

**LAND APPLICATION OF BIOSOLIDS  
IN VIRGINIA**

**A STUDY PREPARED FOR THE  
VIRGINIA DEPARTMENT OF HEALTH  
NOVEMBER, 1997**

*By The*

*UVA Institute for Environmental Negotiation*



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# EXECUTIVE SUMMARY

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The Virginia Department of Health (VDH), through an interagency agreement, requested the University of Virginia Institute for Environmental Negotiation (IEN) to conduct a study of the land application of biosolids in Virginia for the purpose of providing information and insight about local concerns and perceptions of the program, and to provide recommendations to VDH on how the program may be improved.<sup>1</sup> The IEN informally surveyed 23 counties in Virginia, collected and reviewed documents about federal regulations, Virginia regulations, approaches and processes adopted by other states, and talked with persons from various state and federal agencies.

In general terms our survey found a wide disparity of knowledge, information and level of concern among those we contacted. It should be emphasized that the survey was in the form of a reconnaissance, and should not be interpreted as an instrument that could serve by itself as a basis for policy or program actions. Our recommendations for possible policy or program actions are gathered from the discussions and interviews conducted during our study, and as such are intended to provide VDH with additional considerations for possible policy or program changes.

In general, we found that:

- the biosolids program in Virginia has a low level of public visibility and hence of implicit support among those at the county level we interviewed.
- the program has substantial support from the VCES program and the Virginia Tech agricultural faculty.
- the federal regulations that govern biosolids are either unknown or unchallenged by those we interviewed at the county level.
- the level of support for the program at the local level depends upon incidents that arouse public concern. The most common triggering incident is caused by the impact of odor from biosolids on nearby residents.
- where local concerns have been aroused and local officials need to address the concerns, the local ability to engage the state in problem investigation and resolution varies widely in process and outcome. Generally, county officials expressed a desire for greater information and understanding of program in order to increase local capability for responding to complaints, as well as a desire for the state to have a more visible and accessible “field presence.”

- there appears to be a reasonable level of cooperation among generators, contractors, farmers, local government, and the VDH. However, there are simmering concerns and some friction among these parties.
- there appears to be an openness to information and to persuasion that biosolids land application is a positive, soil amending, nutrient enhancing practice and is potentially preferable to other sludge management options such as incineration or landfilling.
- the openness to acceptance of biosolids application as an environmentally positive method of recycling depends upon public confidence that the program is properly regulated and managed. That is, confidence that the rules are properly followed by all parties participating in the biosolids generation, application, and utilization is .
- there is a perception that the role VDH plays in this process should strike an appropriate balance between its role as a promoter of biosolids recycling and as a regulator of the process to assure public health and environmental protection. Some interviewees perceived VDH as placing too much emphasis on promotion of biosolids and too little emphasis on the protection of the public aesthetics, health, and environmental quality.
- there is a desire for greater understanding and information at the local level
- the increasing population, industrial and urban growth of Virginia suggests that there will be opportunities for more conflict over biosolids application. If the current trends continue, conflicts will be triggered by odor or other local nuisance-type issues.

## RECOMMENDATIONS

Our recommendations are based on the assumption that the types of reactions and responses that have occurred in the local jurisdictions where the biosolids program have become sources of policy concern, could readily occur in other jurisdictions as well. If incidents of the types that we have documented continue to occur, and if similar conditions are encountered when public reaction arises, our survey suggests that public confidence in the program will be eroded sufficient to threaten the entire biosolids program. The reason we suggest this possible future is that the likely consequence of declining public confidence will be additional local regulations that will be superimposed upon VDH permitting and enforcement processes. The consequence of these local regulations will be a declining number of sites available for the application of growing quantities of biosolids.

IEN is not expert in any aspect of biosolids management. Our recommendations should be understood as translations from information gained through our

reconnaissance, and which are aimed at increasing public confidence in the program. In those areas that go beyond our competence in public communications and citizen involvement in programs, we have generally made our recommendations based on possibilities suggested to us by respondents during the course of our survey.

IEN believes that Virginia has laid a solid foundation for its biosolids land application program, and that it has from the outset since 1980 attempted to set high regulatory standards. Our survey suggests that the prime focus for improvements in the program might be in the areas of program management and complaint resolution so that public confidence and understanding grows. Along these lines, there are a number of potential steps that have been suggested to us and which we recommend for state consideration.

**Public Education and Information:** While we do not recommend that a broadly aimed public education effort be initiated, we do recommend that the state consider developing an education effort that specifically targets (1) local public officials, (2) selected stakeholders, and (3) the industry and its clients. The goals of this educational effort could be, first and foremost, to decrease the likelihood and frequency of local incidents and, second, to increase local capacity to quickly and effectively respond to and resolve problems when they do occur. (See page 36 for more details.)

**Program and Management Practices:** Our recommendations here offer possibilities for achieving the following three broad goals: (1) an effective process for responding to complaints, beginning with the development of a model response system that can be easily communicated to and used by local authorities; (2) correct and appropriate application of quality biosolids, through a variety of measures such as increased testing of biosolids, nutrient management planning, and monitoring of biosolids application; (3) program accountability to citizens, through information management and tracking, mapping and planning for future land application needs, and managing truck routing and application timing with sensitivity to citizen and local concerns. (See page 38 for more details.)

**Industry-Initiated Partnerships:** Our recommendation here, drawn primarily from experiences in other states, is for the industry in Virginia to explore ways to create or strengthen existing partnerships, to identify and develop safe and acceptable uses for biosolids that have a low potential impact on people. (See page 45 for more details.)

Lastly, we have learned of a new effort planned by the US Environmental Protection Agency (EPA) to improve public acceptance of biosolids reuse (*see Appendix 9*). Some components of the EPA effort appear to dovetail with some of the recommendations we make for state consideration. One example is the “Code of Good Practices” that will involve third-party verification and will aim to minimize odor, manage nutrients, manage transportation, and focus on good practice. Other examples are the proposal to develop an “Incident Response Team” and to expand training for

coordinators, inspectors and enforcement staff. The state might wish to explore areas for potential financial or other assistance from the EPA to help in the implementation of policy or program changes that the state decides to undertake.

# INTRODUCTION

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## PURPOSE OF STUDY

Recent experience in Virginia, according to the Virginia Department of Health (VDH) in its interagency agreement with IEN, has “revealed localized concern related to specific incidents of biosolids application.” The VDH has also stated that its goals are to:

- Enhance effectiveness and field presence in regulating biosolids application in Virginia
- Improve responsiveness to local governmental concern
- Educate citizens about the benefits of biosolids application, thereby increasing public acceptance of biosolids application.

In an interagency agreement with the University of Virginia Institute for Environmental Negotiation (IEN), the VDH requested that a study be conducted of the land application of biosolids in Virginia. The purpose of this study is to:

- Identify aspects of the land application program that are going well.
- Identify typical problems encountered.
- Make recommendations on how the program might be improved to ensure continued program viability in Virginia.

IEN was contracted in order to obtain an independent view on “how we are doing” and to provide insight into “where can we do better.” To conduct this study, IEN was to be asked to survey a sampling of counties in Virginia where the land application of biosolids is going well, those where it is experiencing some problems, and those where land application has either been dropped or banned. In addition, IEN was asked to explore the experiences of other states and to talk with a variety of other stakeholders (e.g. other state agencies, field staff, farmers) in Virginia.

## SCOPE OF STUDY

The scope of the IEN study was limited to issues of regulatory policy, education, and enforcement and how they relate to public perception, acceptance, and environmental sustainability of the program. A number of important issues still debated among some members of the scientific community – such as the regulatory standards for heavy metal concentration limits and cumulative loading limits – are beyond the scope of this study. The validity of current standards may have to be

resolved by scientific studies conducted over a period of decades or more. As a consequence IEN has not attempted to study the communications concerning the scientific issues surrounding the trace metal and pathogen standards.

It is important to note here that, while our study was not directed toward the scientific issues, we remained open to all issues and concerns raised during our interviews. Thus, if we heard, as we did, county personnel raise concerns about nutrient management planning or phosphorous or other related issues, then our responsibility was to report these concerns and, if possible, suggest ways these concerns might be addressed. Where possible IEN identifies for VDH's consideration the options and trends in public policy concerning these issues.

In brief, our contract with VDH allowed us the freedom to develop any comments and recommendations that we view as appropriate to a good program with long-term viability.

## **ASSUMPTIONS & VALUES**

An attempt to examine the current and potential effectiveness of Virginia's land application of biosolids requires that assumptions be made about various issues that can impact the program. IEN has identified the following assumptions as integral to this study:

- Virginia's population will continue to grow.
- Landfill space in Virginia will continue to decline.
- The amount of land in agriculture is likely to decline as urban centers expand.
- The land application of biosolids will continue to be a federally approved method of using processed sewer biosolids throughout the nation and in Virginia.
- Existing federal and state regulations are adequate to provide for protection of natural resources and of food sources, unless evidence indicates otherwise.

Additionally, core values identified by IEN as integral to this study are:

- Recycling of natural and other resources has positive value and should be encouraged.
- Natural resources, such as water quality, need to be preserved and protected.
- The safety of food sources, such as farm crop land and livestock, needs to be preserved and protected.

# BACKGROUND

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## DEFINITIONS

Biosolids, or sewage sludge, is defined under Federal regulations (40 C.F.R. 503, henceforth referred to as *the Part 503 Rule*) as any solid, semisolid, or liquid residue generated during the treatment of domestic sewage in a treatment works. This definition includes scum and solids removed in primary, secondary, or advanced wastewater treatment, and any substance derived from sewer sludge. It does not include ash remaining after incineration of sewer sludge, and it is distinct from industrial sewage sludge.

Under Virginia regulations (12 VAC 5-585-10), biosolids means a sewage sludge that has received an established treatment for required pathogen control and is treated or managed to reduce vector attraction to a satisfactory level and contains acceptable levels of pollutants, such that it is acceptable for use for land application, marketing or distribution in accordance with this chapter.

## CHARACTERISTICS

*The Chesapeake Bay Nutrient Management Training Manual* describes biosolids content, characteristics and nutrient availability as follows:

“Biosolids are the materials remaining after treatment facilities purify wastewater from homes, businesses and industries. In some communities, runoff from roads, lawns and fields is also included. Biosolids are composed of inorganic constituents, such as macro- and micro-nutrients and non-nutrient trace elements, organic compounds, and microbes and other biological entities, including pathogens and parasites.

