Understanding Wastewater Regulation in Virginia

for Wastewater Operators

Prepared by the

Public and Government Communications Committee

of the

Virginia Water Environment Association

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By the Virginia Water Environment Association Government Affairs Committee

About the authors:

The Virginia Water Environment Association, Inc. (VWEA) is a member association of the Water Environment Federation. Its mission is to preserve and enhance Virginia's water environment, now and for future generations. VWEA's objectives are as follows:

- The advancement of fundamental knowledge of the water environment, its basic quality, and the physical laws governing its interaction with other aspects of the environment and with the aesthetic, economic, and biological needs of the earth's inhabitants.
- The advancement of practical knowledge in the technology, design, construction, operation, and management of water quality control systems and facilities.
- The increased understanding of the nature and function of the earth's natural waterways, surface, subsurface, and atmosphere, and encouragement and promotion of action necessary to preserve and enhance them.
- The implementation of the objectives previously stated through an exchange of information and experience among its members, and other interested persons, by an annual meeting, seminars, or other activities for its members.
- The publication and distribution of information relating to the water quality control field.
- The promotion of public understanding and the encouragement of sound regional policy in matters relating to the water quality control field.
- The improvement of the professional status of all personnel engaged in any aspect of the water quality control field, including, but not limited to, the design, management, and operation of water quality control systems.
- The stimulation of public awareness of the relationship of water resources to the general public welfare and the need for preservation and reuse of water resources.
- The advancement of the education of its members and other interested persons by the presentations of technical programs at its annual meetings, seminars, workshops, and other meetings.
- Affiliation with the Water Environment Federation and participation in the activities of the organization.

The Government Affairs Committee is involved with tracking and reporting federal and state legislation that may have an impact on the wastewater industry in Virginia. We also write and submit articles for the quarterly *Conduit* regarding local policies, new or proposed legislation, and other topics dealing with regulation. The committee is responsible for developing a session at the annual VWEA conference for Government Affairs, whereby state officials, regulators and policy makers are invited to speak on topics of interest in the wastewater field.

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Chapter 1: Introduction

In response to the importance that modern American society places on protecting the environment, governments have adopted a host of environmental laws and regulations. Wastewater collection systems and treatment plants are on the front line of environmental protection, and they operate within this complex legal and regulatory framework. Moreover, environmental regulations are constantly evolving and becoming more stringent and expensive to comply with. Knowledge of the basic regulatory framework is essential for wastewater operators to understand the purposes of the systems they operate, the actions to ensure compliance with regulations, and the consequences of non-compliance. This handbook has been prepared to help wastewater operators learn more about wastewater regulations in Virginia.

Most environmental regulations in Virginia related to the collection, treatment, and disposal of wastewater are promulgated by either the federal or state government. Although to the regulated community many of these regulations seem burdensome, regulators have the difficult job of balancing the protection of the environment that society demands against oftentimes competing interests, such as private property rights, farming, timber, economic development, and cost. While the federal and state governments promulgate the majority of the regulations, the responsibility for complying with these regulations most often falls to a local government and industries.

Local governments have a difficult job. They have the responsibility for operating and maintaining their community's sewerage system, planning for their community's future needs, and insuring that their system is operated in compliance with increasingly complex and stringent regulations while maintaining affordable rates. The role of the wastewater treatment plant operator is extremely important to protecting public health and the environment. Without the expertise and integrity of the wastewater operator, municipalities would not be able to achieve their responsibility to the public, nor abide by their legal obligations. The wastewater operator is the last and most important line of defense in a regulatory process that ensures that domestic and industrial waste is treated to appropriate levels that will maintain or improve water quality for the public's benefit and health.

This handbook has been prepared to help wastewater operators learn more about wastewater regulations in Virginia. It describes the legal and historical context of these regulations and looks at important wastewater topics, particularly the Virginia Pollution Discharge Elimination System (VPDES) Permit program, but also collection systems, industrial pretreatment, and biosolids management. Reporting and recordkeeping requirements and compliance obligations are summarized and discussed. The handbook also addresses Virginia's Chesapeake Bay program, the state's new nutrient standards, and nutrient trading. A list of resources for wastewater operators is included as well as a handy guide to frequently encountered abbreviations.

Chapter 2: Legal Background

Most of the major environmental regulations originate from the federal government. Environmental laws quite literally require an Act of Congress (e.g., Clean Water Act, Clean Air Act) which must be approved by the President and are subsequently carried out by federal agencies. After an Act of Congress is passed, the EPA must carry out the will of Congress and must manage a complex process before an environmental regulation is promulgated. Before a regulation is final, the EPA must research the problem, establish draft regulations, solicit public comment (Administrative Process Act), and publish the regulation. Once the regulation is final, it is published in the Code of Federal Regulations (CFR); the primary environmental chapter is 40CFR. It is important to note that the EPA typically turns to state regulatory agencies to actually carry out and enforce most of its regulations; when a State is granted this authority, it is referred to "primacy". Virginia has primacy to enforce most major environmental laws, and has adopted it own corresponding laws and regulations.

Clean Water Act

Federal water legislation dates back to the 19th century, when Congress enacted the River and Harbor Act of 1886, re-codified in the Rivers and Harbors Act of 1899. Recognizing the threat that polluted water posed to the public's health and welfare, Congress enacted the Federal Water Pollution Control Act (FWPCA) in order to "enhance the quality and value of our water resources and to establish a national policy for the prevention, control and abatement of water pollution."

The original FWPCA was passed in 1948 and was amended in 1956, 1965, and 1966, each time expanding federal authority. Despite the improvements achieved by each amendment to the original act, the result of this legislation was a hodgepodge of law. Eleven reorganizations and restructurings of federal agency responsibility compounded the difficulty of effectively implementing the law. To solve these problems, the 1972 amendments to the FWPCA restructured the authority for water pollution control and consolidated authority in the administrator of the U.S. Environmental Protection Agency (EPA). In 1977, this law was again amended and became known as the Clean Water Act (CWA).

The CWA sets the legal framework for more detailed regulations to be developed by the EPA and the states. The EPA has the primary responsibility of establishing regulations to meet the requirements of the Clean Water Act. Many states, including Virginia, have been given primacy over these programs.

The Virginia State Water Control Board was established in 1946 to regulate wastewater discharges into Virginia's rivers. After the passage of the Federal Water Pollution Control Act in 1972, the State Water Control Board became the delegated Commonwealth of Virginia agency to administer the Clean Water Act. At the time of establishment, the State Water Control Board included citizen members and staff. In 1992, the Virginia Department of Environmental Quality (DEQ) was created and incorporated the State Water Control Board staff. The State Water Control Board, however, continues to have responsibility

for administrating Virginia water control law. The board is made up of seven Virginia citizens appointed by the governor, based on merit without regard to political affiliation. The State Water Control Board adopts regulations and considers special orders resolving violations of its regulations and permits. Virginia law requires the State Water Control Board to meet at least four times per year. Day-to-day administration of the board's programs is delegated to the DEQ.

The State Water Control Board and the DEQ administer several CWA-related permitting programs, of which the most relevant to wastewater treatment plants is the Virginia Pollutant Discharge Elimination System (VPDES) permit program. Anyone wishing to discharge wastewater to surface water in Virginia must obtain a Virginia Pollutant Discharge Elimination System (VPDES) permit. This permit is the state's most important vehicle to control and enforce protection of the water environment. It carries the weight of, and is enforceable through, both federal and state laws and regulations. The EPA maintains authority to review applications and permits for major dischargers. Chapter 4 discusses other CWA-related permit programs, such as the Virginia Pollution Abatement (VPA) permit program and the Virginia Stormwater Management Program (VSMP).

