

# Chapter 10


## Active Construction Nutrient Management Plan Virginia Department of Transportation

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## Table of Contents

| <b>Chapter 10: Active Construction<br/>Nutrient Management Plan for VDOT</b> | <b>Page<br/>Number</b> |
|--|------------------------|
| 1. Site Description & Sampling Information                                   | 3                      |
| 2. Nutrient & Lime Recommendations and<br>Nutrient Application Worksheet     | 5                      |
| 3. Nutrient Management Guidelines  | 6                      |
| A. Season of Application and Cautions  | 6                      |
| B. Impervious Surfaces   | 6                      |
| C. Management to Improve Density<br>of Turf without Use of Fertilizers       | 6                      |
| D. Environmentally Sensitive Areas   | 6                      |
| E. Use of Iron   | 7                      |
| F. Organic Nutrient Sources  | 7                      |
| G. Samples of Fertilizer Ratios<br>Appropriate for VDOT Use                  | 9                      |
| H. Spreader Calibration  | 9                      |
| 4. Record of Actual Nutrient Applications                                    | 11                     |

# Chapter 10: Active Construction

## General Nutrient Management Plan for VDOT

The Virginia Department of Transportation (VDOT) agrees to comply with all requirements set forth in the Nutrient Management Training and Certification Regulations, 4 VAC 5-15-10 *et seq.*, and to follow recommendations for turf fertilization and management as described in the Virginia Nutrient Management Standards and Criteria, Revised October 2005. This includes implementing the Department of Conservation and Recreation's approved **Nutrient Management Plan**, and submitting an **Annual Activity Report**.

All nutrient applications performed by VDOT staff shall comply with the provisions of this Nutrient Management Plan as of July 1, 2006. Any contracts bid on or after December 10, 2006, must comply with this Nutrient Management Plan. Any long term construction contracts for specific projects bid prior to July 1, 2006 are exempt from the terms of this plan except that should any section of the contract involving nutrient applications be re-negotiated during the life of the contract, the new sections of the contract must comply with the terms of this Nutrient Management Plan

### 1. Site Description & Sampling Information

This nutrient management plan was written to accommodate lime and fertility management for establishment and maintenance of perennial vegetation at active construction sites statewide. The data and information presented in this plan were compiled by Jody Booze-Daniels and W. Lee Daniels, CSES Dept., Virginia Tech. 540-231-7175; [wdaniels@vt.edu](mailto:wdaniels@vt.edu).

#### Soil Types, Sampling and Fertilizer Application Requirements:

Virtually all portions of VDOT active construction areas that receive fertilizers are drastically disturbed cut/fill landscapes which are mapped by USDA-NRCS as either "Udorthents" or "made land". Therefore, it is impossible to assign conventional soil series and associated soil productivity groupings for nutrient management planning. Due to their general lack of native topsoil covers, and frequent occurrence of compaction and poor soil structure, all soils managed by VDOT are assigned to Productivity Group III or IV for the purpose of nutrient management planning.

When dry fertilizer is used, it shall be applied uniformly to the seeding areas at the time of seeding. All slow release and slowly soluble fertilizer may be applied through a hydraulic seeder except for Sulfur Coated Urea (SCU). The method of application for all fertilizer products shall be approved by the Engineer prior to applying the fertilizer. When applied in liquid form or mixed with water, fertilizer shall provide the same value of nutrients per acre as specified for dry fertilizer. Fertilizer applied in liquid form shall be constantly agitated during application.

Lime and nutrient recommendations must be based upon an appropriate recent ( $\leq 1$  year) soil sample analysis. For active construction areas in excess of 2 (two) acres, a recent composite soil sample of the area to be vegetated and/ or revegetated must be collected and analyzed before

lime and fertilizers are applied. For large linear projects, soil analysis to represent no more than 1 (one) linear mile per sample is required.

**Soil Tests:** Soil sampling and testing shall be executed prior to nutrient application for new construction or repair of previously vegetated areas. Soil samples shall be required to represent no more than 20 acres per sample. For linear projects such as along rights-of-way, a soil test shall be required within each linear mile. A minimum of 20 sub-samples, representative of the entire area, taken at a depth of 0" to 4" per sample shall comprise a soil sample. Soil samples shall be analyzed by a Department of Conservation and Recreation approved laboratory; namely, A&L Eastern Agricultural Laboratories, Brookside Laboratories, Spectrum Analytical Laboratories, Virginia Tech Soil Testing Laboratory, or Waters Agricultural Laboratories.

