mohammad Mirshahi, P.E. State Location and Design Engineer Approved August 18, 2008	

Changes are shaded.

CURRENT REVISION

- Changed the name of the Asset Management Division to Maintenance Division.

EFFECTIVE DATE

- These instructions are effective upon receipt.

POLICY

- The Roadside Development Sheet and the Erosion Control Summary Sheet are to be included in project plan assemblies.
- The Roadside Development Summary will indicate the Maintenance Division's recommended seed mixtures, and estimated quantities for Topsoil, Seeding (Regular and Legume), Fertilizer and Lime.
- Seed additives (e.g. foxtail millet) are paid for as Regular Seeding except Crown Vetch, Sericea Lespedeza and Birdsfoot Trefoil
- Seed mixture recommendations may at times deviate from the seed mixture guidelines on the Roadside Development Sheet. The District Roadside Manager will provide recommendations for the application of seed mixtures (core mix and additives), fertilizer, lime, etc.

SPECIAL INSTRUCTIONS

- The approximate area (hectares or acres) to be disturbed will be shown under “Notes” on the Roadside Development Sheet. This area is not to be expanded for estimating purposes.

- Notes on the Roadside Development Sheet marked by a star are for the use of field forces only. The Designer is not to use any percentages shown under “Notes” on the Roadside Development sheet when computing quantities.

MULCH

- Roadside Development involves two categories of mulch as follows:

  - Seeding Mulch, Type I or II is applied in the field with the seed mixture. This mulch is included in the price for the regular seeding and is not summarized in the plans.

  - Erosion Control Mulch is summarized on the Erosion Control Summary Sheet when recommended by the Maintenance Division. This material is estimated at the rate of 0.25 acres (1,210 S.Y.) per 100 feet of alignment or 0.332 hectares (3,319 m2) per 100 meters of roadway alignment) and is to be paid for as follows:

PAY ITEM	UNIT	ITEM CODE
Erosion Control Mulch	Acres (Hectare)	27288
Erosion Control Mulch	S.Y. (m2)	27284

LEGUME SEEDING

- The seed mixes available for roadside development include three “Legume” seeds, Crown Vetch, Sericea Lespedeza and Birdsfoot Trefoil specified as additives “E, F. and G” on the Roadside Development Sheet.

- These Legume seeds are used only on slopes 3:1 or greater and are not used on shoulders or other locations to be mowed.

- Legume Seed, and Legume Overseeding are to be summarized for separate payment.

- Whenever the Maintenance Division specifies any of these Legume seeds, the mowable areas on the project (slopes flatter than 3:1) and non-mowable areas (slopes 3:1 and greater) must be measured separately in order to accurately summarize the seeding requirements.

ESTIMATING QUANTITIES

- If the lime application rate is not provided by the Maintenance Division, the Designer should estimate the Normal Lime Quantity based on 5 metric tons per hectare (2 tons per acre).

- If the fertilizer application rate is not provided by the Maintenance Division, the Designer should estimate the Normal Fertilizer Quantity based on 675 kilograms per hectare (600 pounds per acre).

- The seed mixtures (core mix plus additives) shown on the Roadside Development Sheet are weights per hectare (or acre) of disturbed area. These quantities may vary for each construction season.

- The Designer is advised to:

  1. Determine the disturbed area to be seeded.

  2. Determine the application rate for the sloped and mowed areas shown for each construction season.

     Example for Seed Mix 2E:
     100 lbs. Core Mix + 20 lbs. Additive =120 lbs.

  3. The greatest seeding rate is assumed to be the “Normal” Seeding rate.

     Example for 10 acre area:

MIX REQUIREMENTS ON THIS PROJECT

PROJECT NUMBERS	SLOPES	MOWED	SLOPES	MOWED	SLOPES	MOWED
	SPRING & FALL		SUMMER		LATE FALL & WINTER	
0123-123-103	2E	2B	3A	3A	4B	4B
	120 LBS.	120 LBS.	110 LBS	110 LBS.	120 LBS.	120 LBS.

The Normal Seeding rate = 120 lbs. per acre.
120 lbs. x 10 acres of disturbed area = 1200 lbs. “Normal” Seeding Quantity

- When a legume seed additive is specified (Crown Vetch, Sericea Lespedeza or Birdsfoot Trefoil) the sloped areas and mowed areas must be measured separately when summarizing seeding quantities.

  1. Determine the flat (less than 3:1) areas and sloped (3:1 and greater) areas to be seeded.

     Example: 10 acres of mowed areas; 5 acres of sloped areas.

  2. Determine the application rate for the mowed areas.

Example for “Seed Mix 2B”:100 lbs. Core Mix + 20 lbs. Additive = 120 lbs.

3. Determine the application rate for the sloped areas:

   Example for Seed Mix 2E: Core Mix “2” = 100 lbs.; Additive E” = 20 lbs.

4. Determine the quantities of Regular Seed and Legume Seed.

   Example for mowed area (Seed Mix 2B):
   Core Mix 100 lbs. + 20 lbs. = 120 lbs. x 10 acres = 1200 lbs. Regular Seed

   Example for sloped areas (Seed Mix 2E):
   100 lbs. x 5 acres = 500 lbs. Regular Seed
   20 lbs. x 5 acres = 100 lbs. Legume Seed

- The “Normal” quantities for lime, fertilizer, and seeding are based on the actual area to be disturbed. The “Normal” quantities are to be increased by the following percentage factors to obtain the quantity to show in the summary:

  - Lime = Normal Quantity increased by 90%
  - Fertilizer (15-30-15)= Normal Quantity increased by 90%
  - Regular Seed = Normal Seeding Quantity increased by 60%
  - Overseeding=100% of Normal Seeding Quantity (no mulch or fertilizer)
  - Legume Seed = Normal Seeding Quantity increased by 60%
  - Legume Overseeding = 100% of Normal Seeding Quantity (no mulch or fertilizer)

  Examples for determining quantities to summarize:

  20 tons “normal” Lime x 1.90 (or 190%) = 38 tons Lime
  3 tons “normal” Fertilizer x 1.90 (or 190%) = 5.7 or 6 tons Fertilizer
  1700 lbs.“normal”Seeding x 1.60 (or 160%) = 2720 lbs. Regular Seeding
  1700 lbs. “normal” Seeding (@ 100%) = 1700 lbs. Overseeding
  100 lbs. “normal” Legume Seeding x 1.60 (or 160%)= 160 lbs. Legume Seed
  100 lbs. “normal” Legume Seeding (@ 100%) = 100 lbs. Legume Overseeding

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PAY ITEMS

• Lime	Metric Ton/Ton	27250
• Fertilizer	Metric Ton/Ton	27215
• Regular Seed	kg/lbs.	27102
• Overseeding	kg/lbs.	27103
• Legume Seed	kg/lbs.	27104
• Legume Overseeding	kg/lbs.	27105
• Topsoil Class A	ha/acres	27012
• Topsoil Class B	ha/acres	27022
• Erosion Control Mulch	ha/acres/m2/S.Y.	27288

REVIEW BY MAINTENANCE DIVISION

- The Roadside Development Sheet is to be reviewed by the Maintenance Division prior to submission of the plan assembly for construction.

- Anytime the current Roadside Development Sheet is replaced by a revised Roadside Development Sheet, the District Roadside Manager should be requested to determine the need for any changes in seed mixes, quantities, etc.

INSERTABLE SHEETS

- The Roadside Development Sheet may be obtained through the CADD Insertable Sheet Directory.

  - Special Design Section Drawing No. A-4 (Imperial)
  - Special Design Section Drawing No. MA-4 (Metric)

- The Erosion Control Summary Sheet may be obtained through the CADD Insertable Sheet Directory.

  - Special Design Section Drawing No. A-5 (Imperial)
  - Special Design Section Drawing No. MA-5 (Metric)

ROADSIDE DEVELOPMENT SEEDING FOR ACTIVE CONSTRUCTION - MOUNTAIN REGION - WorkSheet for Roadside Managers

PROJECT:

PPMS#

DATE:
ISSUED BY:

Seed Selection within Nutrient Management Guidelines:**Step 1**. Determine if the site will be seeded in the Dormant or Growing Period. Seeding of CORE MIX will be most effective if completed from March 15 to May 31 and Aug 1 through Oct 31, as these are periods of optimal establishment for cool season grasses. Over-seeding should be completed during this time of optimal establishment. If the project schedule dictates regular seeding during the Dormant Period or June - July than the establishment of the turf may be hindered. A Dormant Period Temporary Seeding mix should be used during the dormant period and may be used in the August through October period , based on weather and field conditions.

Approximately _____ Acres will be disturbed on this project and will require the establishment of **persistent and perennial grasses and/or legumes.**

← Dormant Period →				
NOV	DEC	JAN	FEB	MARCH
1-30	1-31	1-31	1-29	1-15

← Growing Period →							
MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT
15-31	1-30	1-31	1-30	1-31	1-31	1-30	1-31

Step 2. Determine if the site will be seeded with a Permanente Seed Mix or Temporary Seed Mix within each Period (Shading indicates best time of year to plant).