Clean Air Act

Federal legislation related to air pollution dates back to the 1950s with the Air Pollution Control Act of 1955, which only provided funding for the research of air pollution sources. The 1963 Clean Air Act (CAA) established a federal program within the U.S. Public Health Service for researching monitoring and control techniques; the Air Quality Act of 1967 expanded the range of federal authority.

The Clean Air Act of 1970 established federal and state regulations that set emission standards for stationary and mobile sources. CAA 1970 also established four regulatory programs: (1) the National Ambient Air Quality Standards, (2) State Implementation Plans, (3) New Source Performance Standards, and (4) the National Emission Standards for Hazardous Air Pollutants. In 1971, the EPA was established separately to implement provisions from the CAA.

The first of major amendments were made to the CAA in 1977. In 1990, amendments provided authorization for several control programs, established permit program requirements, and expanded and modified NAAQS standards. The contents of the CAA include the following:

- Title I – Air Pollution Prevention and Control
- Title II – Emission Standards for Moving Sources
- Title III – General Provisions
- Title IV – Acid Deposition Control
- Title V – Permits
- Title VI – Stratospheric Ozone Protection

The CAA Amendments of 1990 are the present-day federal legislation governing air pollution standards. In the Commonwealth of Virginia, the State Air Pollution Control Board and DEQ administer the Clear Air Act's shared federal programs and also implement other state regulations as necessary for the public health.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) is a national law that sets the standard for solid and hazardous waste disposal. RCRA, passed by Congress in October 1976, was an amendment to the 1965 Solid Waste Disposal Act. The goals of RCRA are to protect human health and the environment from potential hazards of waste disposal, conserve energy and natural resources, reduce waste generated, and to make sure that wastes are properly managed. RCRA includes a congressional mandate giving the EPA the authority to develop the regulations that will put the law into effect.

Under RCRA, there are three separate, interconnected programs: a solid waste program, the hazardous waste program, and the underground storage tank program. RCRA bans open dumping of waste, promotes source reduction and recycling, and promotes safe disposal of municipal waste.

In 1980, the first RCRA regulations, the Hazardous Waste and Consolidated Permit Regulations, were issued. These regulations instituted the now-prevalent "cradle to grave" perspective of hazardous waste management. RCRA has been amended three times: the Federal Hazardous and Solid Waste Amendments (HSWA) of 1984; the Federal Facility Compliance Act of 1992; and the Land Disposal Program Flexibility Act of 1996. The DEQ administers this program in Virginia.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA), first passed by Congress in 1974, gives authority to the EPA to establish federal drinking water standards to safeguard against naturally-occurring and man-made contaminants. The SDWA applies to every public water system in the U.S., of which there are more than 160,000. State drinking water programs have direct oversight of water systems; states can apply for the oversight authority to implement SDWA regulations. Virginia, through the Virginia Department of Health (VDH), is one of the states that has this authority.

Chapter 3: Water Quality Standards and Related Regulations

Under the Clean Water Act, states such as Virginia are required to establish water quality standards that designate uses of each water body and water quality criteria needed to protect those uses. Water quality standards are at the heart of the Clean Water Act, and the ultimate purpose of wastewater treatment plants is to ensure that these standards are met.

Virginia's Water Quality Standards

Virginia's water quality standards are written in the Virginia Administrative Code (9 VAC 25-260), which is available on the Virginia Department of Environmental Quality (DEQ) website[1]. The standards consist of three components: (1) designated uses; (2) water quality criteria; and (3) an antidegradation policy.

Designated Uses

Designated uses are statements regarding the existing, intended, or potential uses of a water body. These designations legally apply to a water body regardless of whether the water is currently being put to that use, or whether it is clean enough for the use. In Virginia, all public waters have the following designated uses:

- Recreation (e.g., swimming and boating),
- Aquatic life propagation and growth,
- Wildlife,
- Production of edible and marketable natural resources (e.g., fish and shellfish),
- and/or public water supplies

The Chesapeake Bay and tidal tributaries are subdivided according to special subcategories of the aquatic life use, including the following:

- Migratory fish spawning and nursery
- Shallow water submerged aquatic vegetation
- Open water aquatic life
- Deep water aquatic life
- Deep channel aquatic life

Water Quality Criteria

Water quality criteria are specifications of the condition or chemical content of water that corresponds to attainment of designated uses. Criteria can be either narrative or numeric. An example of an narrative criterion includes Virginia's general criterion (9 VAC 25-260-20):

> *State waters…shall be free from substances attributable to sewage, industrial waste, or other waste in concentrations, amounts, or combinations which…interfere directly or indirectly with designated uses of such water or which are inimical or harmful to human, animal, plant, or aquatic life.*

Numeric criteria specify the concentration and duration of specific chemical constituents that allow attainment of designated uses. Most criteria are for constituents that can be harmful to humans or aquatic life, such as metals, pathogens, radionuclides, or synthetic organic

[1] http://www.deq.state.va.us/wqs/

chemicals. For such constituents, exceeding the listed concentration represents an excursion of the criterion. Virginia's water quality standards also include criteria for parameters such as dissolved oxygen—which must be maintained at minimum concentrations for aquatic life protection—and temperature, which should not fluctuate outside of specified ranges. A single constituent can have actually several different criteria corresponding to different designated uses (e.g., aquatic life v. human health protection), salinities (freshwater v. saltwater), and types of toxic effects (acute v. chronic toxicity). More than one of these might apply to a given water body.

Antidegradation Policy

Under the Clean Water Act, states' water quality standards must include an antidegradation policy to protect existing water quality. Virginia specifies three levels of protection of existing water quality:

Tier 1: The Tier 1 level of protection indicates that water quality standards will be attained. This minimum level of protection is assigned to water bodies with water quality that is near the minimum necessary to attain designated uses, or to those that are not attaining designated uses.

Tier 2: The Tier 2 level of protection applies to water bodies with water quality that is better than necessary to protect designated uses. For such water bodies, the existing water quality will be maintained unless a lowering of water quality is necessary to accommodate important economic or social development.

Tier 3: The highest level of protection applies to special waters designated as "exceptional waters." Many of these waters are streams in highly scenic or pristine areas of the Commonwealth. No new, additional, or increased discharge of sewage, industrial wastes, or other pollution are allowed in Tier 3 waters.

Water Quality-Based Effluent Limits

A wastewater treatment plant or industry that discharges to surface water in Virginia must obtain a permit from DEQ through the Virginia Pollutant Discharge Elimination System (VPDES) program, as discussed further in Chapter 4. When issuing these permits, DEQ performs an analysis to determine if the discharge has the reasonable potential to (1) cause an excursion of water quality criteria, or (2) degrade the existing water quality of the receiving water, according to the appropriate antidegradation tier. If such a potential exists, the VPDES permit will be issued with water-quality based limits on the concentration and/or load of those constituents. The limits are calculated using information on the characteristics of the discharge and the receiving stream under critical hydrologic conditions, such as the 1Q10 or 7Q10 streamflow (i.e., the lowest 1-day or consecutive 7-day streamflow expected to occur every ten years on average).