For site disturbance to 2 (two) acres or less of land, whether in a block or along a linear path, fertilizer may be applied without a soil test at the following rate: 45 lbs. N, 90 lbs. P<sub>2</sub>O<sub>5</sub>, and 90 lbs. K<sub>2</sub>O per acre. Lime should be applied at 2 (two) tons per acre when a soil test is not available.

When problem sites occur where vegetation is failing, a new soil test shall be required in addition to a site assessment for soil physical problems such as compaction. Once the causal problem has been determined and site-specific remedial action taken (such as low pH followed by lime application) has occurred, any vegetative re-establishment shall follow the specification rates listed in the table on the following page for Active Construction.

**Soil Sampling Methods:** Take 20 or more sub-samples from the upper 4" of soil, from different locations within each uniform sampling area to make a composite sample. Take the sub-samples in a random manner, such as with a zigzag pattern to minimize the variability that may be present in your sampling area. This allows you to obtain a reasonably representative soil sample. Soil samples must be analyzed for pH, phosphorus, and potassium.

The larger the area, the more sub-samples that are needed. The more sub-samples you take, the more representative your sample will be of your landscape area. When you realize that your 1/2 pound composite sample could represent up to 2 million pounds of soil, you can understand why proper sampling is so important.

When you have taken sufficient sub-samples from a uniform area, thoroughly mix the sub-sample slices or cores, breaking up clumps and removing all foreign matter such as roots, stalks, rocks, etc. (<http://www.soiltest.vt.edu>)

## 2. Nutrient & Lime Recommendations and Nutrient Application Worksheet

Appropriate soil sampling and analysis is essential for effective nutrient management planning. 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.

### **Nutrient Recommendations:**

***Nitrogen Fertilizer:*** The rate is limited to 45 lb nitrogen /A (1 lb/1000 ft<sup>2</sup>) at each application and separated by at least 30 days. A maximum of 90 lb/A (2 lb/1000 ft<sup>2</sup>) of 100 % water soluble nitrogen (WSN) may be applied per year. Cool season grasses should receive at least 75% of their total fertilizer in the fall and the warm season grasses should receive 100% of their fertilizer during the summer. Do not apply fertilizer during periods of drought. Slowly available N (water insoluble nitrogen – WIN) may be used and is strongly encouraged. The application rates of a fertilizer that has at least 30% WIN can be raised to 60lb nitrogen per acre per application. Areas in heavy shade (more than 60% of the day) or low traffic may need only ½ the fertilizer of full sun areas.

***Phosphorus and Potassium Fertilizers:*** Apply each fertilizer (P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O) as indicated necessary by soil test using the following table.

**For Active Construction with soil test:** The amount of P<sub>2</sub>O<sub>5</sub> & K<sub>2</sub>O that will be applied according to appropriate soil test levels.

| Soil Test (Va Tech)   | P <sub>2</sub> O <sub>5</sub> |                        | K <sub>2</sub> O |                        |
|-----------------------|-------------------------------|------------------------|------------------|------------------------|
|                       | lb/A                          | lb/1000ft <sup>2</sup> | lb/A             | lb/1000ft <sup>2</sup> |
| <b>L- (0-3 lb/A)</b>  | 150-175                       | 3.5-4.0                | 100              | 2.25                   |
| <b>L (4-8 lb/A)</b>   | 125-150                       | 3.0-3.5                | 100              | 2.25                   |
| <b>L+ (9-11 lb/A)</b> | 100-125                       | 2.25-3.0               | 100              | 2.25                   |
| <b>M</b>              | 40-90                         | 1.0-2.0                | 40-90            | 1.0-2.0                |
| <b>H</b>              | 0                             | 0                      | 0                | 0                      |
| <b>VH</b>             | 0                             | 0                      | 0                | 0                      |

**For limited (< 2 acres) active construction areas without a soil test:**

**Maximum allowable N-P-K application is 45-90-90 lbs/A as N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O.**

**Lime should be applied at 2 tons per acre if soil test is not available.**

### **Liming Recommendations:**

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 will be applied at 2 tons per acre to all new construction sites where soil test is not required.