“...Raw (untreated) biosolids are converted into a form that is less offensive in terms of odor and pathogenic organism content. Stabilization reduces the amount of solid matter and removes oxygen-demanding compounds. Aerobic and anaerobic digestion are the most common biological processes employed to stabilize these organic wastes. The result of these processes is a product that has an earthy odor and is without raw, undigested solids. Most of the pathogens have been destroyed, but the effluent remains high in nutrient content. Liquid sewage biosolids are blackish and contain colloidal and suspended materials of 2% to 5% solids. Most biosolids applied to agricultural land are of this type, but they may be mechanically or chemically dewatered to increase the solids content to 18-25% ('cake'). Lime treatment employs a chemical means (high pH), and

composting employs a biologically mediated, thermophilic process as alternative stabilizing procedures.

“...Biosolids vary widely in their chemical, biological, and physical properties. The determining factors include the source and composition of the sewage, the treatment system, the extent to which the material is digested and stabilized, and the handling method between processing and application to the soil. A major reason for considering the use of sewage biosolids in crop production is its nutrient value. The guiding principles in designing an effective nutrient management program for use of biosolids in cropping systems are to supply biosolids-derived nutrients when and where they are needed by the crop, and in the required quantities (*emphasis added*).

“Nineteen studies of municipal biosolids from 45 sites in seven southern states show enormous variability in composition.... Because composition varies greatly, each type of biosolids intended for use on agricultural land should be analyzed separately (*emphases added*).... The nutrient supplying capacity of biosolids has been difficult to predict due in large part to differences in biosolids quality and in experimental conditions... Biosolids should not be applied in excess of the agronomic rate. In general, the agronomic rate provides the N needed by the crop or vegetation. Therefore, lacking another limiting constituent in biosolids to be land applied, careful consideration must be given to calculating the application rate based on the kinds and amount of N in the biosolids.... (*emphasis added*).

“... The imbalance between N and P in biosolids can cause soil P levels to increase substantially, often to levels much higher than necessary for adequate P nutrition of crops, and may increase the potential for off-site movement of P.

“It has been suggested that Biosolids application rates be based on the P content rather than on the N content. This would alleviate the increase in soil P that is common with long-term biosolids applications but would greatly increase the land required for land application. Some states have compromised on this issue by requiring that P application not exceed anticipated crop removal of P after soil test P has reached a certain level (usually quite high).”<sup>2</sup>

## **THE LEGAL FRAMEWORK FOR LAND APPLICATION OF BIOSOLIDS**

### *Federal Regulations*

The Part 503 Rule promulgated by the Environmental Protection Agency in 1993 establishes minimum national standards for the treatment, monitoring, use and disposal of biosolids. States may change their own regulations to meet the minimum federal standards, may be designated with the authority to issue permits in accordance

with federal standards, may be more restrictive than the federal standards, or may administer the federal standards in a manner different from federal regulations. Anyone disposing of biosolids must comply with the Part 503 Rule. However, the EPA notes that “if a state has its own rules governing the use or disposal of biosolids and has not yet adopted the Federal rule, the owner/operator will have to follow the most restrictive portions of both the Federal and State rules.”<sup>3</sup>

The federal Part 503 Rule classifies biosolids according to trace element pollutant levels, pathogen levels and whether they are distributed in bags or in bulk. Depending on the nature of the biosolids, various management practices are identified under the Part 503 Rule so that all permissible combinations of biosolids quality and management practices are expected by the EPA to provide an equivalent level of safety. The EPA notes in a 1994 publication concerning the Part 503 Rule that “its current rule for the final use or disposal of biosolids is the result of nearly 10 years of intensive study and development.” Later in the same publication it states that the “EPA believes that this Part 503 Rule fully meets the Congressional mandate to be protective of public health and the environment and allows for the safe and effective recycling of biosolids -- indeed providing beneficial technology for a better environment.”<sup>4</sup>

Since the promulgation of the Part 503 Rule, according to a fall 1996 survey conducted by *BioCycle* to which 46 states responded, approximately 22 states are seeking delegation to administer the technical standards of the Part 503 Rule, 2 did not respond, and 25 states will not be seeking delegation. In 1996 Utah was the first state to receive delegation authority for the US EPA. It is also interesting to note that, of the 46 states, 32 said their regulations are more restrictive than the Part 503 Rule, 1 state said it is more restrictive in some cases, 4 said their regulations are the same and 9 said their regulations were not more restrictive.

### *Virginia Regulations and Administration*

Virginia’s program of land application of biosolids has been evolving since 1980, when it pioneered one of the first site-specific permitting systems in the nation for biosolids land application. Today, the land application of biosolids in Virginia is governed by regulations adopted in 1995 and amended in August 1997, which incorporate federal standards and, in a number of respects, are more restrictive than federal standards.

In 1994 the Virginia General Assembly charged the Virginia Department of Health (VDH) with protecting public health by regulating the use of biosolids. (See Acts of Assembly, 1994, Chapter 288; Sections 32.1-164.5 and 62.1-44.19:3 of the *Code of Virginia*.) Prior to 1994 this authority resided with the State Water Control Board, which is now an adjunct of the Department of Environmental Quality (DEQ).

The Virginia legislature empowered the State Health Commissioner to issue land application permits which are required before biosolids may be applied to the land. The code requires the State Health Commissioner to promulgate regulations including:

- (1) Requirements and procedure for the issuance of permits.
- (2) Procedures for amending permits to include additional sites and sludge types.
- (3) Standards for treatment or stabilization of sewage sludge prior to land application.
- (4) Standards for determining the suitability of land application sites and facilities.
- (5) Required procedures for land application.
- (6) Requirements for sampling, analysis, record keeping, and reporting.
- (7) Provisions for notification of local governing bodies to ensure compliance with the notice and public hearing requirements set out in §32.1-164.2.
- (8) Conditions under which a nutrient management plan approved by the Department of Conservation and Recreation may be required.

The next year, in 1995, VDH adopted the *Biosolids Use Regulations* 12 VAC 5-585, which incorporated into Virginia law the federal standards of the Part 503 Rule and established more restrictive conditions in terms of permitting, buffering, slope restrictions, times of year of application and nutrient management plans requirements. In August 1997, the Regulations were further amended based on recommendations of a Biosolids Use Regulations Advisory Committee, which is composed of representatives of local government and private members of the regulated community.

One of the notable changes to the Virginia regulations is that in the coastal plain the application rate of lime amended biosolids must not raise the soil pH above 6.5. As coastal soils tend to have higher pH to begin with, this change will tend to reduce the amount of biosolids that can be applied to coastal sites or reduce the amount of lime used to amend the biosolids.

The following chart offers a brief comparison of some of the major differences between Virginia regulations and the Part 503 Rule, specifically those where Virginia has adopted a more restrictive policy.

	<b>PART 503 RULE</b>	<b>VIRGINIA REGULATIONS</b>
<b>Permitting</b>	self-implementing: permit not necessarily required	<ul style="list-style-type: none"> <li>• site-specific permit required</li> <li>• permits good for 5 years</li> <li>• permits may receive minor amendments without local hearings, but with local notice</li> <li>• public notice of permit, and adjacent landowners must be notified by permittee</li> </ul>
<b>Buffers to Water</b>	33 feet to all waters of the US	<ul style="list-style-type: none"> <li>• 100 feet to water supply wells or springs</li> <li>• 50 feet to perennial streams</li> <li>• 35 to 100 feet to intermittent streams</li> </ul>
<b>Other Buffers</b>	none specified	<ul style="list-style-type: none"> <li>• 200 feet to occupied dwellings</li> <li>• 50 to 100 feet to property lines</li> <li>• 25 feet to rock outcrops and sinkholes</li> <li>• 5 to 10 feet to improved roadways and agricultural drainage ditches with slope &gt;2%</li> </ul>
<b>Slopes</b>	no restrictions specified	<ul style="list-style-type: none"> <li>• restrictions specified for time of year of application, incorporation, and other operations</li> </ul>
<b>Nutrient Management Plans</b>	none required	<p>required for:</p> <ul style="list-style-type: none"> <li>• Resource Protection Areas (as identified by the Chesapeake Bay Act),</li> <li>• “frequent application” (more than once in/ 3 years)</li> <li>• for any sites that also receive animal wastes</li> <li>• any other sites that NMP specialists feel should be more tightly controlled.</li> </ul>
<b>Groundwater Monitoring</b>	none required	<ul style="list-style-type: none"> <li>• may be required by the Commissioner</li> </ul>
<b>Agronomic Rate</b>	no violation of ground water standard	<ul style="list-style-type: none"> <li>• nitrogen application based on economic yield of specific crops</li> <li>• infrequent application encouraged to restrict agronomic rate to once in 3 year period</li> </ul>
<b>Soil pH</b>	minimum of 6.2	<ul style="list-style-type: none"> <li>• minimum of 6.2 may be necessary</li> <li>• maximum targets established based on soil characteristics</li> </ul>

	no maximum	
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## CLASSIFICATION OF BIOSOLIDS

The federal and state regulations classify biosolids along several continua: pathogen levels (e.g. *salmonella*, *e coli*, etc), pollutant levels (e.g. trace metals such as cadmium, lead, copper, selenium, etc.), and whether they are distributed in bags (e.g. "Milorganite") or in bulk (e.g. land application or compost available by the truck load).

The classifications are lengthy, complex and technical. We will highlight here only the most salient features of the different classifications. For further information, we refer the reader to the EPA handbooks listed in the Bibliography (see Appendix 10).

**Pathogen Limits (Class A or B):** Class A biosolids refers to those that have been processed to achieve the highest regulated level of pathogen control. Class A biosolids can be distributed in bulk and, depending on the treatment process, may be able to be applied virtually without restrictions to site or quantity, although guidelines for application rates should be provided at the time of distribution or sale. For the most part, Class A biosolids are composted and distributed as compost. If Class A biosolids also meet the highest regulated level of pollutant control for trace elements, they can be classified as Exceptional Quality (EQ) and can be distributed in bags with no limitations or site use or quantity.

Class B biosolids are processed to achieve a lower regulated level of pathogen control, and are therefore restricted in their application according to site characteristics, public access and contact with public waters, food crops and livestock.