Virginia's water quality standards allow for excursion of some water quality criteria only in specially permitted mixing zones near some wastewater outfalls. The size of a mixing zone is limited to protect aquatic life, and mixing zones are not a substitute for application of the minimum treatment technology.

Technology-Based Effluent Limits and Effluent Guidelines

Not all VPDES effluent limits are directly based on water quality standards. Rather, some limits are based on the capability of treatment and control technologies to reduce levels of pollutants. For example, the Clean Water Act requires that all publicly-owned treatment works (POTWs) provide at least secondary treatment, defined as treatment capable of meeting effluent limits shown in Table 3-1. In developing VPDES permit limits, DEQ must consider both water quality and technology-based limits. In general, the most stringent of the two will apply.

Table 3-1
Secondary Treatment Standards for POTWs

Parameter	30-Day Average	7-Day Average
5-Day BOD	30 mg/L	45 mg/L
TSS	30 mg/L	45 mg/L
pH	6 – 9	--
Removal	85% BOD5 and TSS	--

For industrial sources, technology-based effluent limits are derived from effluent guidelines established by the USEPA for different industrial source categories. The effluent guidelines define different levels of technological control, such as the Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), and New Source Performance Standards (NSPS). The level of control applicable used to develop a specific limit depends on the pollutant, whether the source is new or existing, and whether the technology can be practically and economically applied at the facility. Effluent guidelines apply not only to direct discharges to surface water, but also to indirect discharges: industries that discharge to a POTW. Industrial pretreatment requirements are discussed further in Chapter 8.

Total Maximum Daily Loads

Under the Clean Water Act, states are required to monitor their water bodies for attainment of water quality standards. Every two years, the Virginia DEQ publishes a report on the water quality conditions in the commonwealth and a list, the 303(d) list, of water bodies that are impaired, or not meeting one or more designated uses. Some of the most common water quality impairments in Virginia include the following:

- Pathogens (fecal coliform, *E. coli*, or enterococcus)
- Biological impairments
- PCBs in fish tissue
- Dissolved oxygen and pH
- Nutrients and sediment

Some impairments are caused by natural conditions, such as low dissolved oxygen in swamp waters. Due to the success of the Clean Water Act, very few water quality impairments in Virginia are primarily caused by active point sources such as wastewater treatment plants and industries. If a point source is the sole or dominant cause of an impairment, it can be addressed through the VPDES permitting process. However, many impairments have strong nonpoint source components, including contributions from agricultural, silvicultural, and unregulated urban sources. Nutrient-related impairments of the Chesapeake Bay and tidal tributaries provide an example of impairment that must be addressed by both point and nonpoint source controls.

If a human-caused impairment cannot be addressed through the VPDES permitting process, the state is required to develop a total maximum daily load (TMDL) for the water body. A TMDL is the total pollutant load - expressed as a mass per unit time - that a waterbody can assimilate and still meet water quality standards. Quantitatively, a TMDL is expressed as follows:

$$TMDL = \sum WLA + \sum LA + MOS$$

Where:

- $\sum WLA$ = Sum of the individual wasteload allocations to point sources
- $\sum LA$ =Sum of the load allocations to nonpoint sources; and
- MOS =A margin of safety

State agencies uses various methods to develop TMDLs, including stressor studies, source identification studies, and water quality models. Under federal regulations, TMDLs must consider the natural background loads, address seasonal and critical environmental conditions, and be subject to public participation. Margins of safety can be explicit (e.g., 10%) or implicit (e.g., developed using conservative assumptions). For wastewater treatment plants, the wasteload allocations of TMDL will usually be incorporated directly into the VPDES permit.

Chesapeake Bay-Related Regulations

The Chesapeake Bay and its tidal tributaries are on Virginia's 303(d) list for impairment by excessive nutrient and sediment. Nutrients such as nitrogen and phosphorus cause excessive algal growth, which decays and causes low dissolved oxygen concentrations in the bottom waters of the Bay and some tributaries. Excessive algal growth, along with suspended sediment, can also block out light needed for the survival of submerged aquatic vegetation (SAV). Some algal blooms—such as red or brown tides—can be unsightly or even toxic.

Virginia has developed tributary strategies to identify the point and nonpoint source pollutant reduction efforts needed to meet water quality standards in specific tidal waters, including the Potomac, Rappahannock, York, James, and Eastern Shore basins. Implementation of these strategies is also expected to fulfill Virginia's commitment to improve the water quality of the Chesapeake Bay. Under the Chesapeake Bay 2000 Agreement, the states and USEPA have agreed to perform a TMDL for the Chesapeake Bay if water quality standards are not met by 2010. To help implement the tributary strategies, Virginia has adopted several regulations specifically aimed at controlling point source nutrient loads to the Bay:

Technology-Based Nutrient Concentration Limits

Virginia's Regulation for Nutrient Enriched Waters and Dischargers within the Chesapeake Bay Watershed (9 VAC 25-40) requires stringent limits on nitrogen and phosphorus concentrations discharged from medium-sized and large point sources upon upgrade, expansion, or new construction. A plant that upgrades its nutrient removal technology, but does not expand, receives limits that are based on the installed technology. Expanding or new plants receive limits that vary based on the location and size of the discharge (see Table 3-2). Certain detailed exceptions exist to the values shown on Table 3-2 that should be evaluated on a case-by-case before concluding that the Table 3-2 values apply to an individual project.

Table 3-2
Virginia's Technology-Based Nutrient Concentration Limits for Discharges in Chesapeake Bay Watershed

Discharge Category	Location of Discharge	Discharge (MGD)	Total Nitrogen Limit (mg/L)	Total Phosphorus Limit (mg/L)
Upgraded WWTP for nutrient control (no expansion)	Tidal or non-tidal waters	--	Based on technology installed	Based on technology installed
Expanded WWTP	Tidal waters	≥0.1	3.0	0.3
	Non-tidal waters	0.1 – 0.5	8.0	1.0
		≥0.5	3.0	0.3
New WWTP	Tidal waters	<0.1	8.0	1.0
	Non-tidal waters	<0.5		
	Tidal waters	≥0.1	3.0	0.3
	Non-tidal waters	≥0.1		

Wasteload Allocations

Virginia's Water Quality Management Planning Regulation (9 VAC 25-720) includes nitrogen and phosphorus wasteload allocations for all significant point source discharges in the Commonwealth. These mass loading "caps" were set based on each plant's design capacity and the assumption of low nutrient effluent concentrations. Many wastewater treatment plants are planning major upgrades to comply with the wasteload allocations. As communities and wastewater generation rates continue to grow, localities will have to find creative solutions to remain under the nutrient loading caps. Such solutions could include more advanced treatment technology, wastewater reclamation/reuse, or trading/offsets under the General Watershed Permit (discussed below).

Nutrient Trading under the General Watershed Permit Regulation

Virginia's General Watershed Permit Regulation (9 VAC 25-820) requires compliance with nutrient wasteload allocations assigned to significant dischargers of nitrogen and phosphorus in each of Virginia's major watersheds to the Chesapeake Bay (e.g., Potomac-Shenandoah, Rappahannock). Individual significant dischargers have the option of either complying with their individual nutrient wasteload allocations or purchasing nutrient credits from other point sources that are beneath their wasteload allocation. The regulation is expected to lower the overall cost of attaining the tributary nutrient load caps. The regulation also establishes a procedure by which new

or expanding point sources can obtain point or nonpoint source offsets of their nutrient load.