Temporary Seed Mix

Dormant Period Seeding

Code	lbs/A	Description
D-1	100	20% Barley, Cereal Rye(Secale Cerial) or Winter Wheat & 80% Certified Tall Fescue
D-2	10	100% Barley, Cereal Rye(Secale Cerial) or Winter Wheat
D-3		

Growing Period Seeding

Code	lbs/A	Description
G-1	100	20% Foxtail Millet & 80% Certified Tall Fescue
G-2		

NOTE: The temporary seed, as directed by the Engineer, is to be used only on areas that are to be regraded, later disturbed or left dormant for more than 15 days.

Lime may be applied, fertilizer can be applied at 50% of Nutrient Management Rate. Fertilizer shall **NOT** be applied when the ground is frozen.

Erosion Control Mulch, as directed by the Engineer, is to be used on areas that are to be left dormant for more than 15 days between Dec 1 and February 29.
Erosion Control Mulch, as listed on the "VDOT Approved Product List," shall be applied in accordance with the manufacture's recommendations.
Erosion Control Mulch (or approved method) shall provide 100% coverage of all denuded areas of land.

Permanent Seed Mix for Regular Seeding and Over Seeding (Core Mix)

Code	lbs/A	Description
1	70	100% Certified Fine Fescue (Chewings, Creeping Red, Hard or Sheep)
2	100	100% Certified Tall Fescue
3	100	50% Certified Fine Fescue (Chewings, Creeping Red, Hard or Sheep) & 50% Certified Tall Fescue
4	20	100% Orchardgrass
5	0	No Natives
6		
7		

Over Seeding Note: Use 100% of seed mixture supplied. The Engineer will require the contractor to perform over seeding when the density of the persistent perennial cover is between 50-75%. Recommendations for the application of seed mixtures, fertilizer, lime, etc are to be obtained from the District Roadside Manager if less than 50% ground cover density of a persistent perennial cover as specified in the seeding mixture is obtained.

Nurse and Companion Species (Additives)

Code	lbs/A	Description
A	10	100% Barley, Cerial Rye (Secale cereal) or Winter Wheat (Dormant Period Nurse Crop)
B	10	100%Foxtail Millet (Growing Period Nurse Crop)
C	30	**100% Crown Vetch* (Companion)
D	10	**100% Sericia Lespedeza* (Companion)
E	10	100% Birdfoot Trefoil* (Companion)
F	10	100% White Clover
G		
H		

A **Nurse** crop is annual species such as rye and millet are temporary varieties and are not considered permanent vegetative cover.

A **Companion** species is perennial grass and/or legumes added to the Permanente Seed Mix to enhance the probability of establishing a vegetative cover.

*Legumes should be planted in the spring, and fertilizer should be applied at the Nutrient Management Rate. Legume seed shall be inoculated with the appropriate strain and rate of bacteria. For hydroseeding, use three times the dry seeding rate of inoculant. Sericia lespedeza seed must be hulled if planted in the Growing period, and un-hulled if planted in the Dormant period.

**To be seeded on sites with greater than 3:1 slope and other area that is designated as an area that will not be mowed. Other legumes or listed companion species can be seed on non-mow and mow areas.

ROADSIDE DEVELOPMENT SEEDING FOR ACTIVE CONSTRUCTION - MOUNTAIN REGION - Worksheet for Roadside Managers

PROJECT:

Step 3. The District Roadside Manager completes the Seeding Schedule and Seeding Summarys.

PPMS#

DATE:

ISSUED BY:

Seeding Schedule

Assign Perminante Seed Mix with Nurse and Companion Species

Project Number	Project Area	NON-MOW	NOW	NON-MOW	NOW	NON-MOW	NOW
		Dormant Period Nov 1 - March 15		**Growing Period Cool Season Feb 15* - May 31 Aug 1 - Oct 31**		**Growing Period Warm Season June 1 - July 31**	
**** Fine Fescue Type**							

* Seed that is expected to lay dormant on site may be planted outside the cool and warm season Growing Period.
**Specify type as Chewings, Creeping Red, Hard and/or Sheep Fescue. May mix types.

Mulch and Topsoil Specifications

Type I mulch (Straw) to be used on newly seeded areas adjacent to all waterways, wetlands, swamps, sinkholes, or any area in which drainage flows toward areas under the jurisdiction of the environmental regulatory agencies. Type I shall be applied to provide a minimum of 90% coverage. Type I mulch shall be tacked with Fiber mulch at the rate of 750 lbs per acre and/or mulch tackifier.

Type II mulch (Wood Fiber Mulch) may be substituted for Type I mulch at the recommendation of the District Roadside Manager. Type II mulch shall be applied at a rate of 1500 (net dry weight) per acre to provide a minimum of 90 percent coverage, and shall be applied over the seed in a separate application.

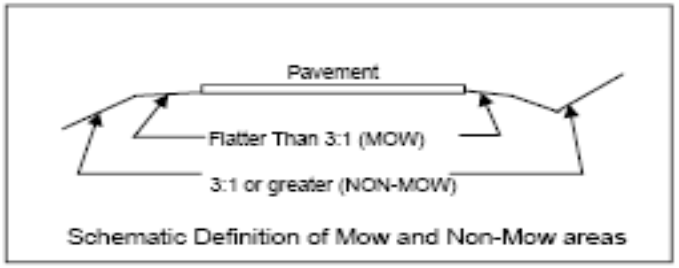
All topsoil is to be free of hard lumps, clods, rocks and foreign debris, and is to be hand raked to tie into existing lawns.

Seeding Summary

Project Number	Topsoil 2" Class		Seeding				
	A	B	Regular Seeding	Temporary Seeding ι	Over Seeding	Legume Seeding	Legume Over Seeding
	Acres		lbs	lbs	lbs	lbs	lbs
0							
0							
0							
0							
0							
0							
Total			0	0			
Pay Item Quantities	0	0	0		0	0	0

ι **Temporary Seeding** quantities are included with Regular Seeding pay quantities.

Note: All seed must be in conformance with the current Nutrient Management Plan and with VDOT seed specifications for Grasses and Legumes and be provided at the project site in bags labeled and not opened for use on VDOT projects with a green tag certifying inspection of the Virginia Crop Improvement Association.



Schematic Definition of Mow and Non-Mow areas

ROADSIDE DEVELOPMENT SEEDING FOR ACTIVE CONSTRUCTION - COASTAL PLAIN REGION - WorkSheet for Roadside Managers

Seed Selection within Nutrient Management Guidelines:**Step 1**. Determine if the site will be seeded in the Dormant or Growing Period. Seeding of CORE MIX will be most effective if completed from March 15 to May 31 and Aug 1 through Oct 31, as these are periods of optimal establishment for cool season grasses. Over-seeding should be completed during this time of optimal establishment. If the project schedule dictates regular seeding during the Dormant Period or June - July than the establishment of the turf may be hindered. A Dormant Period Temporary Seeding mix should be used during the dormant period and may be used in the August through October period , based on weather and field conditions.

← Dormant Period →				← Growing Period →								
NOV	DEC	JAN	FEB	MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
15-30	1-31	1-31	1-29	1--31	1-30	1-31	1-30	1-31	1-31	1-30	1-31	1-15

Step 2. Determine if the site will be seeded with a Permanente Seed Mix or Temporary Seed Mix within each Period (Shading indicates best time of year to plant).

PROJECT:

PPMS#

DATE:
ISSUED BY:

Approximately _____ Acres will be disturbed on this project and will require the establishment of **persistent and perennial grasses and/or legumes.**

Temporary Seed Mix

Dormant Period Seeding

Code	lbs/A	Description
D-1	100	20% Barley, Cereal Rye(Secale Cerial) or Winter Wheat & 80% Certified Tall Fescue
D-2	10	100% Barley, Cereal Rye(Secale Cerial) or Winter Wheat
D-3		

Growing Period Seeding

Code	lbs/A	Description
G-1	100	20% Foxtail Millet & 80% Certified Tall Fescue
G-2		

NOTE: The temporary seed, as directed by the Engineer, is to be used only on areas that are to be regraded, later disturbed or left dormant for more than 15 days.

Lime may be applied, fertilizer can be applied at 50% of Nutrient Management Rate. Fertilizer shall **NOT** be applied when the ground is frozen.

Erosion Control Mulch, as directed by the Engineer, is to be used on areas that are to be left dormant for more than 15 days between Dec 1 and February 29.
Erosion Control Mulch, as listed on the "VDOT Approved Product List," shall be applied in accordance with the manufacture's recommendations.
Erosion Control Mulch (or approved method) shall provide 100% coverage of all denuded areas of land.

Permanent Seed Mix for Regular Seeding and Over Seeding (Core Mix)

Code	lbs/A	Description
1	70	100% Certified Fine Fescue (Chewings, Creeping Red, Hard or Sheep)
2	100	100% Certified Tall Fescue
3	100	50% Certified Fine Fescue (Chewings, Creeping Red, Hard or Sheep) & 50% Certified Tall Fescue
4		
5	0	No Natives
6	40	*100% Bermuda hulled or un-hulled
7		

Over Seeding Note: Use 100% of seed mixture supplied. The Engineer will require the contractor to perform over seeding when the density of the persistent perennial cover is between 50-75%. Recommendations for the application of seed mixtures, fertilizer, lime, etc are to be obtained from the District Roadside Manager if less than 50% ground cover density of a persistent perennial cover as specified in the seeding mixture is obtained.