**Pollutant: Limits:** All land applied biosolids must meet *ceiling* concentration limits per for nine specific trace metals. If the biosolids meet the most stringent standard, i.e.. the lowest ceiling concentrations, the biosolids may be classified as EQ. For biosolids meeting less stringent ceiling concentrations, additional standards may need to be met such as *cumulative loading* limits that limit how much of the pollutant trace metals can accumulate in the site with multiple applications over time.

**Vector Attraction Reduction:** All land applied biosolids must satisfy one of ten options that aim to reduce the attraction of "vectors," or animals and insects that might be attracted to the biosolids and could carry away from the biosolids pollutants or pathogens.

**Site Restrictions:** For bulk Class A biosolids there is a 30-day waiting period before crops may be harvested or domestic animals allowed to graze at a site. For Class B biosolids there are a number of site restrictions: (1) sites with a high potential for public use shall have controlled access for one year, (2) sites with a low potential for public use shall have controlled access for 30 days, (3) food crops with parts that touch the biosolids may not be harvested for 14 months, (4) food crops with harvest parts below ground may not be harvested for 20 to 38 months, (5) other food, fiber or feed

crops may not be harvested for one month, (6) turf that humans will be walking on may not be harvested for one month.

In addition to these harvesting restrictions, there are numerous restrictions relating to such things as distance to water, property lines, other buffers, slopes and weather. The application rate of biosolids is determined using the soil characteristics, vegetation present, planned future crops, the biosolids nitrogen content and crop nitrogen needs, the trace element loading rates and the maximum calcium carbonate equivalent loading rates.

## **INFORMATION ON VIRGINIA'S BIOSOLIDS LAND APPLICATION PROGRAM**

The following information are highlights of the biosolids land application in Virginia, collected from the VDH and a survey of the Water Environment Federation (WEF) as reported in its 1997 "National Outlook" report.

- In 1995, according to a survey of the WEF, the following rough tonnage was reportedly generated by states in EPA Regions II, III, and IV.
  - ◇ 20,000 dry tons in West Virginia (R-3)
  - ◇ 40,000 dry tons in Delaware (R-3)
  - ◇ 91,000 dry tons in South Carolina (R-4)
  - ◇ 93,000 dry tons in Maryland (R-3)
  - ◇ 128,000 by DC (R-3)
  - ◇ 155,000 dry tons in Virginia (R-3)
  - ◇ 194,000 dry tons in North Carolina (R-4)
  - ◇ 217,000 dry tons in New Jersey (R-2)
  - ◇ 242,000 dry tons in New York (R-2)
  - ◇ 255,000 dry tons in Tennessee (R-4)
  - ◇ 262,000 dry tons in Pennsylvania (R-3)
  - ◇ 509,000 dry tons in Florida (R-4)
- A more recent estimate by the VDH is that Virginia's Publicly Owned Treatment Works (POTW's) produce approximately 200,000 total solids dry tons per year. Of this, about 150,000 dry tons are biosolids. On a daily basis, Virginia produces about 400 dry tons of biosolids per day.
- Approximately 50% of these biosolids, or 75,000 dry tons per year, are land applied in Virginia. About 35% of the remaining biosolids are incinerated and 15% are

landfilled. For comparison application rates of total biosolids, dry tons were reported in 1995 to the WEF as follows:

- ◇ 32% in Delaware
- ◇ 42% in Virginia
- ◇ 50% in New Jersey
- ◇ 50% in Tennessee
- ◇ 59% in Pennsylvania
- ◇ 63% in West Virginia
- ◇ 67% in South Carolina
- ◇ 70% in New York
- ◇ 70% in Florida
- ◇ 76% in North Carolina
- ◇ 95% in Maryland
- ◇ 98% in DC

- In addition, Virginia receives about 200 dry tons of biosolids per day from out-of-state sources, or about 73,000 dry tons biosolids per year. The bulk of these biosolids comes from Maryland and is land applied by all five major operators in Virginia. Other biosolids from New Jersey are primarily land applied in Essex County, from New York are taken primarily to the Charles City landfill, and pelletized biosolids from Boston, Maryland, New Jersey and Philadelphia are distributed in Virginia for landscape uses.
- The total tonnage of biosolids that are land applied to agricultural and forest land, combining Virginia-produced and other sources, is about 400 dry tons per day or about 150,000 dry tons per year.
- Land application in Virginia is performed primarily by five major companies (*see Appendix 4*).
- The biosolids land application rate in Virginia ranges from 5 to 8 dry tons per acre. The average, however, is dropping to 7 dry tons or less because of two recent revisions to the Virginia permitting regulations: (1) a change in the calculation of the agronomic rate from the *optimum* rate to the lower *economic* rate of application; (b) a lower target soil pH of 6.5 in coastal plains and 6.8 in other areas, which means less lime-amended biosolids may be applied to those soils.

- Given the average rate of application, a total of nearly 24,000 acres per year are spread with biosolids at an average of 65 acres per day. VDH estimates that the overall permitted acreage needed to allow sufficient farmer flexibility in cropping and rotations is three times the amount of acreage applied over three years. Given the rate of 24,000 acres per year, roughly 216,000 acres should be permitted for land application. Currently about 200,000 acres are permitted, slightly less than what is considered sufficient to keep pace with the demand.
- The permitted acreage represents about 2.5 percent of the 8 million acres currently in agricultural production in Virginia.
- Most land applied biosolids in Virginia are classified according to Federal Rule 503 as Class B Pollutant Controlled (PC) biosolids that are treated to achieve both pathogen and vector controls, usually through lime treatment. As a general rule, smaller treatment works tend to treat their biosolids by the digestion process rather than with lime. Virginia does have some federally classified Class A, Exceptional Quality (EQ) biosolids that are composted and sold in bulk by facilities such as can be found in Hampton Roads, Charlottesville, Harrisonburg and Franklin. These composted biosolids may be used by the general public without restrictions to site or quantity, although guidelines for application rates are supposed to be provided at the time of sale.

# METHODOLOGY

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## THE IEN

The Institute for Environmental Negotiation (IEN) is a nonprofit organization affiliated with the Department of Urban and Environmental Planning in the UVA School of Architecture. IEN offers mediation and consensus-building services to governments, citizen organizations and businesses dealing with complex policy choices about land use and the natural and built environment. As such, IEN serves as a third-party neutral to help people create and agree upon solutions that are sustainable. Although this study marks a departure from IEN's typical role in that IEN has been asked to submit recommendations, IEN has striven to maintain its neutrality throughout the information gathering process and in the formulation of its recommendations.

## METHODOLOGY

At the outset of its work the IEN met with a *Special Insight Committee* composed of stakeholders in the supply and transport of biosolids, county government, environmental interests, cooperative extension services, and state agencies (*see Appendix 1*). IEN discussed with the Committee the parameters and general goals of the study, and solicited participant concerns and ideas.

Given the nature of the issues involved, the time pressures of the personnel needed to be contacted, and the need for a high response rate, IEN conducted its survey through telephone interviews with county personnel. Using suggestions from the Special Insight Committee where appropriate, IEN formulated a set of leading questions to use as a framework for its interviews with Virginia county officials (*see Appendix 5*).

At the time of this study, 31 counties and cities of Virginia have land application of biosolids permitted through VDH (*see Appendix 2*). Four of these also have land application of biosolids permitted through the Virginia Department of Environmental Quality (DEQ). In addition to these 31 counties, 11 counties have land application of biosolids permitted solely through DEQ, bringing those with land application of biosolids to a total of 42 counties, which represents 46% of the 92 counties in Virginia.

Over the course of six weeks in July and August, IEN interviewed 23 counties and one city (*see Appendix 3*). Twenty of the counties interviewed have land application of biosolids permitted through VDH, which represents about 65% of the counties permitted through VDH. Three of the counties interviewed do not have any VDH permit for land application of biosolids. While IEN did not interview counties with

permits *solely* through DEQ, a number of counties interviewed had farmland permitted through both VDH and DEQ, which provided IEN with insight into the role of DEQ in the biosolids program.

In addition to Virginia county personnel, IEN also spoke with experts from a variety of state, local, private and other agencies, including the U.S. Environmental Protection Agency (EPA), Water Environment Federation (WEF), Virginia Cooperative Extension Service (VCES), the Waste Management Institute at Cornell University, Virginia Soil and Water Conservation Districts, VDH, DEQ, Virginia Department of Conservation and Recreation (DCR), and the States of Washington and Maryland.

IEN reviewed resource materials available from the EPA concerning federal biosolids regulations (40 C.F.R. 503), the new proposed Virginia regulations, 18 issues of *Sludge* available on the internet, a national overview of biosolids by *BioCycle*, as well as additional materials and papers provided by the VDH, WEF, and the Waste Management Institute (*see Appendix 8*). IEN also reviewed a legal summary prepared by a UVA law student for IEN, as well as other legal documents such as the May 24, 1995 decision of the U.S. District Court regarding the appeal of W. Dale Welch, et.al. versus the Board of Supervisors of Rappahannock County.<sup>6</sup>

After the development of a first draft report, IEN met a second time with the Special Insight Committee to share its findings and to hear Committee member reactions, insights and suggestions. A second draft report was similarly circulated to Committee members, along with a request for comments. (*See Committee responses in Appendix 11.*)

As noted earlier in this report, IEN was contracted to develop and report independent recommendations to the VDH. The advice and suggestions of the Special Insight Committee were extremely helpful in designing the process and in reviewing the material and draft recommendations. Nevertheless, IEN is solely responsible for this report, and neither the Committee nor individual Committee members necessarily endorse all of its findings or recommendations.

# COUNTY SURVEY FINDINGS

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As mentioned above, IEN conducted telephone interviews with personnel from 23 counties and one city by using a set of leading questions (*see Appendix 5*). Most of the interviews were conducted with County Administrators or Assistant County Administrators; at the request of the administrator or assistant administrator a few interviews were conducted with other county staff such as the health officer or county VCES agent. At the outset of its interviews, IEN informed the county official of the study it was conducting for VDH, its methodology of interviewing counties with biosolids programs, and its desire to seek county suggestions for improving the program. Actual interviews ranged in time from as short as ten minutes to nearly over an hour. On average, most interviews lasted about 30 minutes.