For sulfidic materials (see Orndorff and Daniels, 2002 for maps and definitions) or **any** soil sample with a water pH < 4.0, liming recommendations must be based on reactive potential acidity or acid-base-accounting analysis.

Citation: Orndorff, Z.W. and W.L. Daniels, 2002. Delineation and Management of Sulfidic Materials in Virginia Highway Corridors, Final Contract Report VTRC 03-CR3. Virginia Trans. Res. Council, Charlottesville, VA. <http://vtrc.virginia.gov/PubDetails.aspx?PubNo=03-CR3>

### **3. Nutrient Management Guidelines**

#### **A. Season of Application of Fertilizers and Cautions**

All fertilizer will be applied between March 15<sup>th</sup> and November 1<sup>th</sup>. Fertilization outside of this window may result in lost nutrients. In the Fredericksburg, Hampton Roads and Richmond Districts, fertilizers may be applied from March 1 to November 15.

#### **B. Impervious Surfaces**

Do not apply fertilizers containing nitrogen or phosphorus to impervious surfaces (sidewalks, streets, etc.). DO NOT use urea as an ice melting substance in cold weather. Remove any granular materials that land on impervious surfaces by sweeping and collecting, and either put the collected material back in the bag, or spread it onto the turf and/or use a leaf blower etc. to return the fertilizer back to the turfgrass canopy.

#### **C. Management Guidelines to Improve Density of Turf without Use of Fertilizers**

1. Returning Grass Clippings – Do not pick up clippings when mowing. This may allow the nutrients to recycle back to the soil.
2. Legumes, such as white clover, may be incorporated into the turf to provide long term N source for grasses. The pH of the soil should not be lower than 6.0 - 6.5, and the level of phosphorus should be at soil test level no higher than “M”.
3. Suggested Mowing Guidelines - cool season grasses should not be mowed lower than 4-6 inches and warm season grasses should not be mowed lower than 2-3 inches. Mowing the grasses below their minimum height (scalping) should never be allowed because this will shock the plant and can kill the vegetation.
4. Mower blades need to be kept sharp. This produces a cleaner cut which reduces the amount of brown leaf ends, stress and disease on the grass plants. The results are a healthier and stronger turfgrass that may need less pest control.

#### **D. Environmentally Sensitive Areas**

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 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 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

The use of fertilizers with slow release nitrogen is greatly encouraged, especially where there is any reason to suspect environmental concerns.

### **E. Use of Iron**

Foliar iron supplements may be used to stimulant a greening effect on the turfgrass during the summer months without additional applications of nitrogen. A rate of 1 to 1.5 pounds of iron per acre is appropriate.

### **F. Use of Organic Sources as Nutrients:**

Organic by-products (composted and uncomposted manures, biosolids, and sludges) should be applied to supply 45-50 lbs plant available nitrogen (PAN) per acre to the vegetation. The amount of PAN in organic by-products is determined according to the following formula:

$$\text{PAN} = \text{NO}_3\text{-N} + K_{\text{vol}} * [\text{NH}_4\text{-N}] + K_{\text{min}} * [\text{Org-N}]$$

Where:

PAN = lbs plant available N/dry ton

NO<sub>3</sub>-N = lbs nitrate N/dry ton

K<sub>vol</sub> = volatilization factor, or plant available fraction of NH<sub>4</sub>-N

NH<sub>4</sub>-N = lbs of ammonium N/dry ton

K<sub>min</sub> = mineralization factor, or plant available fraction of Org-N

Org-N = lbs organic N/dry ton (calculated by subtracting NH<sub>4</sub>-N from total Kjeldahl N)

Volatilization (Tables 8.1 and 9.2) and mineralization (Tables 8.2 and 9.1) factors for various organic by-products are listed in the Virginia Nutrient Management Standards and Criteria (<http://www.dcr.state.va.us/docs/StandardsandCriteria.pdf>; Virginia Department of Conservation and Recreation, 2005). The use of these tables will enable rates to be calculated for by-products top-dressed over established vegetation or applied (with or without incorporation) directly to soil prior to establishment of vegetation.

When composts are utilized they must meet the minimum quality standards given in Table 1 below. Use of manures, biosolids, sludges or other non-composted organic materials must also comply with applicable Virginia DCR, DEQ and VDH regulatory programs.