*Must be hulled if planted in the Growing Period, and un-hulled if planted in the Dormant Period.

Nurse and Companion Species (Additives)

Code	lbs/A	Description
A	10	100% Barley, Cerial Rye (Secale cereal) or Winter Wheat (Dormant Period Nurse Crop)
B	10	100%Foxtail Millet (Growing Period Nurse Crop)
C	30	**100% Crown Vetch* (Companion)
D	10	**100% Sericia Lespedeza* (Companion)
E	10	100% Birdfoot Trefoil* (Companion)
F	10	100% White Clover* (Companion)
G	20	**100% Weeping Lovegrass
H		

A **Nurse** crop is annual species such as rye and millet are temporary varieties and are not considered permanent vegetative cover.

A **Companion** species is perennial grass and/or legumes added to the Permanente Seed Mix to enhance the probability of establishing a vegetative cover.

*Legumes should be planted in the spring, and fertilizer should be applied at the Nutrient Management Rate. Legume seed shall be inoculated with the appropriate strain and rate of bacteria. For hydroseeding, use three times the dry seeding rate of inoculant. Sericia lespedeza seed must be hulled if planted in the Growing period, and un-hulled if planted in the Dormant period.

**To be seeded on sites with greater than 3:1 slope and other area that is designated as an area that will not be mowed. Other legumes or listed companion species can be seed on non-mow and mow areas.

ROADSIDE DEVELOPMENT SEEDING FOR ACTIVE CONSTRUCTION - COASTAL PLAIN REGION - Worksheet for Roadside Managers

PROJECT:

Step 3. The District Roadside Manager completes the Seeding Schedule and Seeding Summarys.

PPMS#

DATE:

ISSUED BY:

Seeding Schedule

Assign Perminante Seed Mix with Nurse and Companion Species

Project Number	Project Area	NON-MOW	NOW	NON-MOW	NOW	NON-MOW	NOW
		Dormant Period Nov 15 - Feb 28/29		Growing Period Cool Season Feb 1* - May 14 Aug 16 - Nov 14		Growing Period Warm Season May 15 - Aug 15	
** Fine Fescue Type							

* Seed that is expected to lay dormant on site may be planted outside the cool and warm season Growing Period.
**Specify type as Chewings, Creeping Red, Hard and/or Sheep Fescue. May mix types.

Seeding Summary

Project Number	Topsoil 2" Class		Seeding				
	A	B	Regular Seeding	Temporary Seeding ١	Over Seeding	Legume Seeding	Legume Over Seeding
	Acres		lbs	lbs	lbs	lbs	lbs
0							
0							
0							
0							
0							
0							
Total			0	0			
Pay Item Quantities	0	0	0		0	0	0

١ **Temporary Seeding** quantities are included with Regular Seeding pay quantities.

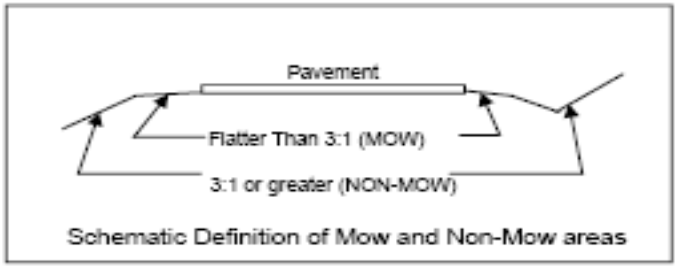
Note: All seed must be in conformance with the current Nutrient Management Plan and with VDOT seed specifications for Grasses and Legumes and be provided at the project site in bags labeled and not opened for use on VDOT projects with a green tag certifying inspection of the Virginia Crop Improvement Association.

Mulch and Topsoil Specifications

Type I mulch (Straw) to be used on newly seeded areas adjacent to all waterways, wetlands, swamps, sinkholes, or any area in which drainage flows toward areas under the jurisdiction of the environmental regulatory agencies. Type I shall be applied to provide a minimum of 90% coverage. Type I mulch shall be tacked with Fiber mulch at the rate of 750 lbs per acre and/or mulch tackifier.

Type II mulch (Wood Fiber Mulch) may be substituted for Type I mulch at the recommendation of the District Roadside Manager. Type II mulch shall be applied at a rate of 1500 (net dry weight) per acre to provide a minimum of 90 percent coverage, and shall be applied over the seed in a separate application.

All topsoil is to be free of hard lumps, clods, rocks and foreign debris, and is to be hand raked to tie into existing lawns.



Schematic Definition of Mow and Non-Mow areas

ROADSIDE DEVELOPMENT SEEDING FOR ACTIVE CONSTRUCTION - PIEDMONT REGION - WorkSheet for Roadside Managers

Seed Selection within Nutrient Management Guidelines:**Step 1**. Determine if the site will be seeded in the Dormant or Growing Period. Seeding of CORE MIX will be most effective if completed from March 15 to May 31 and Aug 1 through Oct 31, as these are periods of optimal establishment for cool season grasses. Over-seeding should be completed during this time of optimal establishment. If the project schedule dictates regular seeding during the Dormant Period or June - July than the establishment of the turf may be hindered. A Dormant Period Temporary Seeding mix should be used during the dormant period and may be used in the August through October period , based on weather and field conditions.

← Dormant Period →				
NOV	DEC	JAN	FEB	MARCH
1-30	1-31	1-31	1-29	1-15

← Growing Period →							
MARCH	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT
15-31	1-30	1-31	1-30	1-31	1-31	1-30	1-31

Step 2. Determine if the site will be seeded with a Permanente Seed Mix or Temporary Seed Mix within each Period (Shading indicates best time of year to plant).

PROJECT:

PPMS#

DATE:

ISSUED BY:

Approximately _____ Acres will be disturbed on this project and will require the establishment of **persistent and perennial grasses and/or legumes.**

Temporary Seed Mix

Dormant Period Seeding

Code	lbs/A	Description
D-1	100	20% Barley, Cereal Rye(Secale Cerial) or Winter Wheat & 80% Certified Tall Fescue
D-2	10	100% Barley, Cereal Rye(Secale Cerial) or Winter Wheat
D-3		

Growing Period Seeding

Code	lbs/A	Description
G-1	100	20% Foxtail Millet & 80% Certified Tall Fescue
G-2		

NOTE: The temporary seed, as directed by the Engineer, is to be used only on areas that are to be regraded, later disturbed or left dormant for more than 15 days.

Lime may be applied, fertilizer can be applied at 50% of Nutrient Management Rate. Fertilizer shall **NOT** be applied when the ground is frozen.

Erosion Control Mulch, as directed by the Engineer, is to be used on areas that are to be left dormant for more than 15 days between Dec 1 and February 29.
Erosion Control Mulch, as listed on the "VDOT Approved Product List," shall be applied in accordance with the manufacture's recommendations.
Erosion Control Mulch (or approved method) shall provide 100% coverage of all denuded areas of land.

Permanent Seed Mix for Regular Seeding and Over Seeding (Core Mix)

Code	lbs/A	Description
1	70	100% Certified Fine Fescue (Chewings, Creeping Red, Hard or Sheep)
2	100	100% Certified Tall Fescue
3	100	50% Certified Fine Fescue (Chewings, Creeping Red, Hard or Sheep) & 50% Certified Tall Fescue
4	20	50% Orchardgrass
5	0	No Natives
6	40	*100% Bermuda
7		

Over Seeding Note: Use 100% of seed mixture supplied. The Engineer will require the contractor to perform over seeding when the density of the persistent perennial cover is between 50-75%. Recommendations for the application of seed mixtures, fertilizer, lime, etc are to be obtained from the District Roadside Manager if less than 50% ground cover density of a persistent perennial cover as specified in the seeding mixture is obtained.

* Must be hulled if planted in the Growing Period, and un-hulled if planted in the Dormant Period

Nurse and Companion Species (Additives)

Code	lbs/A	Description
A	10	100% Barley, Cerial Rye (Secale cereal) or Winter Wheat (Dormant Period Nurse Crop)
B	10	100%Foxtail Millet (Growing Period Nurse Crop)
C	30	**100% Crown Vetch* (Companion)
D	10	**100% Sericia Lespedeza* (Companion)
E	10	100% Birdfoot Trefoil* (Companion)
F	10	100% White Clover* (Companion)
G	20	**100% Weeping Lovegrass
H		

A **Nurse** crop is annual species such as rye and millet are temporary varieties and are not considered permanent vegetative cover.

A **Companion** species is perennial grass and/or legumes added to the Permanente Seed Mix to enhance the probability of establishing a vegetative cover.

*Legumes should be planted in the spring, and fertilizer should be applied at the Nutrient Management Rate. Legume seed shall be inoculated with the appropriate strain and rate of bacteria. For hydroseeding, use three times the dry seeding rate of inoculant. Sericia lespedeza seed must be hulled if planted in the Growing period, and un-hulled if planted in the Dormant period.

**To be seeded on sites with greater than 3:1 slope and other area that is designated as an area that will not be mowed. Other legumes or listed companion species can be seed on non-mow and mow areas.

ROADSIDE DEVELOPMENT SEEDING FOR ACTIVE CONSTRUCTION - PIEDMONT REGION - Worksheet for Roadside Managers

PROJECT:

Step 3. The District Roadside Manager completes the Seeding Schedule and Seeding Summarys.