The Virginia Nutrient Credit Exchange Association, simply called the "Exchange," is a discharger-led organization that facilitates nutrient credit trading among its members. With over 100 member facilities, this organization has prepared basinwide nutrient compliance plans and a specific framework for buying and selling nutrient credits.

Emerging Water Quality Issues

The term *emerging contaminants* refers to unregulated substances that research indicates might have harmful environment effects but for which insufficient information currently exists to adequately characterize the risk or development of water quality standards. These include various pharmaceuticals and organic chemicals, such as antibiotics, hormones (i.e., endocrine-disrupting chemicals), herbicides, fuel additives, and personal care products, which may not be adequately treated through current wastewater treatment technologies.

Many of these substances are not new to the environment, but they have only recently been measured or studied to any significant degree. As more research is conducted, additional regulations are likely to be developed for some of the substances. These might include water quality standards or other requirements for wastewater treatment plants. However, it might be more practical to control many of these substances at the source rather than at the end of the treatment pipe.

In addition to emerging contaminants, states and the USEPA are continuously refining existing water quality criteria and standards, both to reflect the latest scientific information and to ensure that the standards are implemental. For example, most states, including Virginia, are in the process of developing more quantitative nutrient standards for freshwaters to replace narrative nutrient standards. Various states are considering alternative methods for quantifying sediment, siltation, and hydrologic impacts to water bodies. The wastewater treatment communities must continually stay abreast of developments in water quality science and standards and help ensure that Clean Water Act regulations remain both protective of the environment and reasonably attainable.

Chapter 4: Permitting and the Permitting Process

Environmental permitting is the primary mechanism by which local, state or federal authorities protect the environment. As discussed in Chapter 2, the U.S. Environmental Protection Agency (USEPA) has the responsibility of establishing regulations to meet the requirements of the Clean Water Act and Clean Air Act. Many states, including Virginia, have been given primacy over these programs. In Virginia, the State Water Control Board, Air Pollution Control Board, and the Department of Environmental Quality (DEQ) manage permitting programs to enforce environmental mandates.

Permits can range from fairly simple to voluminous documents that are very complex. Operators' understanding of permit conditions and requirements is critical to the successful operation of a wastewater treatment plant. This chapter identifies the major environmental permits required by a plant and explains the VPDES permitting process in detail.

Types of Environmental Permits and Related Regulations

Typical activities covered by permits include wastewater discharge or reuse, biosolids recycling or disposal, stormwater discharge, and emissions to the atmosphere. In some cases, more than one of these activities can is covered by the same permit. Major types of environmental permits are as follows:

Virginia Pollution Discharge Elimination System (VPDES)

The primary target of the Clean Water Act is point source discharges to waters of the United States. A common example of this is a discharge from a municipal wastewater treatment plant to a river, lake, or ocean. Accordingly, anyone wishing to discharge wastewater in Virginia must apply and secure a Virginia Pollutant Discharge Elimination System (VPDES) permit. This permit is the state's primary vehicle to control and enforce protection of the water environment. The VPDES permits address almost all kinds of water discharge from a plant, including wastewater effluent, cooling/utility water, and stormwater associated with plant operation. The exception is stormwater discharges from construction activity, which are covered under the Virginia Stormwater Management Permitting (VSMP) program administered by the Virginia Department of Conservation and Recreation (DCR).

A VPDES permit may be either an *individual* or a *general* permit:

***Individual VPDES Permits*:** The State Water Control Board issues individual discharge permits to facilities. Permit requirements, special conditions, effluent limitations, and monitoring requirements are determined for each facility on a site-specific basis in order to meet applicable water quality standards. VPDES permits have an effective life of five years. Most wastewater treatment plants will hold an individual permit for their effluent, although the stormwater discharges of some plants are addressed under a separate general permit.

***General VPDES Permits*:** General permits differ from individual permits in that these permits are not specific to one facility; rather, they cover a class of discharges. For example, operations such as car washes, coin-operated laundries, seafood processing

facilities, and concentrated animal feeding operations are required to obtain general permit coverage. Qualified facilities obtain coverage by submitting a registration statement and fee to DEQ. As a special case of general permit, the Commonwealth of Virginia created a general permit for nutrients in 2007, which controls the discharge of nitrogen and phosphorus into the Chesapeake Bay (as discussed in Chapter 3).

Another important general VPDES permit covers stormwater discharges from industrial activity. Many plants are required to obtain coverage under this permit, as they are considered to constitute "industrial activity" (i.e., SIC Code 4952). The size of the plant and population served will dictate whether an individual or general permit is required. It is important to note that if a plant can demonstrate they fall under the "No Exposure" clause of the regulation, it does not need a storm water permit. To do this, an operator must demonstrate that all industrial materials and activities are protected by a storm resistant shelter to prevent exposure to rain, snowmelt, and/or runoff.

Virginia Pollution Abatement

Virginia Pollution Abatement (VPA) permits are required for activities that manage pollutants without resulting in a "point source" discharge to surface waters. Examples of this would include, but not be limited to, land application of wastewater and biosolids. As with VPDES permits, either general or individual permits can be issued. The most significant among these is the permitting of biosolids, often referred to as sewage sludge. In 2007, the Virginia General Assembly transferred management of biosolids from the Virginia Department of Health to the Virginia DEQ. Permitting for biosolids application is often accomplished by a VPA permit in the case of a land application company, but for a POTW authorization can be incorporated into a facility's VPDES permit.

Water Reclamation and Reuse

There is a growing demand for water conservation; thus, water reuse will likely grow as an alternative to direct discharge of treated wastewater. Reuse allows treated wastewater discharges to be used for activities such as irrigation or cooling water. Virginia does not have a separate permitting program for reclamation and reuse. Rather, the Water Reclamation and Reuse Regulation (9VAC25-740) states that these activities must be addressed by either a VPDES or VPA permit, depending on whether the wastewater treatment plant from which the water originates has a surface water discharge or not. End users of the reclaimed water are not generally required to hold a permit.

Air Permits

Although wastewater treatment is the primary concern of the operator, some wastewater treatment plants must also obtain an air permit from DEQ. The need for an air permit is dependent upon whether or not air emissions exceed specific regulatory exemption levels. Most small wastewater treatment plants will not exceed these exemption levels. However, air permits are often required by plants that treat industrial wastewater or that operate biosolids incinerators or large electrical generators. The process to obtain an air permit is similar to that for the VPDES permit and will include provisions to control emissions of pollutants into the air.

VPDES Permitting Process

The process for obtaining a permit will vary depending on which type of permit is being requested. Because this manual is primarily designed for wastewater operators, the process to obtain a VPDES permit will be used as an example.

VPDES Permit Fees

Fees are assessed to recover a portion of the costs associated with the processing of permit applications. The fees are maintenance fees that are billed annually via a separate invoice.

Pre-Application Considerations

VPDES permit requirements must be anticipated before a facility is even designed. This is because permit conditions can affect how, where, and when the effluent is discharged, and the level of effluent quality that will be necessary. For example, a discharge to a small water body with little assimilative capacity might have higher treatment requirements than a discharge to a larger water body with higher assimilative capacity. In some cases, pre-application considerations might cause a utility to pursue no-discharge options such as wastewater reuse or land application.

