

**COMMONWEALTH OF VIRGINIA  
DEPARTMENT OF ENVIRONMENTAL QUALITY**

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**Subject:** Water Guidance Memo No. **11-2006**  
Managing Frozen Ground for Biosolids Land Application

**To:** Regional Directors

**From:** Ellen Gilinsky, Ph.D., Director, Water Division



**Date:** March 18, 2011

**Copies:** Deputy Regional Directors, Regional Water Permit Managers, Regional Water Compliance Managers, James Golden, Rick Weeks, Neil Zahradka, and Fred Cunningham, DCR, VDH

**Summary:** This guidance addresses how to determine in the field that ground is frozen and the measures that must be taken to ensure water quality is protected.

**Electronic Copy:**

An electronic copy of this guidance in PDF format is available for staff internally on DEQNET, and for the general public on DEQ's website at: <http://www.deq.virginia.gov/waterguidance/>.

**Contact Information:**

Please contact Christina Wood, Office of Land Application Programs at (804) 698-4263 or [christina.wood@deq.virginia.gov](mailto:christina.wood@deq.virginia.gov) with any questions you have regarding the application of this guidance.

**Disclaimer:**

**This document is provided as guidance and, as such, sets forth standard operating procedures for the agency. However, it does not mandate any particular method nor does it prohibit any alternative method. If alternative proposals are made, such proposals should be reviewed and accepted or denied based on their technical adequacy and compliance with appropriate laws and regulations.**

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## I. Authority

The DEQ is authorized to issue permits for the land application of biosolids in accordance with the Virginia Pollution Abatement (VPA) Permit Regulation, 9VAC25-32-310 through 760 and the Virginia Pollutant Discharge Elimination System Permit Regulation, 9VAC25-31-420 through 720.

State Water Control Law § [62.1-44.19:3](#).B states:

*The Board, with the assistance of the Department of Conservation and Recreation and the Department of Health, shall adopt regulations to ensure that ... (ii) land application, marketing, and distribution of sewage sludge is performed in a manner that will protect public health and the environment; and (iii) the escape, flow or discharge of sewage sludge into state waters, in a manner that would cause pollution of state waters, as those terms are defined in § [62.1-44.3](#), shall be prevented.*

State Water Control Law § [62.1-44.19:3](#).C.8. also requires:

*Regulations adopted by the Board, with the assistance of the Department of Conservation and Recreation and the Department of Health pursuant to subsection B, shall include: ...Requirements for site-specific nutrient management plans, which shall be developed by persons certified in accordance with § [10.1-104.2](#) prior to land application for all sites where sewage sludge is land applied...*

The Nutrient Management Training and Certification Regulations, 4VAC5-15, adopted by DCR in accordance with § [10.1-104.2](#), requires that NMPs address the management of frozen ground. 4VAC5-15-150.A.4.f. states:

*Nutrient management plans shall include a statement indicating that applications of inorganic nutrient sources, liquid manure, liquid sewage sludge, or liquid industrial waste are not to occur on frozen or snow-covered ground. When ground is frozen, dry or semi-solid manures, dewatered sludges, or dewatered industrial wastes may only be applied if the field has: (i) slopes not greater than 6.0%; (ii) 60% uniform ground cover from crop residue or an existing actively growing crop such as a small grain or fescue with exposed plant height of three inches or more; (iii) a minimum of a 200-foot vegetated or adequate crop residue buffer between the application area and all surface water courses; and (iv) soils characterized by USDA as “well drained.”*

VPA Regulation echoes the DCR regulation in 9VAC25-32-560.B.3.c.(2) where it states:

*...Biosolids may only be applied to snow-covered ground if the snow cover does not exceed one inch and the snow and biosolids are immediately incorporated within 24 hours of application. Liquid sludges may not be applied to frozen ground. Dry or dewatered sludges may be applied to frozen ground only if (i) site slopes are 5.0% or less; (ii) a 200-foot vegetative (i.e., at least 60% uniformly*

*covered by stalks or other vegetation) buffer is maintained from surface water courses; and (iii) the entire application site has uniform soil coverage of at least 60% with stalks, vines, stubble, or other vegetation and the site soils are characterized as well drained.*