PPMS#

DATE:

ISSUED BY:

Seeding Schedule

Assign Perminante Seed Mix with Nurse and Companion Species

Project Number	Project Area	NON-MOW	NOW	NON-MOW	NOW	NON-MOW	NOW
		Dormant Period Nov 1 - March 15		**Growing Period Cool Season Feb 15* - May 31 Aug 1 - Oct 31**		**Growing Period Warm Season June 1 - July 31**	
**** Fine Fescue Type**							

* Seed that is expected to lay dormant on site may be planted outside the cool and warm season Growing Period.
**Specify type as Chewings, Creeping Red, Hard and/or Sheep Fescue. May mix types.

Seeding Summary

Project Number	Topsoil 2" Class		Seeding				
	A	B	Regular Seeding	Temporary Seeding ١	Over Seeding	Legume Seeding	Legume Over Seeding
	Acres		lbs	lbs	lbs	lbs	lbs
0							
0							
0							
0							
0							
0							
Total			0	0			
Pay Item Quantities	0	0	0		0	0	0

١ **Temporary Seeding** quantities are included with Regular Seeding pay quantities.

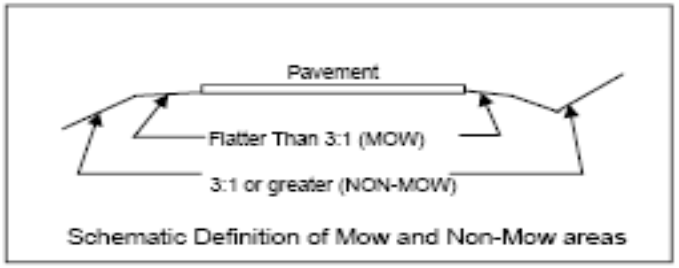
Note: All seed must be in conformance with the current Nutrient Management Plan and with VDOT seed specifications for Grasses and Legumes and be provided at the project site in bags labeled and not opened for use on VDOT projects with a green tag certifying inspection of the Virginia Crop Improvement Association.

Mulch and Topsoil Specifications

Type I mulch (Straw) to be used on newly seeded areas adjacent to all waterways, wetlands, swamps, sinkholes, or any area in which drainage flows toward areas under the jurisdiction of the environmental regulatory agencies. Type I shall be applied to provide a minimum of 90% coverage. Type I mulch shall be tacked with Fiber mulch at the rate of 750 lbs per acre and/or mulch tackifier.

Type II mulch (Wood Fiber Mulch) may be substituted for Type I mulch at the recommendation of the District Roadside Manager. Type II mulch shall be applied at a rate of 1500 (net dry weight) per acre to provide a minimum of 90 percent coverage, and shall be applied over the seed in a separate application.

All topsoil is to be free of hard lumps, clods, rocks and foreign debris, and is to be hand raked to tie into existing lawns.



Schematic Definition of Mow and Non-Mow areas

NUTRIENT MANAGEMENT for ACTIVE CONSTRICTION

Project No. :	PPMS No. :	NMP Issued by :	Date :

INTRODUCTION:

- In accordance with the provisions of the Nutrient Management Plan (NMP) all fertilizer may be applied between applied between March 15th and November 1st. In the Fredericksburg, Hampton Roads and Richmond Districts, fertilizer may be applied from March 1st and November 15th. When the Engineer determines that fertilization must be completed outside the NMP fertilization window, the fertilizer must be applied at the Temporary Seeding fertilizer rate.
- The N fertilizer rate is limited to 45 lbs/acre of nitrogen (1 lbs/1000 ft^2) at each application and separated by at least 30 days. A maximum of 90 lbs/acre (2 lbs/1000 ft^2) of 100% water soluble nitrogen (WSN) may be applied per year. Phosphorus, potassium and lime rates are based on soil test results.
- All fertilizer ratios are given on an N-P_2O_2-K_2O basis.
- There is a difference between the words "pounds of fertilizer per acre" and "pounds of nutrients per area." For example, 98 lbs/acre of 46-0-0 contains 45 lbs/acre of elemental nitrogen (N).
- In order to maximize fertilizer effectiveness and uptake efficiency, soil pH **must be adjusted** to the optimal range of 6.0 to 6.5 whenever fertilizers are applied. For normal soil materials, liming recommendations will be based upon standard agronomic criteria to maintain soil pH between 6.0 and 6.5. Lime rates are based on Tables 3-1 and 3-3 in the Virginia Nutrient Management Standards and Criteria, Revised October 2005. Lime rates supplied by the District Roadside Manager are based on liming materials at 100% CCE. Liming rates for materials that are not 100% CCE (± 10%) must be adjusted accordingly.
- VDOT will recognize environmentally sensitive sites as defined in Section 1A of the 2005 Virginia Nutrient Management Standards and Criteria and limit N and P applications appropriately. Nutrient application setbacks as set forth in Section 1B (e.g. 100 feet from wells or springs, 50 feet from surface water, 50 feet from sinkholes, 50 feet from naturally occurring limestone outcrops and 25 feet from all other naturally occurring rock outcrops) will be rigorously adhered to. However, this plan was developed such that the rate and timing of nutrient applications safeguards water quality and the plan is appropriate for use in environmentally sensitive areas. Nutrients may be applied closer to surface waters when appropriate erosion and sediment control BMP's are in place.
- Soil sampling and testing shall be executed prior to lime and nutrient application for new construction (any time the subsoil is disturbed) or repair of previously vegetated areas, AND the area is greater than 2 acres. (Soil samples should be collected as stated in the current Nutrient Management Plan.)

Type of Seeding	Area Acres	Fertilizer Ratio Lbs. /Ac	Lime Tons/Ac.		Fertilizer Tons	Lime Tons
Seeding on 2" of Class A or B Topsoil						
The Contractor shall submit soil samples for Class A or Class B topsoil analyzed by a Department of Conservation and Recreation approved laboratory; A&L Eastern Agricultural Laboratories, Brookside Laboratories, Spectrum Analytical Laboratories, Virginia Tech Soil Testing Laboratory, or Waters Agricultural Laboratories. **Soil analysis** of topsoil shall including pH, extractable nutrients, soluble salts, mechanical analysis (composition), salinity, percentage of organic content, and USDA soil texture class. Since the soil sample cannot be submitted by the Contractor until after the project is awarded, the NMP derived fertilizer ratio and lime rate for the Topsoil, will be specified after the start of the project. The District Roadside Manager will determine the amount and ratio of fertilizer that can be applied based on the soil test report and NMP.						

Regular Seeding Fertilizer Rate						
Only one application of fertilizer may be applied for the life of the project and will be applied with the Regular Seeding (core mix). The rate and type of fertilizer applied must conform to the NMP for Active Construction (Chapter 10). When the Engineer determines that additional seeding and fertilization is required, a new soil sample must be taken and tested, and the fertilizer rates and type must be applied in accordance with the NMP for Active Construction (Chapter 10). For over-seeding, use Over-seeding Fertilization Rate below. When the Engineer determines that regular seeding and fertilization must be completed outside the NMP fertilization window, fertilizer and lime must be applied at the Temporary Seeding rate. This rate is defined as 50% of the lbs/acre of the fertilizer ratio as specified for Regular Seeding and the lime at the rate of 1 tons/acre with 100% CCE (± 10%). The balance of the fertilizer and the lime (difference between the Regular Seeding and the Temporary Seeding fertilizer and lime rates) may be applied as directed by the Engineer to the same area after the fertilization window has once again opened.						
Temporary Seeding Fertilizer Rate						
The Temporary Fertilizer rate is defined as 50% of the lbs/acre of the fertilizer ratio ($N\text{-}P_2O_2\text{-}K_2O$) specified for Regular Seeding and lime at the rate of 1 tons/acre with 100% CCE (± 10%). The rate of fertilizer ($N\text{-}P_2O_2\text{-}K_2O$), applied after construction resumes, is based on whether or not the site is regraded to expose subsoil materials. 1. If the area receiving the Temporary Seeding fertilizer rate **is** regraded to expose subsoil, apply the Regular Seeding rate of fertilizer and lime. 2. If the area receiving the Temporary Seeding fertilizer rate **is not** regraded then apply only 50% of the Regular Seeding rate of $N\text{-}P_2O_2\text{-}K_2O$ and lime, no sooner than 30 days after previous fertilizer application.						

Over-seeding Fertilizer Rate						
The Engineer will require the contractor to over-seed an area when the existing stand of the permanent vegetative cover, as specified by the Roadside Development Sheet for that job (grass and/or legumes), covers between 50 and 75 percent of the ground. Nurse crop annual species such as rye and millet are temporary varieties and are not considered permanent vegetative cover. If less than 50% of the ground for the site is covered with permanent vegetation, the District Roadside Manager should be contacted to collect a soil sample. Recommendations for the application of seed mixtures, and a new NMP based fertilizer/lime recommendation will be developed based on the soil test report. Over-seeding should always be accompanied by the application of fertilizer and lime as specified in the NMP. The nitrogen application rate is limited to 45 lbs/acre (1 lbs/1000 ft^2) at each application and separated by at least 30 days, therefore over-seeding can be completed only when more than 30 days have passed since Regular Seeding. A maximum of 90 lbs/acre (2 lbs/1000 ft^2) of 100% water soluble nitrogen (WSN) may be applied per year. No additional phosphorus may be applied unless a new soil sample is taken and new NMP recommendations are developed based on the soil test report.						