After a utility or industry has determined to propose a surface water discharge, it is common practice to hold a pre-application meeting with DEQ to discuss application requirements, regulatory issues, potential permit conditions, and schedule. This is an opportunity for DEQ to request any special monitoring or studies (e.g., mixing zone analysis) that will be required to process the application.

Application

Complete permit applications are due to DEQ a minimum of 180 days prior to the expiration of the previous permit or before the discharge from a new facility. DEQ uses the federal application forms, which require a great deal of information regarding the treatment facilities and wastewater and biosolids characteristics. Typical application requirements include these items:

- Information on the owner/operator of the discharge
- Location of the discharge and receiving water body
- Description of the types and amounts of effluent to be discharged
- A water balance diagram of the facility
- Analytical results of the effluent quality

A complete application is important in order for the DEQ to automatically extend the existing permit if for some reason the permit cannot be issued prior to expiration of the existing permit. If a complete application is not received 180 days prior to expiration or discharge, and a new permit cannot be issued, then the discharger is considered to be discharging without a permit and subject to enforcement action and penalties. If it is a new facility, start up of the facility will be delayed until the permit is issued. Once the DEQ receives the application, it is reviewed for accuracy and completeness after which a letter is sent to the applicant stating that the application is complete.

Drafting of the Permit

Upon receiving a complete application, DEQ will evaluate the applicable water quality standards, categorical effluent

guidelines, and need for water quality-based permit limits. A key step in this process is the *reasonable potential analysis*, by which the DEQ will evaluate whether the proposed discharge has the potential to cause an exceedance of water quality criteria or antidegradation targets for any parameter expected to be present in the effluent. Models and statistical analyses are often used to facilitate this analysis. Generally, the most stringent of technology-based and water quality-based limits will be included in the permit. Key parameters for which limits are often needed include biological or chemical oxygen demand, ammonia, temperature, total suspended solids, and pH. Chapter 3 provides additional information on water quality standards.

After permit limits have been evaluated, a VPDES permit can be drafted. The first section of a permit typically includes detailed limitations on what can be discharged into the receiving water body. This is followed by a boilerplate section detailing items that pertain to all permits. Items such as the right of inspection and reporting criteria are included in this section. The draft permit is accompanied by a fact sheet which describes how the limitations were established.

As mentioned, permits vary substantially in size and detail. Virtually all require the submission of monthly Discharge Monitoring Reports (DMRs). The operator must report monthly the flow discharged, the analytical results for the stipulated parameters, and mass calculated as required in the permit. The permit may also specify requirements for additional analytical testing, whole effluent toxicity (WET) testing, biosolids management plans, stormwater management, spill prevention and control plans, and industrial pretreatment program requirements.

Permits usually include language requiring proper operation and maintenance of facilities in accord with approved Operation and Maintenance Manuals. Requirements for notification if plant upsets or bypasses occur are usually included as well. Most often, the operator is required to call the DEQ within 24 hours of an occurrence and write a detailed follow-up letter within five days.

Draft Permit Review, Public Participation, and Comment

The draft VPDES permit is submitted to the applicant and the USEPA for review. Changes to the draft permit might be requested by USEPA or negotiated by the owner/operator. For cases when the DEQ and the owner/operator cannot agree on a permit condition, 9 VAC 25 Chapter 15 authorizes a procedure for resolution of the dispute, which includes the selection of a mediator. It is important to note that dispute resolution can only take place during the preparation of a permit application or permit modification, not after the permit is issued.

After changes are incorporated into the draft permit based on comments from the USEPA and owner/operator, the draft permit is advertised and public comment is solicited. Depending on the nature of the public comments, a public hearing may be held on the permit. In any case, comments received are reviewed by the DEQ, and, if appropriate, modifications are made to the draft permit. The State Water Control Board will then be asked to take action on the permit. The State Water Control Board can issue the permit as recommended by

the DEQ, approve a modified permit, or choose not to issue the permit. If approved, the applicant is issued the permit with a specific effective date and permit duration. The applicant is then legally responsible to meet all conditions of the permit.

Chapter 5: Wastewater Reporting, Recordkeeping and Inspections

The Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulations (9 VAC 25-31-10) and federal regulations require wastewater treatment facilities to self-monitor wastewater discharges and biosolids production and quality. These self-monitoring results must be reported periodically to the DEQ and/or EPA to ensure that facilities are being operated in accordance with permit requirements. In addition to self-monitoring, the regulatory agencies conduct periodic inspections in order to validate the facility's self-reporting information.

Wastewater Discharge Monitoring Reports

Virginia's Pollutant Discharge Elimination System (VPDES) Permit Regulations define Discharge Monitoring Reports (DMRs) as the form supplied by the department or an equivalent form developed by the permittee and approved by the board, for the reporting of self-monitoring results by permittees. Simply put, discharge monitoring reports are the form utilized to document and provide information showing compliance or non-compliance with the requirements of a VPDES permit issued for a facility. Discharge monitoring reports must be completed by the permittee and submitted to the DEQ on a regular basis, as specified in the permit.

Reporting Frequency

The frequency of reporting is set individually in each permit; however, most VPDES permits for wastewater treatment facilities require the monthly submission of discharge monitoring reports to the Department of Environmental Quality. In no case can the reporting period be longer than one year. VPDES permits for facilities that are not operational or constructed typically require annual reports with "no discharge" being reported for the monitoring period unless a reporting waiver has been granted for the facility.

Sampling Frequency

The frequency of sampling is set individually for each parameter in each permit and will be identified in the DMR. Also, the type of sample (grab or composite) is usually specified. Typical sampling frequencies are daily, weekly, monthly, quarterly, and yearly. The results of some samples may be averaged and others are instantaneous and stand on their own. The sampling frequencies contained in the VPDES permit and outlined in the DMR are minimum frequencies. Additional sampling at the compliance point may be done but must also be reported if taken at a permit-prescribed sample point, in compliance with the VPDES permit.

Permit Limits

DMRs contain permit limits that must be met by the permittee for a facility to be in compliance with its VPDES permit. Limits are typically instantaneous concentrations, average concentrations, average loads, maximum concentrations, maximum loads, or annual loads.

Instantaneous concentration limits often have minimum and/or maximum values and are associated with a single monitoring event (e.g. pH, D.O.). Actual results must be

higher than a minimum limit and lower than a maximum limit for a facility to be in compliance with its permits.

Average concentration limits are obtained by averaging the results of several monitoring events over the time period in question. Average concentration limits are typically reported as annual, monthly, or weekly results and are obtained by determining the numeric average of all sampling results for the reporting period. Geometric means are often applied to disinfection indicators such as Fecal Coliform or E Coli. In the case of annual average concentration limits, all numeric results beginning January 1 to December 31 are averaged; for the nutrient general permit, each monthly average concentration is averaged. In the case of monthly average concentration limits, all numeric results beginning the first of the month to the last day of the month are averaged.

Loads are a measure of the mass discharge obtained by multiplying the flow times the concentration and applying the correct unit conversion factor. Average loads for a particular time period (such as a week or month) are typically determined by multiplying the daily concentrations by the daily flow, multiplying by the appropriate conversion factors based on the units of measurement, to arrive at daily loads (typically pounds or kilograms), and then averaging the daily loads for the time period.