In the course of conducting these 24 interviews there was significant variability of county interest and time available. IEN conducted the interviews more in the nature of an informal conversation than a formal statistical survey, with considerable discretion and judgment about questions to ask given to the interviewer. Just as in some interviews not all questions listed in the Appendix 5 were asked, in many interviews additional questions were asked.

It is important to reiterate that the information obtained from these interviews is neither statistically representative nor even necessarily accurate, as the purpose of the interviews was to elicit county staff awareness and knowledge of their biosolids program.

## *Sludge, Storage, Manure*

In most of the counties surveyed, the primary land application program was of biosolids. While 20 out of 23 of the counties interviewed have ongoing land application of biosolids, few applied manure (6), few had biosolids storage facilities (3) and fewer still applied septage (2).

## *Ordinances*

In eleven of the counties surveyed, the person interviewed believed that the county has an ordinance applying to some part of the biosolids program (Augusta, Caroline, Fauquier, Franklin, King George, New Kent, Northumberland, Pittsylvania, Rappahannock, Richmond, Westmoreland), of which Caroline and Rappahannock have ordinances prohibiting any biosolids application.

Nine counties (Botetourt, Charles City, Essex, Goochland, Hanover, Halifax, Loudoun, Louisa, Prince William) did not report an ordinance, and one county (Orange) was not sure.

Counties that have adopted ordinances concerning biosolids in the last several years include Rappahannock (1992), King George (1994), Northumberland (1996), Augusta (1996) and New Kent (1997). Counties where the possibility of local legislation was already present or raised during our interview period, from June through August 1997, include Hanover, Loudoun, Louisa, New Kent. As our study progressed, an incident occurred in Orange County that also led that county's Board of Supervisors to consider a proposed one-year ban on land application; the resolution was rejected on September 24 by a 3-2 vote.

### *Policy Level Concerns*

Of 21 counties with programs, eleven did not feel they had experienced policy-level concerns. Of the remainder, nine out of ten counties experienced policy-level concerns triggered by a specific problem or complaint. The exception is Rappahannock County which, although no land application of biosolids ever occurred in the county, adopted in 1992 a prohibition on the practice. Rappahannock's prohibition was unsuccessfully contested in a lawsuit by a group of farmers who allegedly were concerned about retaining the right to apply biosolids if they should ever so choose; the District Court of Appeals upheld the county ordinance and found that it did not violate the commerce clause, nor was it preempted by the Clean Water Act.<sup>5</sup>

Three of the nine counties experiencing policy-level concerns felt that they have resolved the problems through adoption of ordinances (King George, Northumberland, New Kent). Three others are considering adoption of ordinances (Prince William, Halifax, Louisa), and Louisa has decided in the short term to simply issue a warning to the suppliers that they must measure pH of the truck load before it is spread at a site. Two others have established advisory committees such as Loudoun, where a Technical Study Group will submit recommendations to the Board, and Hanover, where an ongoing Task Force is established to address specific problems.

### *Nature of Concerns*

Most counties interviewed reported that they receive ongoing occasional complaints and that most are resolved at an early stage. In a number of the counties experiencing more serious problems, multiple concerns were expressed. By far the largest number of reported concerns involved odor (14), while others concerns noted were water quality/pollution (7), nuisance factors such as dropping biosolids on the road (3), traffic (2), hauling to other farms (1), and lack of enforcement (1). These concerns generally match the categories of complaints reported by state regulators and summarized in a 1995 WEF study, in which 41% concerned odors, 21.7% concerned health, 17% concerned nuisance factors, 6.5% concerned appearance, 8.7% concerned transportation, 2% concerned noise, and 2% concerned other issues.<sup>6</sup>

According to the county personnel interviewed, most of the complaints were initiated by citizens (10), while one county received complaints from an environmental organization, one county received its initial complaint from a County Supervisor, and one reported complaints from the farmers whose fields were being spread with biosolids.

In counties that have experienced serious problems, a sequence of events was described by county personnel that generally reflects the following pattern:

* 1 →→→ Incident	* 2 →→→ Local Response/ Investigation	* 3 →→→ Program and Management Concerns	* 4 Local Control and Oversight
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**1. An incident**, such as a noxious odor or visual impacts such as road spills or leaking trucks or other problems that offend citizens, causes a complaint to be lodged with a local authority. Most locally-initiated investigations seem to be resolved at the local level, as most counties reported ongoing occasional complaints that never erupt into a “big deal.” A severe problem, however, such as noxious odors lasting for more than two or three days, usually leads a county to bring in state-level expertise to assist in some manner with the problem. The sequela to an incident seem to depend on several key factors such as:

- (1) relative frequency of incidents,
- (2) the degree to which a community is willing to tolerate “aesthetic” nuisances,
- (3) the response to incidents.

Any one of these three factors can determine whether or not an incident is propelled onto the agenda of local policy makers. For example, in the best case scenario for the program, no policy issues may arise if incidents are (1) infrequent, or (2) the community, especially neighbors, is predisposed to accept these incidents as unfortunate accompaniments to a desirable practice, or (3) the concerns are addressed sensitively and responsibly.

On the other hand, policy issues are likely to be raised and citizens can be expected to organize if (1) the incidents are frequent or close in time, or (2) the community, especially adjacent neighbors, is not predisposed to accept these practices as desirable and is likely to have a lower tolerance for visual and odor nuisances, or (3) the response to the incidents is inadequate or insensitive.

Lastly, policy action and management issues are triggered if (1) the public reaction is strong enough, and (2) local government management or local elected officials feel that some sort of official response is required.

**2. Investigation:** Initiated by the local county government, the investigation may lead local authorities to contact a state agency for assistance and review.

*Principal issues:* Issues that seem to be most troublesome in the counties interviewed are usually visual and odor problems that distress citizens; these might result from over-application of biosolids, poor quality of biosolids often resulting from insufficient lime stabilization or poor timing of application before heavy rains.

*No Uniform Response Process:* It is also worth noting that among the counties surveyed, we found no predictable or uniform process for investigating or resolving the problem. Some counties might resolve a complaint at the local level by simply talking with the complainant and without reporting to the state. Other problems might be resolved by calling the contractor. Yet other problems might be resolved by calling one of five state agencies: DCR, DEQ, VDH, SWCD, or VCES.

**3. Program and Management Concerns:** When management and policy issues are triggered, local citizen and government concerns often move beyond the initial triggering event to broader environmental concerns, such as water quality. The IEN survey did not find that local authorities call into question the appropriateness of either federal standards or state regulations; rather they question the program management, monitoring and enforcement of regulations.

**4. Local control and oversight:** These broader concerns often progress to questions about the adequacy of state monitoring, enforcement and program controls. It is not uncommon for local government to feel that monitoring, enforcement and program controls are inadequate or insufficient to address local concerns. To fill the actual or perceived void, local government often attempts to establish more local control over the program. It is at this point that the County begins to consider various options, such as establishing more local monitoring, creating local permits and advance approvals, establishing an *ad hoc* body or study group charged with recommending local action, prohibiting the practice altogether or even demanding state level changes.

In Loudoun County a fish kill in a private pond served as the trigger event, with newspaper coverage offering pictures of floating dead fish. Although this wasn't the first complaint that the County had experienced, the public nature of this incident raised concerns to a heightened level which, ultimately, led to the establishment by the Board of Supervisors of a Technical Study Group.

A recent incident in Louisa County was triggered by reported overpowering, noxious odors that lasted weeks, not days, and that prevented children from playing outside. An investigation revealed that the biosolids, while applied properly, may not have been properly stabilized by lime. The "immense" number of telephone complaints caused the Board of Supervisors to consider taking action in August 1997, including the possibility of a local ordinance. According to a county official, the Board ultimately

decided that all suppliers to the county should be sent warning notices that pH should be measured routinely, before every batch is applied, and that if another problem occurs the “plug will be pulled” on the program - meaning a probably prohibition on land application.

New Kent County reported that the beginning trigger for its new ordinance on biosolids, adopted in June, was an incident in which biosolids were spilled all over the road. The incident began when biosolids were spread on a field under very wet conditions, so wet that “the truck was dragged through the field, dumped, and dragged back to the road.” While the field was “ruined” by this incident, and the farmer reportedly will not be able to cultivate the field for another couple of years, the condition of the road was what triggered the county complaint. The County reports that it called the VDH, which in turn stopped the hauler from operating. VDH reports no record of such contact and, as the permit is held with DEQ, it is likely that the actual agency contacted was DEQ. The work stoppage was short-lived, however, and when the hauler started up again the next week the County “felt helpless” in being able to stop an unacceptable operation. Not only was the County feeling pressure from an increase in permit applications, but it was unable to use the Agricultural Stewardship Act “bad actor law” as the event occurred two weeks before the law went into effect. The concerns in this instance broadened from a poor road condition to odor, water quality (shallow wells), and general public health. The result was a county ordinance that requires education of farmers before application (“training on soil and crop management”), requires a nutrient management plan for biosolids, requires incorporation within 24 hours, requires lime stabilization when the pH is below 6.0, prohibits application within Resource Protection Areas (RPA’s), and allows surprise, random sampling and testing by the County or VCES.

King George County reported that its ordinance, adopted three years ago, prohibits hauling Class A biosolids from one farm storage facility to another. The county official stated that the ordinance resulted from a specific incident in which biosolids had not been properly lime stabilized, causing noxious odors, and “to make matters worse” were improperly applied to a “set aside” area. A second problem in King George County has concerned a leaking storage pad in need of repair. In both cases the official reported that they called DEQ for assistance and had to strongly insist that DEQ come out to investigate. A strong implication was that the lack of local control and lack of responsiveness by DEQ led to the county ordinance.

In Fauquier County a trigger event was an overturned truck, which caused “public relations” problems for a short time. In Caroline County, where the application of biosolids has been prohibited by ordinance since the mid-1980’s, an incident was triggered many years ago when the biosolids were over-applied to uncultivated pasture land right before a big rain. In addition to complaints about the noxious odor, neighbors were “up in arms” and complained that the biosolids washed off into the stream. Richmond County reported an incident in which a driver, distracted by the

spreading activity in the field, rear-ended a second truck pulling off the road and blamed the county.