The VPA regulation goes on to require that the permittee address frozen ground in the managements practices plan; section 9VAC25-32-680.C.2.c. requires that minimum site specific information in the management practices plan shall include *Procedures used to ensure that operations address the following constraints: application of biosolids to frozen ground, ... and saturated or ice/snow covered ground....*

The VPDES Permit Regulation addresses frozen ground in a general statement, echoing the Federal 503 Rule: 9VAC25-31-550.B. states: *Bulk sewage sludge shall not be applied to agricultural land, forest, a public contact site, or a reclamation site that is flooded, frozen, or snow-covered so that the bulk sewage sludge enters a wetland or other surface waters except as provided in a VPDES permit or a permit issued pursuant to § 404 of the CWA.* However, the requirement to have a NMP incorporates the requirement to implement the site specific BMP's when land applying on frozen ground.

## **II. Background**

When the surface of the ground freezes, it acts as an impermeable layer. If an application of biosolids or any fertilizer to frozen ground is followed by rain, the risk of the product running off from the site is increased due to the impermeability. Therefore additional BMPs are required to prevent pollution of state waters when applying to frozen ground.

As stated above, the VPA regulation as well as DCR's Nutrient Management Regulation require specific site restrictions and best management practices when biosolids are applied on ground that is frozen. In attempts to implement and enforce these BMPs the most common question has been "what constitutes frozen ground?"

## **III. Frozen Ground**

### **A. Definitions**

Frozen ground means soil that is impenetrable due to the presence of frozen moisture. The ground will be considered frozen, in regard to land application, when a layer, one inch or more in thickness, is present within the top six inches of the soil. This will include but is not limited to the following conditions:

1. The surface of the soil is frozen to a depth of one inch or more; or
2. The top layer of ground has thawed, but one inch or more of the ground below is frozen.

### **B. Determination of Frozen Ground**

If a shovel or spade cannot penetrate the surface of the ground, it is obviously frozen. On

the other hand, if overnight low temperatures have remained above freezing, but then one night the temperature drops to 30°F, there may be some frost on the ground but it has most likely not frozen. However, there will be times when knowing whether or not the ground is frozen is in question. At those times, in order to determine if the ground is frozen a soil sample must be collected and examined for the presence of a frozen layer by implementing the following procedures:

1. Collect a soil sample by inserting a round point shovel into the ground to a depth greater than six inches. Extract the shovel and sample from the ground, trying not to disturb the soil sample.
2. Examine the soil profile for the presence of an ice layer.
3. If a layer of solid ice or ice crystals that measures one inch or greater exists within the top six inches of the soil sample then the ground will be considered frozen.

### **C. Best Management Practices when Applying on Frozen Ground**

As dictated by the VPA regulation and DCR's Nutrient Management Training and Certification Regulations, the following (most stringent) rules apply when land applying on frozen ground:

1. Liquid sludges containing <15% solids as defined by 9VAC25-32-520.D., may not be applied to frozen ground.
2. Dewatered or dry sludges, containing 15% to 30% solids or greater than 30% solids, respectively, may be applied to frozen ground only if
  - a. site slopes are 5.0% or less;
  - b. a 200-foot vegetative (i.e., at least 60% uniformly covered by stalks or other vegetation) buffer is maintained between the application site and all surface water courses;
  - c. the entire application site has uniform soil coverage of at least 60% with stalks, vines, stubble, or an existing actively growing crop such as a small grain or fescue with exposed plant height of three inches or more; and
  - d. the site soils are characterized by USDA as "well drained".
3. The permittee's management practices plan must include procedures that address operational constraints for the application of biosolids to frozen ground, saturated ground and ice/snow covered ground.

The goal of the best management practices is to prevent runoff of biosolids from a land application site into surface waters or wetlands and there are several factors that may impact the potential for runoff immediately or as the ground thaws. There may be instances where more stringent BMPs are required to prevent runoff, or where due to site specific circumstances biosolids cannot be land applied without runoff and therefore cannot be applied at that time. For example, if the top half inch of ground is frozen at a site, generally this is not considered to be frozen ground. However, in this case liquid biosolids will be applied, and as the land applier begins to spread the liquid biosolids he observes that it is running across the field, an indication that the liquid has hit an impermeable layer and is not being absorbed. At that point the application should be stopped and continued after the ground has thawed.