ROADSIDE DEVELOPMENT NMP SUMMARY						
PROJECT NUMBERS	Fertilizer Ratio (46-0-0)	Fertilizer Ratio (5-10-10)	Fertilizer Ratio (10-10-10)	Fertilizer Ratio (15-30-15)	Fertilizer Ratio (0-46-0)	LIME
	TON	TON	TON	TON	TON	TON

⊗ DENOTES ITEM(S) TO BE PAID FOR ON BASIS OF PLAN QUANTITIES IN ACCORDANCE WITH CURRENT ROAD AND BRIDGE SPECIFICATIONS.

ROADSIDE DEVELOPMENT SHEET - NMP Lime And Fertilizer Calculations

Fertilizer Guidance for Active Construction

Suggested Fertilizer Analysis based on NMP and soil tests

This table provides guidance for the amount of fertilizer that can be applied according to the NMP. These are examples of fertilizers and their rates (lb/A) that can be used to meet each N-P-K ratio as indicated from laboratory soil test levels. Other ratios may be used as long as the desired pounds of nutrients per acre of **N** and P_2O_5 applied are the same. There is no restriction on the amount of **K_2O and lime** that can be applied in addition to the quantity specified. No additional P_2O_5 can be applied **for the term of the project** without a new soil sample and calculation of the desired pounds of nutrients per acre are based on the soil test and this table.

P_2O_5 Level*	Suggested Fertilizer Analysis	Desired Pounds of Nutrients per Acre (N-P_2O_5-K_2O)					Lime
		45-0-0	45-45-45	45-90-45	45-90-90	45-170-90	
Exception**	5-10-10				900 lb/A**		2 ton/A of lime at 100% CCE (±10%)
L- to L	5-10-10 Plus 0-46-0					900 lb/A of 5-10-10 plus175 lb/A of 0-46-0	Soil Test Rate****
L+ to M-	15-30-15			300 lb/A			Soil Test Rate****
M to M+	10-10-10		450 lb/A				Soil Test Rate****

Nitrogen (N) application is limited to 45 lb/A of N (1 lbs/1000 ft^2) at each application and separated by at least 30 days with a maximum of 90 lb/A (2 lbs/1000 ft^2) **per year**. Contact the District Roadside Manager if fertilizer with a N source with at least 30% Water Insoluble Nitrogen (WIN) is to be used.

Organic Sources of nutrients may be used for only for Active Construction. They should be applied to supply 45-50 lbs/A of plant available nitrogen (PAN).

Nutrient application **set-backs** as set forth in Section 1B (e.g. 100 feet from wells or springs, 50 feet from surface water, 50 feet from sinkholes, 50 feet from naturally occurring limestone outcrops and 25 feet from all other naturally occurring rock outcrops) will be rigorously followed. However, nutrients may be applied closer to surface waters when appropriate erosion and sediment control BMP's are in place.

* These indicate the level of P_2O_5 reported in the soil test, ie. L=Low, M=Medium, H=High, and VH=Very High. When the soil test level of P_2O_5 is at H- or greater, no P may be applied.

** The only time this rate is applied is if the total disturbed area for the project is less than 2 acres AND the subsoil is exposed. This amount of N and P_2O_5 may be applied without a soil test as a one time application.

*** This ratio may be used when P_2O_5 may not be applied OR when a soil test is not taken, but when N is required to improve turf quality.

**** Lime quantities will be calculated based on soil test buffer pH.

Version 11/10/07

PROJECT:

PPMS# **DATE:**

ISSUED BY:

Table 3-1 Lime Recommendations (tons/acre)
Target Soil pH 6.2
Lime Rates based on VA Tech Soil buffer pH (Buffer meq/100g)

Buffer pH	Tons/Acre
6.60	0.00
6.50	0.00
6.40	0.00
6.38	0.25
6.36	0.25
6.34	0.25
6.32	0.50
6.30	0.50
6.28	0.75
6.26	0.75
6.24	0.75
6.22	1.00
6.20	1.00
6.18	1.25
6.16	1.25
6.14	1.50
6.12	1.50
6.10	1.50
6.08	1.75
6.06	1.75
6.04	2.00
6.02	2.00
6.00	2.00
5.95	2.25
5.90	2.50
5.85	2.75
5.80	3.25
5.75	3.50
5.70	3.75
5.65	4.00
5.60	4.25
5.55	4.50
5.50	4.75
5.40	5.25
5.30	5.75

Lime recommendations in the table above are based on the use of a liming material equivalent in neutralizing power to 100% CaCO3. For application rates of liming material that is less than 100% neutralizing power of CaCO3 (pure calcium carbonate) use the table in this section, Lime Rate Adjustment for CCE.

Lime Recommendations Using Other Testing Labs

For approved labs other than Virginia Tech, use the lime recommendations given by the lab. IF there are no recommendations with the soil analysis, use the table below for A&L Agricultural, Spectrum Analytical, and Brookside Laboratories.

Table 3-2

Lime Application Rate [1] (tons/acre) to achieve desired pH of 6.2 based on SMP Buffer Test

Target Soil pH

Soil-Buffered pH	**Tons/Acre**
6.9	**0.50**
6.8	**1.00**
6.7	**1.50**
6.6	**2.00**
6.5	**2.50**
6.4	**4.00**
6.3	**4.00**

[1] Ag-ground lime of 90% plus total neutralizing power (TNP) or CaCO3 equivalent., and fineness of 40% < 100 mesh, 50% < 60 mesh, 70% < 20 mesh and 95% < 8 mesh. Adjustments in the application rate should be made for liming materials with different particle sizes, or neutralizing value.

Waters Agricultural Laboratories uses the Adams and Evans single buffer method which uses a different table for recommendations than the Mehlich or the SMP tables supplied here. In the event you would have lab reports from Waters Lab, which do not have lime recommendations, contact the lab for recommendations based on their analysis procedure.

Lime Rate Adjustment for CCE All Labs

Liming rates (tons/acre) for materials that are not 100% CCE (+ 10%) must be adjusted based on table 3-3. Using the lime application rate to achieve the desired target pH based on the soil test buffer pH, use the table below to adjust that rate based on the % CCE of the liming material to be applied.

Table 3-3
Lime Application Rate Adjustment Based on % CCE of Material

	% CCE of Your Liming Material										
T/ac*	50	60	70	80	90	100	110	120	130	140	150
0.5	1.00	0.75	0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.25	0.25
1.0	2.00	1.75	1.50	1.25	1.00	1.00	1.00	0.75	0.75	0.75	0.75
1.5	3.00	2.50	2.25	2.00	1.75	1.50	1.25	1.25	1.25	1.00	1.00
2.0	4.00	3.25	2.75	2.50	2.25	2.00	1.75	1.50	1.50	1.50	1.25
2.5	5.00	4.25	3.50	3.25	2.75	2.50	2.25	2.00	2.00	1.50	1.50
3.0	6.00	5.00	4.25	3.75	3.25	3.00	2.75	2.50	2.25	2.25	2.00
3.5	7.00	5.75	5.00	4.50	4.00	3.50	3.25	3.00	2.75	2.50	2.25
4.0	8.00	6.75	5.75	5.00	4.50	4.00	3.75	3.25	3.00	2.75	2.75

Lime recommendation to adjust pH as determined from soil test analysis.

Fertilizer Guidance for Active Construction

Suggested Fertilizer Analysis based on NMP and soil tests

This table provides guidance for the amount of fertilizer that can be applied according to the NMP. These are examples of fertilizers and their rates (lb/A) that can be used to meet each N-P-K ratio as indicated from laboratory soil test levels. Other ratios may be used as long as the desired pounds of nutrients per acre of **N** and **P_2O_5** applied are the same. There is no restriction on the amount of **K_2O and lime** that can be applied in addition to the quantity specified. No additional P_2O_5 can be applied **for the term of the project** without a new soil sample and calculation of the desired pounds of nutrients per acre are based on the soil test and this table.

P_2O_5 Level*	**Suggested Fertilizer Analysis**	**Desired Pounds of Nutrients per Acre (N-P_2O_5-K_2O)**					**Lime**
		45-0-0	**45-45-45**	**45-90-45**	**45-90-90**	**45-170-90**	
Exception**	5-10-10				900 lb/A**		2 ton/A of lime at 100% CCE (±10%)
L- to L	5-10-10 Plus 0-46-0					900 lb/A of 5-10-10 plus175 lb/A of 0-46-0	Soil Test Rate****
L+ to M-	15-30-15			300 lb/A			Soil Test Rate****
M to M+	10-10-10		450 lb/A				Soil Test Rate****

Nitrogen (N) application is limited to 45 lb/A of N (1 lbs/1000 ft^2) at each application and separated by at least 30 days with a maximum of 90 lb/A (2 lbs/1000 ft^2) **per year**. Contact the District Roadside Manager if fertilizer with a N source with at least 30% Water Insoluble Nitrogen (WIN) is to be used.

Organic Sources of nutrients may be used for only for Active Construction. They should be applied to supply 45-50 lbs/A of plant available nitrogen (PAN).