Several counties reported that the trigger was an overpowering noxious smell from a “bad batch” of biosolids suffering from low pH or inadequate lime stabilization. Northumberland County reports ongoing complaints about odor and water degradation from citizens since their ordinance was passed in 1996. Essex County reports that while some farmers favor biosolids application, other farmers in the county are opposed to biosolids application because spreading was not as uniform as desired, application when the fields were too wet “cut up the fields” so that agricultural operations were delayed and, lastly, complaints of bad odors resulted when the biosolids remained on the surface and were not incorporated.

In Orange County, the official interviewed feels that they are able to avoid policy-level concerns because of their unusual monitoring program which is the first of its kind, to our knowledge, in Virginia. Beginning in 1993, Orange has hired a part-time local biosolids monitor who keeps the records, inspects application sites, handles complaints and gives prior notice to neighbors. The monitor’s hours are billed to the private biosolids management company. In addition, the county requires that biosolids be lime stabilized, and exceptions require advance notification of and *written approval* from both adjacent landowners and the Supervisor of the election district. While Orange County reports ongoing complaints of odor by neighbors and citizens, and of traffic by citizens who live along the road traveled by five or six trucks per day, they nevertheless believe that its program works extremely well because advance notification minimizes questions and complaints and because the local monitor helps resolve problems before they escalate.

#### *Familiarity With Biosolids Treatment and State Regulations*

Understanding and knowledge of biosolids treatment, testing and state regulations seems to be spotty and inconsistent. While eight said they were familiar with these processes, four county staff said they were not familiar with biosolids treatment and testing, and three were not sure.

#### *Familiarity with State monitoring and inspections*

While six of the county staff interviewed did not know whether there is state monitoring and site inspections, half assumed it was being done on a routine basis. Of the ten people who said they believe state monitoring and site inspections are supposed to occur, most qualified their response with comments indicating that they find the reality of state monitoring and inspections nonexistent or inadequate.

King George County reported that the state should be monitoring the program, but noted that in their experience it was extremely difficult to get the state agency

(DEQ) to actually come out to investigate a problem. Richmond County staff reported that he knew more about Maryland's system of monitoring, in which a field inspector is on site for every truck unloaded. He had never seen a state employee at a permitted site in Virginia and suggested that there is not enough local staff to cover the job.

Louisa, on the other hand, felt that the state was very responsive. Staff reported that when they called the VDH Lexington office, the inspector came out to investigate the very next day.

Rappahannock reported that a key element in their successful defense of their county prohibition on biosolids application was that the state had only one DEQ inspector for the entire northern Virginia region, which in their view demonstrated the state's inability to really inspect and enforce regulations.

New Kent County reported that VDH, following a badly managed application and mishap in which biosolids were tracked onto on the road, immediately stopped the hauler from operating; the next week, however, the hauler resumed conducting its business in the same manner. Although these operations were permitted by DEQ, the staff felt that VDH was unable to handle the problem satisfactorily. The County subsequently moved to adopt in June a new ordinance (*see Appendix 7*) that requires farmer training on soil and crop management, requires nutrient management plans, requires incorporation within 24 hours, authorizes random sampling and testing by the County or VCES Agent and prohibits application within RPAs.

#### *Familiarity with Local Land Use*

Twelve county personnel expressed some familiarity with the type of farmland that can be permitted for land application of biosolids, while only three said they did not know. Thirteen said they either knew or could find out how many acres were permitted in their county, and three said they did not know. Ten said they knew the various locations of these permits, and six did not know.

#### *Familiarity with Haulers and Sources*

Ten county personnel said they knew the source of the biosolids spread in their county, although three said they only knew after the fact when the monthly report arrived. Three did not know the source of biosolids.

Nine said they knew which haulers served which sites (five counties have only one hauler), while five said they did not know. Of those with different haulers operating in the same county, five said they did not feel there was a notable difference between applicators, two noted current differences, two noted differences in the past, and one did not know. The differences are usually reported as differences in the level of professionalism and cleanliness.

Six said they did not know whether the biosolids quality differed among biosolids suppliers, while three said they experienced no notable difference, two said they experienced notable differences, and two said they knew of differences but had not yet experienced the problem themselves.

### *Compliance with Permits*

There was significant variability in the understanding of who is responsible for compliance with permits. Three counties simply did not know who was responsible, while seven said the hauler is responsible, four said the farmer is responsible, and three said DEQ is responsible. No county mentioned the Publicly Owned Treatment Works (POTW) or VDH as the responsible agency. Two of the counties who named the farmer stated that although the hauler may be responsible technically, the ultimate responsibility falls on the farmer. One county also mentioned that incorporation of the biosolids is the responsibility of the farmer, who may or may not follow through appropriately.

### *Complaints Response Procedures*

The responses of county staff relating to complaints procedures indicate that this is an area deserving attention and further refinement at the state and local level.

Designated Officials: In terms of having a designated official responsible for the biosolids program, eight counties have designated officials and five do not. Of those who say they have designated officials, it is interesting to note that most of these officials are fulfilling other responsibilities as well, such as the assistant county administrator or county VCES agent. In several cases it seemed that the county administration simply assumed that the county VCES agent was responsible for the program.

One county VCES agent, however, noted that while VCES may assist the farmer in understanding and administering the program, by providing assistance with nutrient management plans or water quality plans, it is not an appropriate role for VCES to assume a role of oversight, monitoring, or inspection as it could place the VCES agent in an adversarial position toward the farmer.

Complaints Procedures: Half of the respondents said they knew of a process or procedure they could initiate at the local or state level in the event of a local problem or complaint, while half said they did not know. Many of those who knew of a process or procedure said it was simply to call an official (e.g. VCES, VDH, DEQ) and/or to call the hauler.

*Handling Complaints:* The wide diversity of responses of counties questioned about how they would typically respond to a complaint suggests that there is no clear, uniform procedure currently understood or practiced. While two counties did not say what they would do in the event of a complaint, of the remaining eleven who responded one county said it would first call the Soil and Water Conservation District, one would first do an on-site inspection, one would first call DEQ, two would first call the contractor, two would first call VDH, and four counties noted a sequence of actions such as conducting an on-site visit, calling the contractor, and also calling DCR, DEQ or VDH.

Overall, the level of county “readiness” or advance preparedness to handle complaints appears to be low. Unless a county had already experienced significant problems, the method of handling a potential complaint does not seem to be *pre-identified* or well established. Rather, counties appear to develop ways of handling problems on an *ad hoc* basis in the event of a problem.

#### *Public Education*

No county interviewed has an ongoing, active public education program about the land application of biosolids, and most were not aware of any education program. Nine counties said they did not know if such a program existed, one county said it did not have such a program, and two said they rely on the state for public education materials. Five other counties said they had offered some public education in the past, which usually referred to the public hearing during the permitting process.

### **COUNTY RECOMMENDATIONS FOR PROGRAM IMPROVEMENT**

Virtually every county offered suggestions on how the program could be improved. The following are their recommendations, grouped according to common themes.

Please Note: *The following recommendations were made by County officials or staff. We report them here, without addressing their accuracy or relevance, simply to provide the reader with greater insight to the perspective of the counties interviewed. The listing of these recommendations does not imply IEN endorsement or agreement.*

#### **COUNTY Recommendations for Program Improvements in *Regulations and Permitting regarding biosolids quality***

- Ensure quality biosolids.

- Require applicators to measure the pH of the truck load before it can be applied to the field.
- Require trucks to be labeled with the company name, to facilitate notification of the appropriate company in the event of a problem.
- Give haulers the authority to refuse loads of biosolids that are not appropriately stabilized or are not otherwise of suitable quality.

**COUNTY Recommendations for Program Improvements in *Regulations and Permitting regarding application***

- Require Nutrient Management Plans.
- Require Water Quality Conservation Plans, which cover erosion and pest controls.
- In rural/suburban areas, only permit the application of only Class A biosolids and require rapid incorporation. (4 counties suggested this.) Other related suggestions were that application should take into account the weather and winds, that the behavior of trucks on major roads should be monitored, and that more storage should be created across the state to facilitate holding biosolids in the event of bad weather.
- Application should be prohibited in the flood plain and bottom lands (to address water quality concerns).
- Application should be prohibited on pasture or hay land, where biosolids cannot be incorporated (to address odor and water quality concerns).
- Require testing in every permit to ensure that the requirement for 18 inches to groundwater is respected.
- Require long-term testing, where the soil is tested at least every three years, and down stream tests are conducted over the long-term, beyond 5 years.
- Permits should not be allowed to be changed by the State without local government's input.

**COUNTY Recommendations for Program Improvements in *Advance Notification***

- Applicators should be required to give farmers advance notice of application by 48 hours. Farmers should have the final approval of the timing of the biosolids application.

- The local SWCD should receive advance notification of the time and place of applications.

### **COUNTY Recommendations for Program Improvements in *Inspections, Monitoring, Enforcement***

- Inspections and enforcement should be conducted at the state level (5 counties suggested this). Suggestions include requiring state inspections and chemical sampling of every load applied at each site, as one county believes is required by the Maryland program; conducting random state-level inspections; and making an example of a violator and publicizing the fine/enforcement.
- Provide the SWCD with the authority (but not the responsibility) for spot inspections.
- Use the Agricultural Stewardship Act to enforce “bad actors,” e.g. farmers who induce firms to incorporate biosolids but then do not plant crops for uptake.
- Create a fund to pay for enforcement/inspection officers. One option offered is that used by Maryland’s program in which they charge the generator \$1 per ton and use this money to hire a private inspection firm. Another option used by Orange County is for the county to hire a monitor/inspector whose hours are then billed to the biosolids management company. (*See Appendix 6 for Orange County’s job description and contractual agreement.*)

### **COUNTY Recommendations for Program Improvements in *Roles and Responsibilities***

- Take responsibility off of the farmers for making sure the applicator spreads the biosolids uniformly and according to the conditions of the permit.
- The state agency should adopt a non-advocacy, neutral position. This would improve its credibility with the public. The current advocacy orientation of the agency limits its ability to provide a disinterested review of a permit or a problem.

### **COUNTY RECOMMENDATIONS FOR EDUCATION (SEEN AS A MECHANISM FOR PROBLEM PREVENTION)**

- Public education for citizens and farmers about public concerns of odors, water quality, and public health. These concerns should be acknowledged candidly, not minimized, and people should be told *how* these concerns are being addressed in the program. (2 counties suggested this.)