Annual average loads are typically determined by averaging the monthly average loads. Years typically begin January 1 and end the following December 31.

Information

DMRs must include all information required by the VPDES permit and all other data collected must be consistent with the VPDES permit requirements. Examples of extra data might include dissolved oxygen, biochemical oxygen demand, total nitrogen, or total phosphorous. If collected at an established sample point as defined in the VPDES permit, this additional information must be reported on the DMR.

DMRs must be completed in permanent ink and data must be reported to the correct number of significant figures.

DMRs typically include the facility name, the VPDES permit number, the discharge number, the time period that the DMR covers (normally a complete month for most municipal and industrial wastewater treatment facilities), the sampling frequency, the type of sample (typically either a grab or composite), the permit limit, number of excursions, overflows, the reported value, contact information for the authorized person that signs the DMR, a certification statement, and a signature.

Abbreviations

Typical abbreviations utilized on DMRs are as follows:

NA	Not Applicable
NR	Not Required
X	No Sample Results
<QL	Below Quantification Level
>	Greater than value
<	Less than value
KG/D	Kilogram/day
G	Gram
MG/L	Milligram/liter
LB/D	Pounds/day
MGD	Million gallons/day

Reporting Violations

If the limits set by the VPDES permit are violated, a brief explanation of the violation must be attached to the DMR when it is submitted. The brief explanation should describe cause of the violation and the corrective actions that are being taken to prevent or minimize future violations. Explanations should reference each violation by date and if there are multiple unrelated violations separate explanations should be provided. It is usually good practice to include this information both on the DMR comment section and in a cover letter. It is also important to note that some violations require 24 hour notice; All conditions outlined in the boilerplate (Part II) of the permit should be understood. Frequency, duration and magnitude of violations will impact the severity of potential enforcement action.

Overflows and Bypasses

Overflows and bypasses must be reported on the DMR. Most permits require phone notification within 24 hours following an overflow or bypass event and a five-day follow up letter. A brief explanation of the overflow or bypass must accompany the DMR when it is submitted. The explanation should describe cause of the overflow or bypass and, if appropriate, the corrective actions that are being taken to prevent or minimize future overflows or bypasses. Explanations should reference each overflow or bypass by date and if there are multiple unrelated events during the reporting period. Operators should be certain who is responsible for reporting overflows within the collection system (Sanitary Sewer Overflows or SSOs) and that these events are correctly reported.

Signing a Discharge Monitoring Report

In Virginia, discharge monitoring reports must be signed by an authorized person or by an authorized person's delegate. For a corporation a DMR must be signed by a responsible corporate officer. This typically is a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or a manager responsible for the treatment facility. For a partnership or sole proprietorship, the DMR must be signed by a general partner or the proprietor. For a municipality, state, federal, or other public agency, the DMR must be signed by a principal executive officer or ranking elected official.

An authorized person can delegate to others the responsibility to sign DMRs. To delegate this responsibility to others, the delegation must be made in writing and submitted to the DEQ. Either a specific person or position can be delegated the responsibility to sign a DMR. The person to which this responsibility is being delegated to must have responsibility for the overall operation of the regulated facility. DMRs require the signature of the authorized executive and the operator in responsible charge. The operator in responsible charge is required to be licensed in the Commonwealth of Virginia. License levels are dependent on the permitted capacity of the facility.

The following certification statement from 9VAC25-31-110 D is required as part of each DMR:

> *I certify under penalty of law that this document and all attachments were prepared under my direction or*

supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

The DMR should be reviewed carefully for completeness and accuracy before signing.

Submission of DMRs

VPDES permits have specific dates by which the DMR is required to be submitted to the local regional DEQ office. DMRs are due by 10th of month following the reporting period. A paper or electronic DMR may be submitted.

Electronic DMRs

The DEQ allows electronic DMRs to be submitted via the internet. An electronic DMR (e-DMR) provides an alternative method of submission as opposed to the traditional hard copy. The same information is collected as with a paper DMR for a facility. Using an electronic process for submitting reports can save personnel time. Signature requirements are satisfied using unique Personal Identification Numbers (PINs) that are issued to e-DMR certifiers as part of the registration process. There are no additional fees associated with utilizing an e-DMR.

If you are interested in utilizing an e-DMR, you should contact the DEQ or go to DEQ's website.

Inspections

All facilities with Virginia's Pollutant Discharge Elimination System (VPDES) permits are subject to inspection by the Department of Environmental Quality or the United States Environmental Protection Agency at anytime. Inspection may be scheduled or unannounced. DEQ inspection check sheets can be found on the DEQ website at http://www.deq.virginia.gov/vpdes/checklist.html. There are many useful documents on this website to prepare your facility for an inspection and to assist you with the proper operation and management of your facility.

Concerning inspections of facilities with VPDES permits, state law notes the following:

Upon presentation of credentials, any duly authorized agent of the Board may, at reasonable times and under reasonable circumstances:

1. Enter upon the permittee's property, public or private and have access to records required by the permit,
2. Have access to, inspect and copy any records that must be kept as part of permit conditions,
3. Inspect any facility's equipment (including monitoring and control equipment) practices or operations regulated or required under the permit,
4. Sample or monitor any substances or parameters at any locations for the purpose of assuring permit compliance or as otherwise authorized by Law.

The objectives of the State's inspection program are stated as follows:

1. To assure that facilities are in compliance with statutes, regulations, and requirements,
2. To improve facility performance by providing advice and assistance,
3. To support permit development,
4. To maintain a regulatory presence as an act of deterrence,
5. To support administrative, civil, and criminal enforcement actions,
6. To support development and implementation of the pretreatment program.

In general, there are three types of inspections: routine, compliance/complaint, or re-inspections and assistance inspections. Routine inspections occur, as implied, on a regular basis. Their frequency is discussed later. Compliance/complaint inspections occur whenever needed, depending on the compliance history of the facility. Re-inspections may occur after a routine or compliance/complaint inspection to insure that a facility has addressed any deficiencies. Assistance inspections occur when a facility requests assistance from the Department of Environmental Quality.

A facility with a VPDES permit is subject to five broad subtypes of inspections: technical, laboratory, sampling, pretreatment, and storage and land application of municipal biosolids. Samples may be collected at the time of the inspections as a check on the plant operation or analytical capabilities.

Technical Inspections

The purpose of this type of inspection is to document the overall performance of the treatment facility. This inspection involves a complete evaluation of the operation and maintenance of the wastewater treatment and/or sludge treatment facility as well as a cursory evaluation of the facility's record keeping, sampling, laboratory testing procedures, and implementation of the pretreatment program. Inspection of collection systems can be included as part of this inspection. Generally, technical inspections are completed once every two years.

Laboratory Inspection

The laboratory inspection is a comprehensive review of the permittee's laboratory sampling, analytical, and record keeping procedures. During a laboratory inspection, the inspector evaluates the procedures used by the permittee for discharge monitoring from sample collection and flow measurement through laboratory analyses, data work-up, and DMR reporting.

The purpose of this inspection is to determine whether the facility's self-monitoring procedures can be expected to produce results that are representative of the quality and nature of the permitted discharge. This is accomplished by reviewing analytical, record keeping, and reporting procedures.