Soil test levels for P must be between L- and M+ for P if organic amendments are utilized. Organic amendments will not be utilized by VDOT for any soil testing H- or above for P.

**Table 1. Recommended Specifications for Compost**

| Parameters <sup>1,6</sup>  | Units of measure   | Turf establishment or topdressing, planting bed establishment              | Surface mulch to be vegetated                                   |
|--|--|--|---|
| pH <sup>2</sup>  |  | 6.0-8.5  | 5.5-9.0   |
| Soluble Salt Concentration <sup>2</sup> (electrical conductivity)          | dS/m (mmhos/cm)  | ≤10  | ≤10   |
| Moisture Content   | %, wet weight basis                                      | 30-60  | 25-60   |
| Organic Matter Content   | %, dry weight basis                                      | 30-65  | >30   |
| Particle Size  | % passing through a selected mesh size, dry weight basis | 98% passing through ¾" screen or smaller                                   | 99% passing through 3" screen, >25% passing through 3/8" screen |
| Stability <sup>3</sup> (Carbon dioxide evolution rate)                     | mg CO <sub>2</sub> -C per gram organic matter per day    | <8   | <8  |
| Maturity <sup>3</sup> (Bioassay): Seed emergence and Seedling vigor        |  | ≥80%<br>≥80%   | ≥80%<br>≥80%  |
| Physical Contaminants (inerts)   | %, dry weight basis                                      | <1   | <1  |
| Chemical Contaminants <sup>4</sup>   | mg/kg (ppm)  | Meet or exceed US EPA standard, 40 CFR, Part 503.13, Tables 1 and 3 levels |   |
| Biological Contaminants <sup>5</sup> Fecal coliform bacteria or Salmonella | MPN per gram (dry wt)<br>MPM per 4 grams (dry wt)        | Meet or exceed US EPA Class A standard, 40 CFR, Part 503.32(a) levels      |   |

<sup>1</sup> Recommended test methodologies are provided in the Test Methods for the Examination of Composting and Compost (TMECC, The U.S. Composting Council)

<sup>2</sup> The pH and soluble salt content are more relevant for the amended soil than for the compost for the establishment and growth of a particular plant. Plant species vary in their sensitivity to pH and soluble salts. Most ornamental plants and turfgrass species can tolerate a soil soluble salt level of 2.5 dS/m and 4 dS/m, respectively. Seeds, young seedlings and salt sensitive species often prefer soluble salt levels at half the aforementioned levels.

<sup>3</sup> Stability and maturity ratings comprise an evolving area of compost science, for which new, alternative test methods should be considered as deemed acceptable by the scientific community.

<sup>4</sup> US EPA standard, 40 CFR Part 503.13, Tables 1 and 3 levels are: arsenic (As) ≤ 41 mg/kg, cadmium (Cd) ≤ 39 mg/kg, copper (Cu) ≤ 1500 mg/kg, lead (Pb) ≤ 300 mg/kg, mercury (Hg) ≤ 17 mg/kg, molybdenum (Mo) ≤ TBD, nickel (Ni) ≤ 420 mg/kg, selenium (Se) ≤ 100 mg/kg, zinc (Zn) ≤ 2800 mg/kg.

<sup>5</sup> US EPA Class A standard, 40 CFR 503.32(a) levels: Salmonella <3 MPM/4 g total solids or fecal coliform <1000 MPM/g total solids.

<sup>6</sup> Landscape architects and project (field) engineers may modify the allowable specification ranges based on specific field conditions and plant requirements.

**G. Samples of Fertilizer Ratios Appropriate for VDOT Use**

This chart can be used to determine the best ratio of fertilizer for active construction. For P<sub>2</sub>O<sub>5</sub> application rates above 90-110 lbs/Ac, it will be necessary to supplement the base fertilizer blends with 0-46-0.