- Education for public officials. (3 counties suggested this.) One county noted that counties should be provided information about cumulative loading limits and metals in the biosolids.
- Education for the spreaders/ contractors.
- Adjacent landowners should be informed of permitting and spreading, under the Disclosure Laws.

## OTHER FINDINGS

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### WHAT IS GOING WELL WITH VIRGINIA'S LAND APPLICATION PROGRAM

Drawing from our survey of Virginia counties, as well as discussions with various agency personnel, IEN believes the following characterizes what is going well with Virginia's land application program.

- Low profile: The state program has been in existence for 16 years during which time approximately one-half million wet tons of biosolids have been applied to nearly 25,000 acres of farmland annually. Yet our survey found that the program is relatively unknown and little understood by the public and public officials. The relatively few complaints that have occurred typically have been triggered by objections to odor. Most problems, when they occur, tend to stay local.
- No formal, organized opposition: In the absence of continuing local incidents, no group has organized to oppose the land application of biosolids at the state level or local level.
- Active support: The program appears to be viewed favorably by the agriculture community as a way of obtaining nutrients at low or no cost, and the Virginia Tech agriculture science faculty and VCES generally supports and promotes the program to the farming community.
- Standards not challenged: Consistent with the finding that the program is little understood, federal and state standards are not usually challenged, even when a problem occurs at a local level.

### ISSUES AND CONCERNS THAT MAY BE RAISED

In the event of multiple incidents, biosolids applications can easily evoke negative responses to the program by triggering latent or not-so-latent concerns. Examples of these concerns are that:

- Biosolids are not a nutrient or soil amendment material which is being recycled but a biosolids that is being disposed of; that is, it is a waste product.
- Human waste is inappropriate for application to crop or pasture land.
- Biosolids from locations remote from the application site are more objectionable.
- Odors are especially objectionable and are more than a minor nuisance.

- Health concerns relate to the uptake of inert materials and heavy metals that may bioaccumulate.
- Pathogens may not be entirely removed by stabilization and can cause illnesses.
- Government officials including environmental agency officials cannot be trusted because they have self-serving, vested interests in promoting the disposal/land application process.
- The regulations are not properly monitored or enforced.
- Inclination by the public to accept criticisms of the program as valid because of the distrust of, or lack of enforcement by, agency officials.

We believe the most effective way to minimize the likelihood of these concerns from being raised is through good communications and education and program management practices that reduce the probability of incidents.

## CHARACTERISTICS OF A STRONG STATE PROGRAM

Based on a composite of our interviews and research, in our view a “strong state program” of biosolids land application can be characterized by:

- Communication: Frequent and steady communication and information sharing, flowing back and forth between the state, local government, other groups at the local level, and industry.
- Local “Field” Presence: A strong local field presence through on-site monitoring, training and education, rapid on-site investigations in the event of a problem and local hearings.
- Training: Frequent training offered at local level (as opposed to the state capital) for all involved parties, e.g. applicators, generators, farmers and monitors.
- Effective Response Systems: A rapid and predictable response to complaints, including on-site investigation, face-to-face meetings with the complainant and other involved parties, local hearings if needed, and an open attitude that problems can and do occur.

Information on trends and programs in other states can be helpful to assess where Virginia’s standards are in relation to other states, as well as to obtain ideas on how Virginia’s program might be improved. Drawing from the trade journals *Sludge* and *BioCycle*, as well as some individual contacts, we summarize below a few significant national trends, as well as features of some other state programs, to provide a larger context for understanding the Virginia program.

- *Most states are more restrictive than the federal rule:* According to a Fall 1996 national survey conducted by *BioCycle*, 32 out of 46 states consider their regulations to be more restrictive than the federal Part 503 Rule.
- *About half the states seek delegation:* While 22 of the 48 responding states, including Virginia, indicated that they hoped to achieve delegation from the US EPA to administer the Part 503 Rule, 25 states indicated they would not seek delegation, and 2 did not respond.
- *Restrictions are in management practices:* 32 states, including Virginia, report more restrictive management practices than the Part 503 Rule. Most of these restrictions involve setback distances, slope restrictions, winter time application, agronomic rates, post application moratorium periods for grazing, cumulative loading requirements.
- *Beneficial use seen as increasing:* 30 states reported that they are seeing a general trend of increased beneficial use of biosolids in their state.
- *Numerous challenges reported:* The number one challenge reported by states relates to public acceptance of land application. Other challenges reported by *BioCycle* include finding suitable sites, meeting pathogen reduction levels, odors from both land application and composting programs, adequate storage capacity, lack of manpower and permitting. It is interesting to note that only two states reported having to deal with local ordinances that restrict the use of biosolids.
- *Alabama* adopted new rules in 1996 that require “sludge handlers” to perform hydrological studies, and requires the state groundwater division to review permits. In 1995, they began to consider allowing installation of ground water monitoring stations, and transitioning from site permitting to a watershed permitting strategy for NPDES, in line with the EPA model.
- *California* uses lagoons with “activated biosolids” as its primary means of disposal, while its incineration program is “winding down” and landfilling is used sparingly. To address pathogen reduction considerations, the state sometimes requires more than a 30-day wait between biosolids land application and grazing.
- *Colorado* issues site-specific permits for land application sites. The city of Pueblo appealed the selenium standard because it is built on soil containing naturally occurring selenium. Colorado applies biosolids on golf courses, reclamation sites, or highway medians where public access is limited. The city of Denver owns thousands of acres of farmland and uses land application of biosolids in their production of small grain crops for market sales.

- *Connecticut* has established practices that are more stringent than the Part 503 Rule with regard to storage, record keeping, and product stability.
- *Idaho*, according to a 1994 *Sludge* report, is not planning on changing or upgrading the state program, which consists primarily of management plan requirements and approval protocols. EPA will remain the prime regulatory authority in the state for biosolids.
- *Indiana* land applies roughly 75% of its biosolids. It has adopted site use restrictions that are more restrictive than the Part 503 Rule. In terms of education, Indiana has had “round table discussions” in different parts of the state, with some success. They also publish a bi-annual newsletter that is sent to all landowners of permitted sites in the state, which helps to give provide farmers with timely technical support. According to one of their program managers, they have “tried very hard to involve our Residuals Management Committee in as many different ways as possible.”
- *Maryland* reportedly has the longest public participation process for land application of biosolids permits in the nation. (Another source indicates that states with longer public participation processes for permits are Wisconsin, Ohio and Virginia.) Maryland requires a site-specific nutrient management plan that is “enforceable” in that any deviation from the planned crop plantings causes a suspension in land applications until the nutrient management plan is revised accordingly and approved. The Maryland program also requires an on-site monitor at every field application; the monitor is provided by a private inspection firm and is funded by a generator “tipping fee” of \$1.00 per ton. Maryland officials believe that the presence of an on-site monitor at every site does decrease the number of problems and incidents, although they are unable to provide specific supporting statistics .
- *Minnesota* faces the problem of severe weather conditions and extreme winter temperatures. According to *Sludge*, the hallmark of Minnesota’s program is its “holistic perspective.” In addition to setting state standards, the state administers an intensive operator training program and requires certification for applicators. Also, each specific site has to be approved by a soil scientist prior to application.
- *Missouri* requires tracking of its exceptional quality biosolids, according to the *BioCycle* survey. Site restrictions and buffer zones are also incorporated into state regulations.
- *Montana*, in contrast, where only 13% of its biosolids is land applied, is not going beyond the Part 503 Rule.
- *Nevada*, as reported by *Sludge* in 1995, is not intending to seek delegation of the Part 503 Rule; instead it is seeking to establish a Memorandum of Understanding with

the EPA that would enable Nevada to write its own permits. Nevada prohibits importation of biosolids for disposal, but does allow importation for land application.

- *New Jersey*, according to a 1996 *Sludge* article, is moving towards deregulation. In 1996 New Jersey law prohibited land application of biosolids on fields used to grow field crops, but that barrier would be removed with the intended adoption of the Part 503 Rule. New Jersey will not be permitting individual sites, but will require letters of approval from the state Department of Environmental Protection. *Sludge* further reported that 30% of its biosolids is land applied within the state, 24% is incinerated, and the remainder 46% is shipped out of state.
- *New Mexico*, according to a 1994 WEF survey, will require ground water monitoring and ground water discharge plans for almost all land application sites.
- *Ohio*, according to a 1993 *Sludge* report, is struggling with issues of health risks. A bill introduced would require the responsible state agency to draft regulations that address the health risks of biosolids disposal. Testimony of a medical microbiologist about surviving pathogens and persistence in the soil was considered critical to the passage of this bill.
- *Oklahoma* requires incorporation of all applied biosolids on a daily basis, according to the *BioCycle* survey.
- *Oregon* has a long-standing program of land application of biosolids, endorsed since 1979. The Part 503 Rule is stricter than Oregon's previous standards; the responsible state agency did not require advance public notice, monitoring for metals, reporting management practices, or require a 12-month lag between applying Class B biosolids and harvesting turf. Now, according to the *BioCycle* survey, the state approves sites by a letter in which restrictions may be specified for season, depth to groundwater, slope, application method, crops or soil type. Setbacks to water sources are also specified.
- *Pennsylvania and Maryland* were reported by *Sludge* to be "eyeing more restrictive cadmium limits" than Part 503 Rule.
- *Wisconsin* prohibits application on frozen or snow covered ground, according to the *BioCycle* survey, and has established setback requirements, slope restrictions, as well as agronomic rates that consider all sources of nitrogen. Wisconsin also enjoys a long history of recycling.

## TERMINOLOGY AND PERCEPTIONS

As the WEF documents establish, and as our survey confirms, sewage sludge or biosolids programs must contend with public perception. Even the use of the terms “biosolids” or “sludge” to describe the material is contested by different parties.

Generally, water treatment professionals and the WEF favor the term “biosolids” while usage of this term is contested by some as implying that corn stalks, silage etc. rather than sewage sludge is what is being described. Apparently the US EPA cannot itself use the term “biosolids” in its regulations. In any case, the terminology used remains unsettled and controversial.

The issue of terminology raises the question, What treatment processes are sufficient to justify the distinction between “sludge” and “biosolids”? It is also interesting that the generic term “sludge” can include industrial sludge which can be of a very different character than sewage sludge.