Nutrient application **set-backs** as set forth in Section 1B (e.g. 100 feet from wells or springs, 50 feet from surface water, 50 feet from sinkholes, 50 feet from naturally occurring limestone outcrops and 25 feet from all other naturally occurring rock outcrops) will be rigorously followed. However, nutrients may be applied closer to surface waters when appropriate erosion and sediment control BMP's are in place.

* These indicate the level of P_2O_5 reported in the soil test, ie. L=Low, M=Medium, H=High, and VH=Very High. When the soil test level of P_2O_5 is at H- or greater, no P may be applied.

** The only time this rate is applied is if the total disturbed area for the project is less than 2 acres AND the subsoil is exposed. This amount of N and P_2O_5 may be applied without a soil test as a one time application.

*** This ratio may be used when P_2O_5 may not be applied **OR** when a soil test is not taken, but when N is required to improve turf quality.

**** Lime quantities will be calculated based on soil test buffer pH.

Version 11/10/07

Fertilizer Guidance for Roadside Maintenance

Suggested Fertilizer Analysis based on NMP and soil tests

This table provides guidance for the amount of fertilizer that can be applied according to the NMP. These are examples of fertilizers and their rates (lb/A) that can be used to meet each N-P-K ratio as indicated from laboratory soil test levels. Other ratios may be used as long as the percentages of **N** and **P_2O_5** applied are the same. There is no restriction on the amount of **K_2O and lime** applied. Please remember that up to 90lb of N per acre can be applied in a year, but applications have to be more than 30 days apart. Once sampled, soil test data for a given location may be used for all remaining years under the NMP, and the same amount of fertilizer may be applied yearly. Remember to report all fertilizer and lime applications on a worksheet similar to that attached to the NMP.

P_2O_5 Level*	**Suggested Fertilizer Analysis**	**Desired Pounds of Nutrients per Acre (N-P_2O_5-K_2O)**				**Lime**
		45-0-0	**45-45-45**	**45-90-45**	**45-90-90**	
Exception**	5-10-10				900 lb/A**	2 ton/A of lime at 100% CCE (±10%)
L- to M-	15-30-15			300 lb/A		Soil Test Rate****
L- to M-	15-30-15 with 30% WIN			400 lb/A		Soil Test Rate****
M to M+	10-10-10		450 lb/A			Soil Test Rate****
M to M+	20-20-20		225 lb/A			Soil Test Rate****
H- to VH	46-0-0	98 lb/A***				Soil Test Rate****

N application is limited to **90 lb/A per year**. May use 120lb/A in a year if the N source contains at least 30% Water Insoluble Nitrogen (WIN).

Organic Sources may **not** be used for Roadside Maintenance.

Nutrient application **set-backs** as set forth in Section 1B (e.g. 100 feet from wells or springs, 50 feet from surface water, 50 feet from sinkholes, 50 feet from naturally occurring limestone outcrops and 25 feet from all other naturally occurring rock outcrops) will be rigorously followed. However, nutrients may be applied closer to surface waters when appropriate erosion and sediment control BMP's are in place.

*These indicate the level of P_2O_5 reported in the soil test, ie. L=Low, M=Medium, H=High, and VH=Very High. When the soil test level of P_2O_5 is at H- or greater, no P may be applied.

**If subsoil is exposed and site is less than 2 acres, then use this rate of N and P. If the subsoil is not exposed and the site is to be over-seeded, then a soil test must be taken prior to P_20_5 application.

*** This ratio may be used when P_2O_5 may not be applied **OR** when a soil test is not taken, but when N is required to improve turf quality.

**** Lime quantities will be calculated based on soil test buffer pH.

Version 11/10/07

Determining Lime Requirement by On-Site Soil Testing with pH Indicator Strips

Introduction

The current VDOT Nutrient Management Plan allows Roadside Managers to forgo soil testing if the size of the area to be vegetated is less than 2 acres and subsoil materials are exposed. The amount of lime allowed is set at 2 tons/A. However, in some areas this amount of lime may be not needed if the soil pH is between 6.0-6.5. Applying additional lime to soils with adequate pH will force the pH above the recommended level which can also be harmful to plant uptake of certain nutrients, and is costly.

It is easy to test soil pH on-site and to calculate how much lime to apply. This protocol will explain how this is done.

Background Information

The soil pH is the amount of “active” acidity in the water that surrounds soil particles. It is a direct measure of the hydrogen ion concentration in a soil:water slurry. This is referred to as “Water pH,” and it is determined by suspending soil into distilled water on a 1:1, volume to volume ratio. This is what you will be measuring when you perform an on-site pH test.

However, you should be aware that when you send soil to an approved soil testing laboratory, they will perform both the “Water pH” test as well as “Buffer pH” tests*. The latter test measures the total acidity that is in the soil solution, which includes “active” and “residual” acidity, but the pH value itself is meaningless with respect to actual soil pH. The Buffer pH test is a more exact predictor of how much lime is required to neutralize the hydrogen ions. This test also “self-adjusts” for different types of soil texture. When doing an on-site pH test using indicator strips with distilled water, you are performing the “water” pH test. The next step is to calculate the amount of lime required by the use of two tables which account for soil texture and different liming agents.

For more information, check out these sites:

http://www.uky.edu/Ag/ukturf/pubs.htg/Lawn%20Care/id72.htm
http://extension.agron.iastate.edu/soilfertility/presentations/soilphliming04.pdf

* *As a side note, some labs use a Mehlich buffer solution to perform this test.*

Supplies Needed for On-Site Soil Water pH Test

1) **Small Paper Cup**

2) **1/8th Cup Dry Measure & 1 Cup Wet Measure**

Dry Measure

Wet Measure

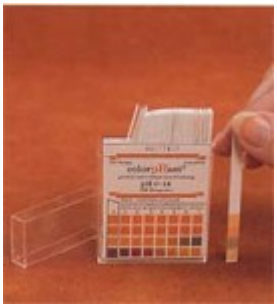
3) **Jug of Distilled Water from Grocery Store or Pharmacy**

4) **Disposable Straw or Coffee Stir Straw**

5) **pH Indicator Strips - Wide Range**
Whatman 53280 (4.5-10) Color-Bonded pH Strips 100 for $19 (do not need to use this if you use the ColorpHast brand)

6) **pH Indicator Strips - Narrow Range**
ColorpHast by Merck comes in various ranges, but buy the narrow range 4-7. They cost around $18/100 strips. With this brand you do not need the broad range (1-14).
http://www.sanitationtools.com/Products.asp?Product=1438&Category=65

Whatman 53283 Integral Comparison Strips 3.8-5.5 range, 0.2 pH units
53284 Integral Comparison Strips 5.2-6.8 range, 0.2 pH units
200 strips for $30
http://www.labsafety.com/search/pH+indicator+strips/34548/
These are more accurate, but need to use the wide range strips to determine the range to decide which narrow range strip to use.



Protocol for On-Site Soil Water pH Test

1. Sample the area to be seeded in the prescribed zig-zag pattern as described in the Nutrient Management Plan. Take all 20 sub-samples and mix them in a bucket (paint bucket works well). Remove rocks, vegetation, bark, debris. From the well-mixed soil, remove a scoop with the 1/8th cup dry measuring cup. Pack down the soil with light pressure and take a knife to level off the top.
2. Add the soil to the disposable cup. Pour 1/8th of a cup of ***Distilled*** water into the wet measuring cup. Add this to the cup and use the stir straw to mix for about 30 seconds or until all soil is wet.
3. The solid should sink to the bottom. The liquid may be brown, but that is fine. Take a wide range strip (unless you are using the colorpHast brand) and dip the color end into the solution. You may need to tilt the cup gently to have enough liquid to submerge the strip. Count to 10 and pull out. If the tape is covered in dirt, use a tissue to gently wipe off the dirt. Then compare the colors on the tape to that on the box. If you do not feel confident with the result, dip a new strip.
4. Now you should have a ball-park estimate of the water pH of the soil. Test the solution with the narrow-range strip to get a more accurate reading.
5. The next step is to calculate how much lime is required to raise the pH between 6.0-6.5.

Calculating The Lime Rate

1. You need two pieces of information to do this part. You need the WATER pH that you determined prior to this part, and you need to know the soil's texture which is then used to estimate soil charge or CEC.
2. Soil texture can be determined in a soil testing laboratory, but also can be done by the feel of the soil in your hand. If you have never done this before, find someone who has and ask them for a lesson. Once you do this a couple of times, you will readily be able to estimate the general soil texture class for this purpose. Generally, soils with sand, loamy sand, coarse sandy loam have CEC between 2-5 meq/100g soil. The CEC of soils with fine sandy loam, loam, silt loam is between 5-15. And the CEC of soils with clay, clay loam will be greater than 15. In other words, the finer the soil particles, the higher the CEC, and more lime will be required to satisfy the total acidity present.
3. Use Tables 1 & 2 on the next two pages to determine how much lime must be applied to raise the pH between 6.0-6.5.
4. Lime will remain active in the soil for 2 to 3 years. If lime was previously applied to the soil with in this period and the pH is close to 6.0 (+/- 0.2) there is no need to apply more at this time.