Generally, laboratory inspections are completed at least once every two years. With the December 2008 promulgation of the Virginia Laboratory Certification regulations (1VAC30-45 and 1VAC 30-46), the DCLS will take over the DEQ's responsibilities for laboratory inspections. The regulations are designed to ensure that environmental laboratories submitting data for compliance purposes are certified by the state and have quality systems in place to guarantee the production of reliable and accurate data. The deadline for submittal of

the application of lab certification is September 29, 2009 for noncommercial laboratories.

VPDES Sampling Inspection

In this inspection, samples are taken by the Department of Environmental Quality for independent analysis. Sometimes during a sampling inspection samples for all reported parameters will be collected and analyzed. Sometimes split samples are taken with the facilities laboratory and the laboratory utilized by the Department of Environmental Quality both analyzing the sample.

Pretreatment Audits

POTWs discharging more than 5 MGD of wastewater are required to have pretreatment programs. Depending on the industries discharging to a POTW, facilities smaller than 5 MGD may also be required to operate a pretreatment program. DEQ will conduct pretreatment audits on those facilities that do have a program. Pretreatment audits are designed to provide a comprehensive review of a facility's pretreatment program to both show compliance and look for ways to improve an existing pretreatment program. As each pretreatment program is unique to a locality, persons conducting or assisting with a pretreatment audit should be familiar with all aspects of the local pretreatment program.

Generally, fully approved pretreatment programs are typically audited annually. Developing and conditionally-approved programs are not audited.

Storage and Land Application of Municipal Biosolids Inspections

Municipal facilities utilizing land application of biosolids are inspected for compliance with their sludge management plans (SMP) and VPDES permit conditions. Land application sites are inspected and the records associated with these sites are audited. Generators of biosolids are required to monitor biosolids' quality to insure compliance with their permit and SMP. Biosolids' testing records and storage facilities are inspected. Generally, inspections for the land application of municipal biosolids are conducted annually.

Chapter 6: Compliance & Enforcement

Chapter 2 of this manual presents a broad overview of federal environmental laws, particularly the Clean Water Act (CWA). In addition to setting forth specific requirements and procedures, these laws also embody the national environmental goals that the laws are designed to achieve, such as the Clean Water Act's goal of restoring the physical, chemical, and biological integrity of the nation's surface waters, the so-called "fishable and swimmable" goal. The detailed requirements that the laws set forth are the specific methods that Congress has chosen to help attain these goals. Chapter 3 of this manual describes some of the key requirements of the CWA and Chapter 4 describes how these requirements are passed down to wastewater treatment plants and their operators through the permitting process. Through day-to-day, month-to-month, and year-to-year compliance with their permits, wastewater treatment plants do their part to achieve the nation's goals for surface water quality.

A necessary component of this strategy for achieving the water quality goals of the CWA is to ensure that wastewater treatment plants are operated in accordance with the permits that have been issued to them. This includes ensuring that all discharges are fully permitted and meet all stipulated effluent standards; that biosolids are recycled or disposed of in accordance with the permit and all applicable laws and regulations; that the wastewater treatment plant is properly operated and maintained; and that all provisions of the discharge permit are complied with.

Clean Water Act Basis for Compliance and Enforcement Determinations

The Clean Water Act provides authority to the U.S. Environmental Protection Agency and to the states to establish and enforce discharge permit requirements. It also provides a great deal of flexibility to EPA and the states in taking compliance and enforcement actions. In Virginia, permitting authority has been delegated by the EPA to the State Water Control Board, which in turn has authorized the Department of Environmental Quality (DEQ) to administer the VPDES permitting program.

The important compliance-related components of the CWA are the following:

- All point source discharges must be permitted. The CWA makes the discharge of any pollutant to the navigable waters of the U.S. illegal unless it complies with a number of sections of the Act, including being authorized by a National Pollution Discharge Elimination System (NPDES) permit. As noted in Chapter 4, in Virginia these are known as VPDES permits.
- Discharging facilities must comply with all of the limitations, requirements, and provisions stipulated in their permits. Many of these requirements are very specific, such as numeric concentration limits and frequency of effluent sampling. Others, though, are general and less well defined, such as "operate the facilities in a workman like manner."

- Dischargers must maintain adequate monitoring and record-keeping and open its facilities and records to the EPA or state inspection.

These provisions set the requirements for discharge. The monitoring and reporting described in Chapter 5, along with EPA or state inspections and audits, provide the regulatory agencies with the means to determine if facilities are in compliance with their permits.

Clean Water Act Enforcement Methods

In the event of a violation, the Clean Water Act provides for a range of possible enforcement actions by the EPA or a delegated state. All of the following enforcement actions can be undertaken by either the DEQ or EPA. It is important to note that the EPA can initiate one of these actions against a Virginia discharger even if the DEQ has chosen not to, or has undertaken one that the EPA felt was inadequate.

An enforcement action could be taken for several reasons, such as a violation reported through the Discharge Monitoring Report, a public complaint, or as the result of an EPA or state inspection or audit. Frequency, duration, and magnitude of violations will impact the severity of potential enforcement actions. Following a determination that a violation has occurred, the EPA or DEQ could take one of the following actions:

- Warning Letters. A letter from the DEQ is sent to the discharger acknowledging the discharge and requesting a response within a certain number of days on the action taken to prevent future violations.
- Notice of Violation (NOV). The NOV cites the violations and requires a corrective action plan and schedule to achieve permit compliance.
- Administrative Order. An Administrative Order would direct the discharger to correct the deficiency and bring the facility into compliance with its permit. EPA Administrative Orders are not subject to review by the Courts and are generally used for infrequent or less serious violations. EPA may include an Administrative Penalty of up to $32,500/day of violation assessed against a discharger. EPA does not have sole discretion on the penalty; however, the facility receiving the penalty may request an administrative hearing on the penalty and could appeal it to the EPA's Environmental Appeals Board, or ultimately to Federal Court. More typically, Administratrative Orders in Virginia are issued by DEQ in the form of a Consent Order agreed to by the discharger as a means of resolving violations. Consent Orders may include a penalty.
- Civil Enforcement through Federal or State Courts. In this case, the EPA or the state agency files suit in Federal or State Court against the discharger. There are three possible outcomes. The most frequent is that a Consent Decree is negotiated by the parties and then issued by the Court as a legally-binding Court Order. The Consent Decree can contain agreed-upon corrective actions, timelines, and deadlines; fines and penalties for the existing violations; and possible stipulated fines and penalties in the event the discharger violates the terms of the Consent Decree.

  If the parties cannot agree on a Consent Decree, then the suit can go to trial, in which case the outcome is

determined by the Court. The Court could find for the regulatory agency in whole or in part and issue appropriate Orders for corrective action. It could also impose penalties of up to $32,500 for each day of the violation. Finally, it could find for the discharger and dismiss the case.

- Criminal Penalties through the Federal or State Courts. The Act authorizes criminal penalties for certain violations deemed serious enough to warrant them. These violations include willful or negligent violations of the permit, making false statements (such as including false data in a Discharge Monitoring Report), and knowingly placing others in danger of death or injury. Both jail terms and monetary fines can be imposed by the Court.

Citizen Lawsuits

The Clean Water Act allows citizens to initiate civil lawsuits against individuals or dischargers for violations of effluent limits or a previously issued Order. In order to file such a suit, the citizen must show that he or she has suffered direct harm from the violation and the violation has not been diligently prosecuted by the state or EPA. Harm can be broadly defined, however, and could include such things as loss of recreational opportunities.