The term “biosolids,” if it is to be used, must justify its appropriateness in comparison to “sewage sludge” and it ought to be clearly distinguished from “industrial sludge.” Enough of our interviews indicate that when one uses the term “biosolids” it is necessary to explain precisely what one means. Some of the responses also suggest that many consider it a euphemism, not a qualitatively different product from what they refer to as “sludge.”

Generally, we found most counties to have a neutral or positive view of the positive *potential* of land application of biosolids, as it offers local farmers a way to obtain inexpensive nutrients for their fields and because it appears to be a positive way of recycling waste. When put into practice, however, the application of biosolids seems to present a number of challenges at the local level which often lead to less than favorable, cautious, fearful, and sometimes outright negative views of the practice.

## ADEQUACY OF FEDERAL AND STATE STANDARDS

In terms of federal and state regulations, most counties interviewed in our survey did not raise questions about the adequacy of the Federal rule 503(c) or state regulations VR 355-17-200/12 VAC 5-585 in protecting public health, safety and well-being. Most counties interviewed seem to believe that the regulations concerning treating, testing and applying the biosolids -- if followed properly -- will provide adequate human and environmental protection. Almost every major county problem, according to the officials interviewed, could be better addressed and resolved, if not actually prevented, by improved on-site monitoring, inspection and enforcement of existing regulations. The actual or perceived insufficiency of a strong state “field presence” provides county leaders with an strong impetus to establish more local controls to ensure that local concerns are adequately addressed.

With regard to state and federal agency personnel interviewed in our survey, while most believe that existing regulations are sufficient to protect public health and safety they also acknowledge a need for better education, monitoring and enforcement. Reasons given include ensuring that the *quality* of applied biosolids actually meet state regulations, that *application* is done correctly according to specifications, as well as safeguarding environmental resources and the future of the program.

In contrast, the CWMI believes that federal regulations, while adequate in some respects, do not establish sufficient soil and biosolids testing, reporting and enforcement mechanisms to protect public safety. Further, with regard to trace elements, the CWMI believes the restrictions relating specifically to pasture land, crop land, and edible gardens (compost, Class A) are not sufficiently restrictive to ensure that toxic levels of trace elements are not taken up by either animals or vegetables, and thus ultimately by humans.

# IEN RECOMMENDATIONS

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The recommendations that we suggest here are based upon the belief that public acceptance and public confidence in the program require some program modifications and not just public information or education. Our interpretation of the interviews is that odor problems and other nuisance-like impacts from biosolids applications have raised enough questions about the biosolids program that high level management attention should be given to raising public confidence in the management of the entire program. Especially critical, we feel, is the connection between biosolids application and ground and surface water nutrients.

More specifically, to address county concerns and raise public confidence we have formulated four broad categories or recommendations for state consideration. The first set of recommendations concern a targeted public education and information effort tailored for county officials, stakeholders, and industry, with the specific goals of both problem prevention and resolution. The second set of recommendations concern program and management practices, in which we suggest the state consider measures to (1) develop a uniform complaint resolution mechanism for immediate response to local incidents, (2) ensure correct and appropriate application of quality biosolids, (3) improve program accountability to citizens. The third set of recommendations are based on success stories in other states and concern industry-initiated partnerships and innovations in finding positive and publicly acceptable uses for biosolids.

## PUBLIC EDUCATION AND INFORMATION

We recommend the state undertake as an integral and critical part of the land application program, an effort to educate and inform the following identified groups and to establish a culture of steady information-sharing between local and state governments and industry.

- **General Public** We do not recommend a broadly aimed public education effort as a way of reducing local problems or concerns. In fact, a recent study by the Water Environment Federation (WEF) indicates that resistance to biosolids programs is correlated with several factors, including citizen education programs.
- **Local Public Officials** We recommend educating local public officials who are likely to be called in the event of a problem and who could help in problem resolution, such as county administrators, supervisors, soil and water district personnel and boards, VCES agents, and public health officers. Education and information could include such things as:

- a. routine and predictable advance notification of all land applications in the county;
  - b. a simple brochure explaining the state-recommended complaint resolution mechanism (described more below) and possible enforcement actions;
  - c. more on-site demonstrations;
  - d. reports on changes or advancements in regulations, industry practices, and enforcement action taken against “bad actors.”
  - e. a periodic Question/ Answer report or information packet on previous or recent incidents in the state that would answer important questions, such as those asked in Appendix 11 by the representative of the Virginia Association of Counties (VACO) about state enforcement actions that were or were not taken, what the state plans to do differently, and relevant regulations.
- **Stakeholders** We recommend educating other people who could become involved in local problems, or who could provide helpful information to the public in the event of a problem. Stakeholders are a more broadly defined group that, in addition to the above group of local public officials, would include farmers, environmental organizations, scientists at local universities, VCES and Soil and Water Conservation staff, as well as persons expert or involved in waste management. Two goals of this effort might be to:
    - a. educate and inform a cadre of stakeholders throughout the state about standards, program management practices, and problem resolution mechanisms, to facilitate better problem prevention and resolution at the local level. (*See below under “model response system.”*)
    - b. encourage formal or informal information flow back to the state about local concerns or problems, so that the program can be continually assessed and improved.

One example of a way to accomplish these goals is a bi-annual newsletter, such as the one published by the state of Indiana which is sent to all landowners of permitted sites to provide timely technical support. Indiana also reports that it has had some success using regional “round tables” for dialogue and educational purposes. We recommend that the state develop some mechanism(s) for regular two-way information flow and education with stakeholders.

- **System Participants** We recommend that all parties in the biosolids application system be educated to the characteristic features of their interaction and to the necessity for cooperation if the entire program is not to be jeopardized. The “system” would include generators, contractors and applicators, haulers, farmers,

complaint respondents, and regulators with state agencies (VDH, DEQ, DCR). Education should cover each group's critical program management practices that can affect natural resources, community relations and overall program continuance. Topics for training and education might include:

- (1) key features and goals of nutrient management plans;
- (2) buffers and other critical application standards;
- (3) timely testing and monitoring to ensure appropriate biosolids stabilization;
- (4) appropriate routing of trucks and cleanliness;
- (5) potential methods for advance notification of local authorities and, possibly, neighbors.

## **PROGRAM AND MANAGEMENT PRACTICES**

We recommend that the state consider refining its program and management practices to achieve the following broad goals. For each goal we suggest specific steps that the state may wish to consider as options for achieving these goals.

### **1. CREATE AN EFFECTIVE PROCESS FOR RESPONDING TO COMPLAINTS.**

- Develop a model response system, in cooperation with local governments, that can be communicated to and used easily by local authorities when a problem occurs. Several members of the Special Insight Committee strongly agreed that this recommendation is critical to the viability of the program. Characteristics of this response system could include:
  - a) multiple paths for rapid identification of a problem and complaint filing. A few possibilities could include requiring that all transport vehicles are clearly marked with the company name and complaint phone number, placing flags or markers at every application site with a number to call in the event of a problem, and advance notification of VCES and SWCD staff of application sites and times with the number of who to call in the event of a problem.
  - b) rapid response, i.e. a 24-hour response capability;
  - c) face-to-face response, meaning someone will visit the site, and meet with local complainants and authorities;
  - d) open response, meaning an attitude of "yes, problems can occur; let's fix this problem as quickly as possible and find ways to make sure it doesn't happen again."

- Communicate this response system to all localities with land application programs, to farmers and to stakeholder organizations through a brochure, workshops or other mechanisms. Train local government staff how to properly refer complaints.
- Train state field personnel to respond to complaints in a rapid, appropriate and open manner. Train them in the allowable and appropriate enforcement actions, and provide guidelines on when and how to initiate such actions.
- Develop a crisis communication roster, in collaboration with local governments. It might be desirable to have a roster of individuals, who are competent and informed about biosolids programs and generally supportive of biosolids land application, who could be contacted by the media (newspapers, television, radio) when there is an incident or situation that provokes a high level of public visibility. These people should be drawn from those groups which the public will accord some level of trust and competency. For example, scientists, water quality and health professionals, members of respected environmental organizations.

The Powell Tate company, in its “Communications Plan on Biosolids” prepared for the WEF in 1993, recommended the development of “third party allies” with environmental organizations. Other groups that might become “third party allies” would be landscape architects, home economists, sustainable agriculture groups, etc. This is an intriguing idea, and if it could be brought to fruition would do much to create a public image of biosolids as recycling rather than just waste disposal. It is not clear how responsive such organizations would be to such an effort, however, and it would demand an organized initiative.

- Train farmers and industry *why* and *how* to respond to complaints in a rapid, appropriate, and open manner.

## 2. ENSURE CORRECT AND APPROPRIATE APPLICATION OF QUALITY BIOSOLIDS.

- Explore methods of ensuring that land applied biosolids are of high quality, with particular attention to improving those characteristics, such as odor, that could offend or harm local citizens. Methods the state might consider include:

(a) *Improve verification at the site of origin* that the biosolids to be applied meets federal and state standards and will not be unduly odiferous – prior to transportation by the contractor. There are numerous ways this goal might be accomplished, and various ways in which the responsibility might be allocated among parties. The key issue is that knowledge about the condition of the particular batch of biosolids to be transported should be communicated by the generator in a timely manner to the contractor, prior to transportation, to enable an informed decision by the contractor about whether or not the

biosolids will be accepted, or whether the batch of biosolids should be directed to more isolated sites.

Some possible ways of facilitating this goal are that, for example, a responsible employee of the generator could be on hand prior to loading the trucks to inform the contractor of any difficulties or equipment breakdowns experienced by the generator during the processing of the biosolids that could affect odor. This would enable timely communication about issues that are not directly addressed by federal and state regulations, but could affect neighbor reaction to the biosolids.

Other suggestions made by one or more members of the Special Insight Committee are that the contractor could be authorized and encouraged to require compliance data from the generator, to test the pH of suspect biosolids prior to transport, to notify proper regulatory agencies of known or suspected violations of federal and state biosolids treatment, to refuse a suspect batch of biosolids, and, last but not least, could also be held responsible (i.e., penalized by the state) if substandard biosolids are land applied. One of the reasons for these suggestions may stem from the fact that federal regulations do not directly address odor, so a contractor may be victimized by unknowingly accepting a load of biosolids which technically complies with federal standards but which is likely to cause significant complaints.