Table 1. Amount of Lime (assume CCE at 100%)* to Raise Soil pH to 6.5 by Soil Texture and Water pH			
Sandy Texture			
Water pH**	**lb/1000 sq ft**	**lb/A**	**T/A**
4.8***	135	5,880	2.94
5.0	120	5,230	2.61
5.5	80	3,480	1.74
6.0	45	1,960	0.98
Loamy Texture			
Water pH	**lb/1000 sq ft**	**lb/A**	**T/A**
4.8	180	7,8401	3.92
5.0	145	6,316	3.16
5.5	85	3,703	1.85
6.0	60	2,614	1.31
Clayey Texture			
Water pH	**lb/1000 sq ft**	**lb/A**	**T/A**
4.8	200	8,712	4.36
5.0	170	7,405	3.70
5.5	110	4,792	2.40
6.0	70	3,049	1.52

*Not all liming materials are the same. Pure calcium carbonate (calcite, CaCo3) is the standard agricultural limestone product and its calcium carbonate equivalent (CCE) and its “Neutralizing Value” (NV) are both 100%. Most liming products NV is between 85-90%.

Some products such as dolomitic limestone contains both calcium carbonate and magnesium carbonate. Its NV is between 108-195%, and less dolomite is needed compared to pure calcite . Therefore, it is necessary to know the “Neutralizing Value” of the product because you may need to apply more or less than indicated in Table 1.

**There are gaps between water pH values in this chart. If the water pH value is between numbers, round the pH down. For example, if the water pH value you measured with the pH indicator strip is 5.2 in Clayey soil, then apply 3.70 tons/A of limestone with NV of 100%.

*** If the pH value is **less than 4.0**, then this may be **sulfidic materials** you are dealing with. Liming recommendations must be based of reactive potential acidity on acid-base accounting. Consult Lee Daniels at Virginia Tech for more information (http://www.cses.vt.edu/revegetation/remediation.html)

Calculating Amount of Lime to Apply When the CCE/NV is Not 100%

Table 2 is from DCR's Nutrient Management Standards and Criteria (2005) and provides an easy way to calculate how much lime based on NV/CCE to apply. The left hand column provides the amount of lime (T/A) needed as directed in Table 1. In the top row, find the NV or CCE of your lime. Now you can determine in T/A how much of your specific lime product to apply.

Table 2.Lime Applications Rate Adjustment Based on % CCE (NV) of Material

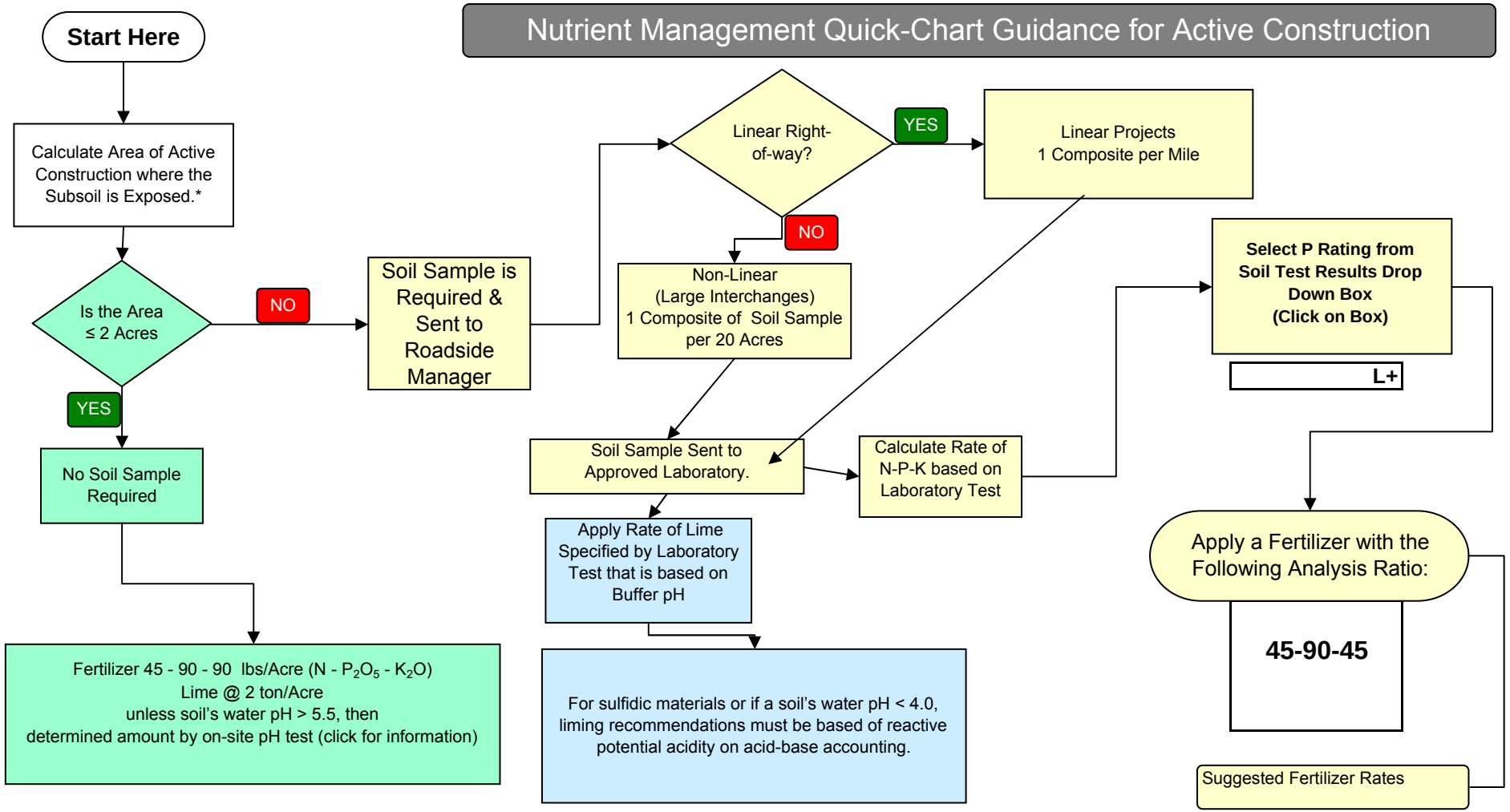
	% CCE of Liming Material										
T/A lime from Table 1	50	60	70	80	90	100	110	120	130	140	150
0.5	1.00	0.75	0.75	0.75	0.50	0.50	0.50	0.50	0.50	0.25	0.25
1.0	2.00	1.75	1.50	1.25	1.00	1.00	1.00	0.75	0.75	0.75	0.75
1.5	3.00	2.50	2.25	2.00	1.75	1.50	1.25	1.25	1.25	1.00	1.00
2.0	4.00	3.25	2.75	2.50	2.25	2.00	1.75	1.75	1.50	1.50	1.25
2.5	5.00	4.25	3.50	3.25	2.75	2.50	2.25	2.00	2.00	1.75	1.75
3.0	6.00	5.00	4.25	3.75	3.25	3.00	2.75	2.50	2.25	2.25	2.00
3.5	7.00	5.75	5.00	4.50	4.00	3.50	3.25	3.00	2.75	2.50	2.25
4.0	8.00	6.75	5.75	5.00	4.50	4.00	3.75	3.25	3.00	2.75	2.75

Conclusion

At this point you should know how much lime should be added to adjust the pH of the soil to the desired level. You should know how much of the specific liming agent to use based on CCE/NV.