**Fertilizer Application Chart**

| <b>Fertilizer Analysis</b> | <b>Pounds of fertilizer/A<br/>(lb/1000 ft<sup>2</sup>)</b> | <b>Pounds of Nitrogen/A<br/>(lb/1000 ft<sup>2</sup>)</b> | <b>Pounds of P<sub>2</sub>O<sub>5</sub>/A<br/>(lb/1000 ft<sup>2</sup>)</b> | <b>Pounds of K<sub>2</sub>O/A<br/>(lb/1000 ft<sup>2</sup>)</b> |
|----------------------------|--|--|--|--|
| 5-10-10                    | 900 (20)   | 45 (1.0)   | 90 (2.0)   | 90 (2.0)   |
|                            |  |  |  |  |
| 10-10-10                   | 450 (10)   | 45 (1.0)   | 45 (1.0)   | 45 (1.0)   |
|                            |  |  |  |  |
| 15-30-15                   | 300 (6.7)  | 45 (1.0)   | 90 (2.0)   | 45 (1.0)   |
|                            |  |  |  |  |
| 46-0-0                     | 96 (2.2)   | 45 (1.0)   | 0  | 0  |
|                            |  |  |  |  |
| 18-46-0                    | 240 (5.5)  | 45 (1.0)   | 110 (2.5)  | 0  |
|                            |  |  |  |  |
| 0-46-0                     | 98 (2)   | 0  | 45 (1.0)   | 0  |

**H. Spreader Calibration**

All fertilizer spreaders will be calibrated per the guidance given below.

## Calibration of Spreaders<sup>1</sup>

### Pan Method

Push the spreader over a pan(s) and collect and weigh the material that was spread. By knowing the area of the pan and weight of the material, the application rate can be determined by:

$$\text{Material per } \frac{\text{Grams}}{1,000 \text{ sq. ft}} = 1,000 \times \frac{\text{Grams Material Collected}}{\text{ft}^2 \text{ Pan} \times \# \text{ of Pans} \times \# \text{ of Passes}}$$

### Sweep and Weigh Method for Drop Spreader

Push a drop spreader over a clean, smooth surface of a known distance and sweep and weigh the material. The application rate can be determined by:

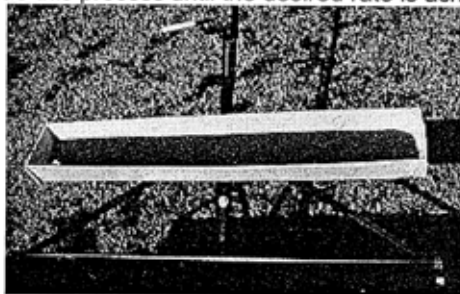
$$\text{Material per } \frac{\text{Grams}}{1,000 \text{ sq. ft}} = 1,000 \times \frac{\text{Grams Material Collected}}{\text{Spreader Width} \times \text{Distance Traveled}}$$

### Catch Pan Method

Attach a catch pan to the bottom of the spreader. Establish and mark two points of a known distance. Push the spreader over the known distance, opening the hopper at the starting point, and closing at the finish point, while collecting the material in the catch pan. The application rate is determined by using the following formula:

$$\text{Material per } \frac{\text{Grams}}{1,000 \text{ sq. ft}} = 1,000 \times \frac{\text{Grams Material Collected}}{\text{Spreader Width} \times \text{Distance Traveled}}$$

Whichever method is used, make enough passes or travel enough distance so that the material collected is enough to be weighed accurately. If the calculated rate is too high, reduce the setting adjustment. If it is too low, increase the setting adjustment. Continue this process until the desired rate is achieved.



#### 4. Record of Actual Nutrient Applications July 1, 2006 to July 1, 2007

| <b>Active Construction : Nutrient Management Plan for VDOT</b> |   |   |  |   |  |
|--|---|---|--|---|--|
| District: _____  |   |   | Acreage: _____                                   |   |  |
| Location: _____<br>_____                                       |   |   |  |   |  |
| County: _____  |   |   |  |   |  |
| Year, Month  | Fertilizer Ratio Applied  | Amount Fertilizer Applied lb/A (lb/1000 ft <sup>2</sup> ) | Nitrogen Applied lb/A (lb/1000 ft <sup>2</sup> ) | P <sub>2</sub> O <sub>5</sub> Applied lb/A (lb/1000 ft <sup>2</sup> ) | K <sub>2</sub> O Applied lb/A (lb/1000 ft <sup>2</sup> ) |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
| Year, Month  | Agricultural limestone applied ton/A (lb/1000 ft <sup>2</sup> ) |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |

**Date Worksheet Prepared: 7/1/06**

Note: This 'Record of Actual Nutrient Applications' sheet must be submitted with the subsequent plan regardless of amount and timing of fertilizer or lime application with this plan's period.