(b) *Improve on-site verification* of the biosolids quality, as a way of “closing the loop” and empowering the farmer and local authorities to monitor biosolids quality. Again, several ways this might be done could include authorization of on-site pH testing prior to application, such as can be performed by the independent monitors in Maryland, the biosolids monitor in Orange County, or could be done by spot checks by the farmer, local SWCD or VCES personnel. People who are authorized to do on-site pH testing could also be educated on appropriate actions to take in the event of a problem.

- Ensure that land applied biosolids are applied correctly with respect to federal and state standards, with particular attention to buffers, slopes, distance to ground water, weather conditions, etc. We recommend the state consider ways to accomplish this through both improved nutrient management planning and improved monitoring of applications.

The process for determining appropriate application rates for a particular site is quite complex. A simplified outline of the process includes (1) determining site soil characteristics, distance to water table, and the farmer’s planned crop rotations or vegetation and the associated nutrient uptakes; (2) based on this information, determining the agronomic rate, or the amount of nitrogen needed by the specified

crop or vegetation, over what period of time; (3) measuring the level of nitrogen in the biosolids to be applied, and determining the application rate that will not exceed the agronomic rate. Other factors that can affect the application are the time of year (fallow fields are not good application sites), slope, whether or not the biosolids will be incorporated into the soil, geological features, type of spreading equipment and weather.

Clearly, many points in the system are vulnerable to error. Some issues, such as appropriate and timely response to weather conditions, may be more susceptible to error than others. We recommend that the state reduce the potential for error by establishing checks and balances within the system. Examples of these checks and balances could include:

(a) *An independent confirmation of compliance at the point of application* that the rate of application and the site cropping pattern conforms to the original agreement. This would take the form of a document that would be sent to VDH and/or DCR and signed by on-site state personnel, a locally hired monitor, staff of the local SWCD or VCES, or an independent monitor. Deviations from the original agreement could be grounds for the rapid response system to be initiated. This is separate from (b) in that this provides an automatic information flow back to the state on program compliance.

(b) *On-site monitoring of the application* by (i) state agency field personnel, (ii) an independent monitor for every application as in Maryland or Orange County, or (iii) local agents such as SWCD, VCES, or public health personnel. Monitoring could range from, at a minimum, authorized spot checks to mandatory monitoring of every application site. Monitoring could include everything from soil sampling, checking the uniformity of application, verifying non-application in buffer zones, incorporation and planting of crops specified in the nutrient management plan.

Authorization of multiple agencies to perform spot checks would allow flexibility in the program for local conditions and staffing. Several members of the Special Insight Committee have strongly urged that VDH install full-time staff at each of its regional offices who would perform site inspections, monitoring, and also respond to complaints.

Whatever model is pursued by the state, monitoring *must* be sufficiently frequent and routine to provide *real* incentives to all parties to comply with all aspects of the program. In addition, the monitors must be qualified to understand what they're seeing, to understand the regulatory framework, and to be able to communicate with citizens well in a non-technical language. The funding of the monitors could be accomplished through a variety of mechanisms. The "tipping fee" of \$1/per ton in Maryland, for example,

would create in Virginia a fund of about \$150,000, based on an average of 400 tons applied per day. This would pay for about 3 regional monitors in the state. Other methods of funding monitors include the Orange County model in which the monitor's hours are billed by the county to the contractor, fees are assessed to the contractor for nutrient management plans, fees are assessed to the generator, or fees are assessed to the farmer for the provision of nutrients, or some creative combination of the above.

To facilitate this monitoring, advance notification of application sites might be provided by the contractor to the appropriate persons, such as the local SWCD, VCES, county staff, neighbors or state staff. Working with the state, the industry could develop a method of streamlining notification, so that all appropriate local and state persons are notified in a timely way.

(c) *Nutrient management certification of applicators*, to increase the understanding of the factors involved in nutrient management and, as part of the checks and balances built into the system, enable a cross-check on the planned cropping for the site. Several members of the Special Insight Committee voiced support for requiring contractor certification in nutrient management, specifically industry staff involved in developing permit applications and site managers. There was some concern about whether it would be appropriate to certify actual application equipment operators. We believe the state might consider the possibility of requiring nutrient management certification for all persons who develop permit applications and who thereby determine site-specific agronomic rates. Additionally, the state might consider requiring that a person be present at each application site who is certified in nutrient management, whether it be the contractor site manager, the applicator, or someone else. This on-site nutrient management planner would be responsible for verifying that the cropping pattern is the same as specified in the permit, that the application does not exceed the agronomic rate and that buffers and all other aspects of the application are in compliance with the permit and good management practices. We encourage the state to use certification as a way of increasing accountability and cross-checks, by having the nutrient management planner sign a document that is returned to VDH, attesting that application has or has not complied with the permit. Suspension of certification could also be considered in the event of violations.

- Ensure that environmental concerns are addressed in the land application program, so that environmental concerns and problems are precluded at the outset. To accomplish this, we recommend that:

(1) Measures be taken to clarify the roles and responsibilities of VDH and DCR, perhaps through an interagency Memorandum of Understanding.

Items that might be clarified include, but may not be limited to: (a) who determines site-specific agronomic rates; (b) who communicates these site-specific agronomic rates to the contractor, applicator and farmer; (c) who ensures application is according to these rates; (d) who reviews reports of monitors, on-site nutrient management planners, or others, to ensure agronomic rates and other important application parameters are not violated; and (e) who initiates and is responsible for what types of enforcement action. This kind of agreement on roles will help eliminate the possibility of something simply “slipping through the cracks,” which can easily occur when more than one office or agency is involved in a program.

(2) The state continue monitoring the research and policy trends with regard to the phosphorous content of biosolids, its impact on the waters of Virginia, and whether it should become a limiting nutrient in biosolids nutrient management planning in Virginia. Because of the importance of reducing nonpoint source pollution of Virginia waters that flow into the Chesapeake Bay, we recommend that VDH adopt a conservative stance with regard to phosphorous, erring when possible on the side of safety until data indicates otherwise.

(3) The state continue monitoring the research and policy trends concerning trace metal content of biosolids and cumulative loading of the soils. Some interviews about forthcoming technologies such as fly ash suggested that these standards for Class A biosolids might require attention. The state also might consider ways of encouraging through incentives or other mechanisms the application of biosolids to sites that do not enter the food chain, such as forest land, median strips, golf courses, reclamation sites or park land.

In our survey additional recommendations were made *by county personnel* and field experts. These include:

(4) Encourage or require incorporation of biosolids within a short time period for all appropriate applications.

(5) Discourage or limit application to pasture land near the rural/urban interface.

(6) Specifically prohibit land application in the flood plains. (This suggestion was broad in nature, but if VDH pursues this recommendation it might wish to consider a variety of criteria such as flooding frequency, soil type, time of year in which floods have occurred historically, etc.)

- Ensure that land applied biosolids are managed with sensitivity to citizen and local concerns, such as routing of trucks around residential areas, cleanliness of trucks

and operations, timing of applications to avoid interfering with commuters and taking all efforts to reduce odors. Methods for consideration might include:

- (a) Advance approval of routing on county roads.
- (b) Advance consultation with VCES or other local agencies with regard to timing and other issues of concern.
- (c) Advance notification by at least 2 weeks of neighbors and other appropriate persons.
- (d) Clear labeling of transport trucks with company name.
- (e) Marking the field with something like a flag or sign indicating that biosolids have been applied and a number to call in the event of a question.

### 3. IMPROVE PROGRAM ACCOUNTABILITY TO AND CONFIDENCE BY CITIZENS OF VIRGINIA

- Clarify enforcement of violations so that it is rapid, meaningful and consistent, and so that the threat of fines, suspension of licenses or other possible enforcement action becomes a real deterrent to violations.
- Improve the reporting of enforcement action to the public, particularly in the locality where it occurred and in other localities where land application is common.
- Explore ways in which the VDH will be perceived as having struck an appropriate balance between its responsibilities for encouraging the application of biosolids as a soil nutrient, and its responsibilities for assuring compliance with the regulations that govern application. When local problems arise from land application, those who complain about these problems expect a neutral, independent response.

Our recommendations urge steps that will improve the public's assurance that this balance will be adequately managed. VDH has already taken steps, including organizational and management changes, that assure that the program receives appropriate agency-level accountability.

- Create a method for collecting, maintaining, and tracking data with regard to amounts of biosolids applied to what fields, and the biosolids characteristics to enable tracking of such things as cumulative loading. Use this data collection to provide information to localities or others on request.
- Create an inventory of available land appropriate for land application of biosolids, including land currently in use and additional land that might be appropriate in the future. Use this map/inventory to identify in advance potential needs and environmental issues and concerns, from storage to transportation, as well as to create a plan for ways to facilitate or enable continued use of this land for biosolids land application.

## INDUSTRY-INITIATED PARTNERSHIPS

We recommend that the industry in Virginia initiate efforts to strengthen partnerships, particularly with generators and other industries, to identify and develop safe and acceptable uses for biosolids that also have a low potential impact on people.

In some states, such as Washington, the biosolids industry has developed innovative partnerships with environmental organizations for safe and acceptable use of biosolids, such as in the creation of forestry corridors. It should be noted that such partnerships do not always enjoy support from other interested constituent organizations. However, where such initiatives are undertaken by the industry itself, it appears that the state programs, overall, may benefit from a more positive public reception.

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## FOOTNOTES

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<sup>1</sup> Interagency Agreement Between VDH and IEN, page 2.

<sup>2</sup> *“Chesapeake Bay Region Nutrient Management Training Manual,”* by Steve Nagle, Greg Evanylo, W. Lee Daniels, Douglas Beegle, and Velva Groover, Editor Frank Coale, pp 8.4-8.12.

<sup>3</sup> *“A Plain English Guide to the EPA Part 503 Biosolids Rules,”* United States Environmental Protection Agency, September 1994, EPA Document 832/R-93/003, p.16.

<sup>4</sup> *“Biosolids Recycling: Beneficial Technology For A Better Environment,”* United States Environmental Protection Agency, June 1994, EPA Document 832-R-94-009, pp 1 and 25.

<sup>5</sup> U.S. District Court for the Western District of Virginia, Charlottesville Division, Civil Action No. 94-002-C, Welch v. Board of Supervisors of Rappahannock County, 888F.Supp.753 (May 24, 1995).

<sup>6</sup> *“National Outlook--State Beneficial Use of Biosolids Activities,”* by the Water Environment Federation, June 1997.