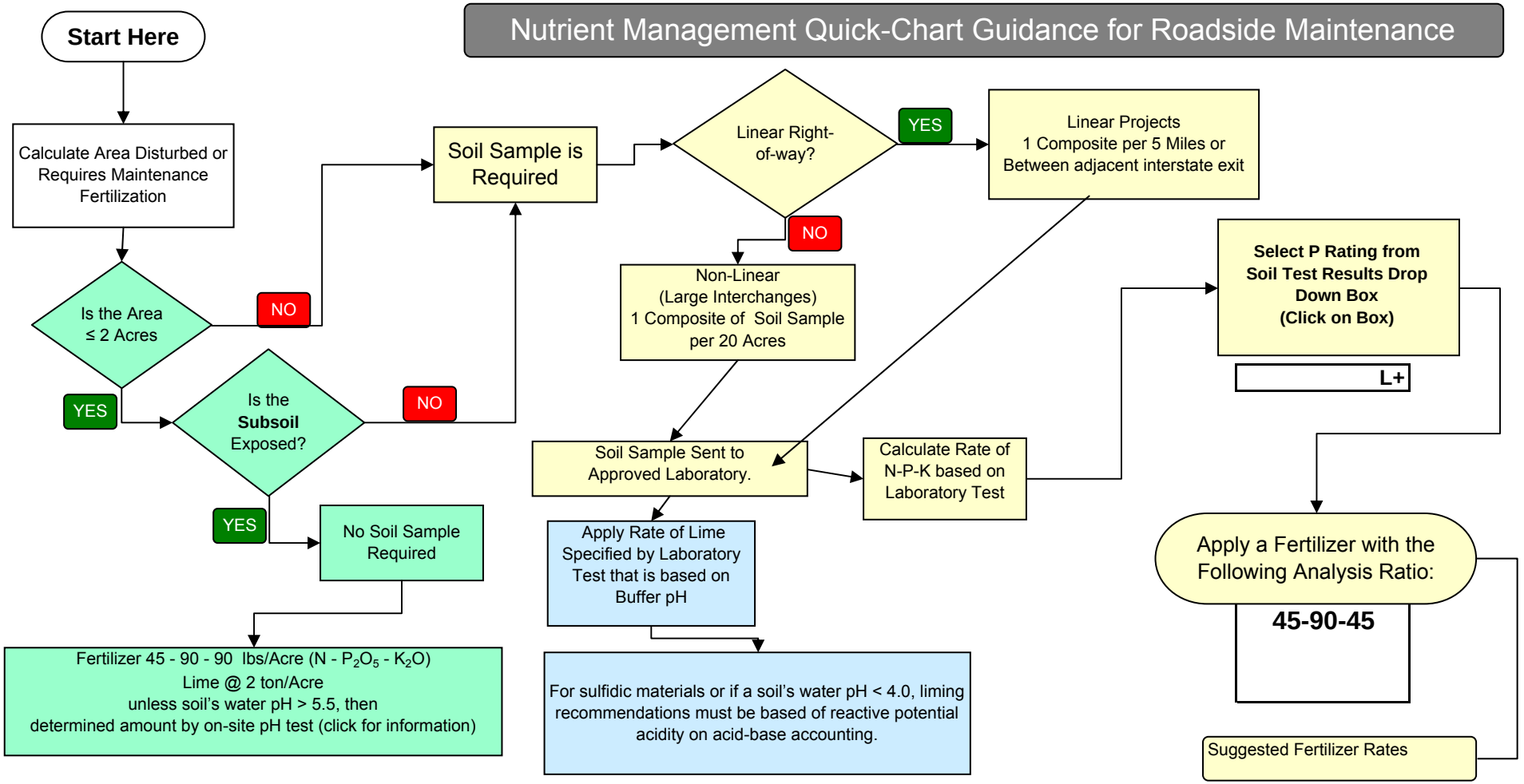
If you have questions, please contact W. Lee Daniels at Virginia Tech, Dept CSES - 540-231-7175 or wdaniels@vt.edu

Nutrient Management Quick-Chart Guidance for Active Construction



09/25/2008

Nutrient Management Quick-Chart Guidance for Roadside Maintenance



09/25/2008

S107F00-0708

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
STORM WATER POLLUTION PREVENTION PLAN

November 19, 2007c
Reissued July 2008

INTRODUCTION

The Storm Water Pollution Prevention Plan (SWPPP) is comprised of, but not limited to, the Erosion and Sediment Control (ESC) Plan, the Stormwater Management (SWM) Plan and related Specifications and Standards contained within all contract documents and shall be required for all land-disturbing activities that disturb 10,000 square feet or greater, or 2,500 square feet *(930 square meters or greater, or 232 square meters)* or greater in Tidewater, Virginia. For the purposes of identifying the affected regions assigned to this designation and the requirements therein Tidewater, Virginia is defined as the Counties of Accomack, Arlington, Caroline, Charles City, Chesterfield, Essex, Fairfax, Gloucester, Hanover, Henrico, Isle of Wight, James City, King George, King and Queen, King William, Lancaster, Mathews, Middlesex, New Kent, Northampton, Northumberland, Prince George, Prince William, Richmond, Spotsylvania, Stafford, Surry, Westmoreland and York and the Cities of Alexandria, Chesapeake, Colonial Heights, Fairfax, Falls Church, Fredericksburg, Hampton, Hopewell, Newport News, Norfolk, Petersburg, Poquoson, Portsmouth, Richmond, Suffolk, Virginia Beach and Williamsburg.

For land-disturbing activities that disturb 1 acre or greater, or 2500 square feet or greater *(.4 hectare or greater, or 232 square meters or greater)* in an area designated as a Chesapeake Bay Preservation Area, coverage under the Department of Conservation and Recreation's Virginia Stormwater Management Program (VSMP) General Construction Permit DCR-01 is required. Where applicable, the Department will apply for and retain coverage under this permit for the land disturbing activity. The requirements of this permit will be satisfied by the Contractor's compliance with the project's SWPPP terms and conditions.

The Engineer shall ensure that the SWPPP is kept on the project site at all times and shall be available for review upon request.

The Contractor shall be responsible for reading, understanding, and complying with the terms and conditions of the DCR-01 General Permit and the project's SWPPP as follows:

I. Project Implementation Responsibilities

The Contractor shall be responsible for the installation, maintenance, inspection, and ensuring the functionality of all erosion and sediment control measures on a daily basis and all other stormwater and pollutant runoff control measures identified within or referenced within the plans, Specifications, permits, and other contract documents.

The Contractor shall take all reasonable steps to prevent or minimize any stormwater or non-stormwater discharge that will have a reasonable likelihood of adversely affecting human health or public and/or private properties.

II. Certification Requirements

In addition to satisfying the personnel certification requirements contained in Section 107.16(a) of the Specifications the Contractor shall certify his activities by completing, signing, and submitting Form C-45 VDOT SWPPP Contractor and Subcontractor Certification Statement to the Engineer at least 7 days prior to commencing any project related land-disturbing activities, both on-site and off-site.

III. Off Site (Outside the Construction Limits) Requirements

The Contractor shall develop erosion and sediment control plan(s) and stormwater pollution prevention plan(s) for submission and acceptance by the Engineer prior to usage of any support facilities, off-site borrow and disposal areas, construction materials or equipment storage areas, and any other areas that may generate a stormwater or non-stormwater discharge directly related to the construction process. Such plans, upon acceptance, shall become a part of and subject to the overall project plan, the VSMP General Construction Permit, and all other contract requirements.

IV. Reporting Procedures

A. Inspection Requirements

The Contractor shall be responsible for conducting inspections in accordance with the requirements of Section 107.16(a) of the Specifications. The Contractor shall document such inspections by completion of Form C-107 (a) and (b), Construction Runoff Control Inspection Form and Continuation Sheet, in strict accordance with the directions contained within the form.

B. Unauthorized Discharge Requirements

The Contractor shall not discharge into state waters sewage, industrial wastes, other wastes or any noxious or deleterious substances nor shall otherwise alter the physical, chemical, or biological properties of such waters that render such waters detrimental for or to domestic use, industrial consumption, recreational or other public uses.

(1) **Notification of non-compliant discharges**

The Contractor shall immediately notify the Engineer upon the discovery of or potential of any unauthorized, unusual, extraordinary, or non-compliant discharge from the land disturbing activity. Where immediate notification is not possible, such notification shall be not later than 24 hours after said discovery.

(2) **Detailed report requirements for non-compliant discharges**

The Contractor shall submit to the Engineer within 5 days of the discovery of the any actual or potential non-compliant discharge a written report describing details of the discharge to include its volume, location, cause, and any apparent or potential effects on private and/or public properties and state waters or endangerment to public health, as well as steps being taken to eliminate the discharge. A completed Form C-107 (a) and (b) shall be used for such reports.

V. Plans, Changes, Deficiencies and Revisions

A. Contractor SWPPP

The Contractor shall develop and provide a SWPPP that documents the location and description of potential pollutant sources such as vehicle fueling areas, storage areas for fertilizers or chemicals, sanitary waste facilities, construction and waste material storage areas, etc. prior to any such pollutant sources being established on the project site. Such plans and documentation shall include a description of the controls to reduce, prevent and control pollutants from these sources including spill prevention and response. The Contractor shall submit such plans and documentation as specified herein to the Engineer and, upon review and approval, they shall immediately become a component of the project's SWPPP and subject to all corresponding requirements contained therein.

B. Changes and Deficiencies

The Contractor shall report to the Engineer when any planned physical alterations or additions are made to the land disturbing activity or deficiencies in the project plans or contract documents are discovered that could significantly change the nature or increase the quantity of the pollutants discharged from the land disturbing activity to surface waters.

C. Revisions to the SWPPP

Where site conditions or construction sequencing or scheduling necessitates revisions or modifications to the erosion and sediment control plan or other any other component of the SWPPP for the land disturbing activity, such revisions or modifications shall be approved by the Engineer and shall be documented by the Contractor on a designated plan set (Record Set). Such plans shall be kept on the project site at all times and shall be available for review upon request.

C-45
Rev. 11-9-07

VIRGINIA DEPARTMENT OF TRANSPORTATION

Stormwater Pollution Prevention Plan (SWPPP)
Contractor and Subcontractor Certification Statement

Order No.: _____ Project Number: _____

Route: _____ Contract ID. #: _____

I certify under penalty of law that I understand the terms and conditions of the project contract, plans, permits, specifications and standards related to the erosion and sediment control, stormwater management and stormwater pollution prevention plan requirements for the affected activities associated with this project, the Virginia Stormwater Management Program (VSMP), and the General Construction Permit (DCR01), if applicable to this project, issued by the Virginia Department of Conservation and Recreation. The VSMP Permit authorizes the storm water discharges associated with the construction activities from the project site identified and described in the bid documents and subsequent contract including any off-site support activities required for the complete fulfillment of the work therein.

Signature: _____

Name: _____

Title: _____

Contracting Firm: _____

Address: _____

Phone Number: _____

Address/Description of Site: _____
(Include off-site areas)

_____

Certified on this date: _____

(Note: This form must be returned with performance and payment bonds)