Chapter 7: Collection Systems

Background

The origin of our collection systems goes back to the eighteenth and nineteenth centuries in English cities such as London and York. Before there was any concept of closed sewer systems, both domestic wastes and liquid wastes from such industries as meat packing were simply discharged into open ditches. Outdoor privies were used and domestic waste was discharged into unlined underground pits, which often seeped into the underground drinking water supplies. Subsequent to an 1850's study by John Snow of England, a physician who was the first to correlate a public health epidemic (cholera) with contamination in public water supply wells, there was the advent of cities providing closed systems for combined and separate sewers; this was also brought on with the advent of the indoor water closet. Accordingly, the first collection systems developed in this country in the early 1900s.

While the purpose of all wastewater collections systems is primarily public health and sanitation, water quality management of the nation's rivers, streams, and lakes became important during the mid 1900s. Domestic and industrial wastes led to contamination of our water bodies with nutrients, oxygen-depleting organic matter, and toxic products such as heavy metals.

Types of Systems

Wastewater collection systems fall into three broad categories: (1) separate sanitary systems that are focused on domestic and industrial wastewater, albeit from residential, commercial, industrial, and institutional facilities; (2) storm sewer systems that collect rainfall and runoff from impervious developed areas; and (3) combined sanitary and stormwater systems, which combine the two systems into one outfall location and generally exist in a few larger or older cities.

Combined Sewer Systems

Combined sewer systems include collection of both wastewater and storm water. In Virginia, only the cities of Richmond, Lynchburg, and Alexandria are known to have combined systems, although other systems such as Philadelphia, Pittsburgh, Washington D.C., Boston, and others around the country have these types of systems as well.

In the early part of the century, prior to the EPA being formed and the Clean Water Act of the 1970s, these combined systems were originally designed to collect all sanitary and storm waste flows and discharge flow directly to rivers and streams. With the advent of requirements for treatment of wastewater, first primary treatment standards and ultimately secondary and advanced treatment standards in the 1960s through the 1980s, these combined systems were routed to treatment facilities with the possibility of Combined Sewer Overflow (CSO) to water bodies (at the treatment plant or within the collection system) whenever significant rainfall would occur.

Under today's regulatory environment, CSOs require separate approvals and permitting. CSO permits require nine technology-based minimum controls and a long-term control plan that includes water quality impact considerations. Over the past couple of decades, fewer discharges to the Commonwealth's and nation's streams have occurred due to better system management

in combination with the incorporation of wet weather equalization in the form of large detention basins and below-grade tunnels. Future regulations, besides preventing overflows, are aimed at considering treatment for pathogen destruction and some degree of solids removal prior to discharge. In some cases, the separation of combined sewers into unique sanitary and storm infrastructure can also be implemented.

Separate Sanitary Systems

Sanitary collection systems consist of service laterals from individual properties, sewer mains, and larger interceptor mains and pump stations necessary to convey wastewater to a publicly owned treatment works (POTW). Public entities, municipalities or authorities, own the public domain portion of the sewer system, while property owners are responsible for the service lateral on their property. There may also be larger private collection systems that generally feed into the public system. The focus of this chapter will be separate sanitary sewers.

Stormwater Systems

Stormwater collection systems catch runoff from impervious surfaces such as roofs, streets and parking lots, and convey the flow to receiving streams. In the past, stormwater runoff received scant attention. However, increased concern with nutrients, sediments, and toxics has led to increased regulation.

Under the federal Clean Water Act, large and medium municipal separate storm sewer systems (MS4s) - those located in municipality with a population over 100,000 - were required to be covered by Phase I MS4 NPDES permits. Phase I MS4s require a comprehensive Stormwater Management Program (SWMP) of structural and non-structural measures to control the discharge of pollutants from the storm sewer system to the maximum extent practicable and to effectively prohibit non-stormwater discharges to the separate storm sewer system. The Phase 1 permits require the implementation of the SWMP, storm event monitoring, and regular assessments of the SWMP effectiveness.

Phase 2 MS4s are typically required for small MS4s located in urbanized areas, as defined by the U.S. Census Bureau's 2000 Census. Small municipal separate storm sewer systems include systems owned by municipalities, federal facilities, state facilities (including those owned by VDOT), and public universities. In addition, any small MS4 located in a Phase I large or medium municipality is required to be permitted under the Phase 2 regulations.

Permits for regulated small MS4s require the development, implementation, and enforcement of an SWMP that includes the following six minimum control measures: (1) public education and outreach on stormwater impacts; (2) public involvement/participation; (3) illicit discharge detection and elimination; (4) construction site stormwater runoff control; (5) post-construction stormwater management in new development and redevelopment; and (6) pollution prevention/good housekeeping for municipal operations. Regulated small municipal separate storm sewer system permit applications require the applicant to identify the following:

- Proposed best management practices and measurable goals for each of the six minimum control measures;
- The timing of the implementation of each control measure; and

- The person or persons responsible for implementing the SWMP.

In 2004, the Virginia General Assembly transferred permitting authority for MS4 and construction-related activities from DEQ to the Department of Conservation and Recreation (DCR).

Collection System Elements and Layout

General

Modern sewage collection systems are designed and constructed to achieve total containment of the predicted sewage flows contributed from the established service area and population. In general, sewer systems are designed for the estimated ultimate tributary population with an upper limit consisting of the 50-year population growth projection, except when considering parts of the systems that can be readily increased in capacity. Consideration is given to municipal comprehensive plans and to other planning documents to determine the associated maximum anticipated capacity based on land use.

New sewer system capacity is designed on the basis of an average daily per capita flow of sewage of not less than that set forth in Virginia's Sewerage Collection and Treatment (SCAT) Regulations (9 VAC 25-790-460) or other DEQ approved order. These figures are assumed to include some dry weather infiltration but not inflow. Domestic wastewater flows vary with the season, day of the week, hour of the day, and type of land use or facility. Accordingly, flows are represented as minimum daily, average daily, peak daily, peak hour, and instantaneous peak flows; also, each type of use (residential, commercial, heavy industrial, prisons, etc) has characteristic daily use patterns. The SCAT Regulations generally require that peak hour flow factors (multiples of average daily flow) are 4.0 for laterals and submains and 2.5 (minimum) for mains and interceptors. In addition, other resource documents such as the Ten State Standards and the Regional Technical Standards (Hampton Roads Area) may have other specific requirements.

In addition, infiltration and inflow (I/I) must be considered and all excessive I/I kept out of the system. Whereas systems are initially designed and constructed to prevent excessive I/I, over time the collection systems degrade including joint separation, manhole degradation, flooding or ponding of manholes in new areas of the system, etc., which results in increases of I/I over the lifetime of the system (typically 20 to 50 years). Furthermore, older practices from the 1950s and 1960s of tying roof leaders, driveways drains, and foundation drains into the wastewater collection system are no longer legal or practiced, but many existing communities still have such connections that can lead to hydraulic overloading of the system and treatment plant. Wastewater that doesn't include I/I is referred to as base flow; in addition, there is dry weather I/I and rainfall derived I/I (RDII).

Gravity Systems

The following list defines the various collection system components:

- Building sewer is the private portion of the system on an individual parcel of land, typically consisting of the plumbing lines to within 5 feet of the outside of the foundation. Building sewers are designed in accordance with the Uniform Statewide Building Code of Virginia.

- A lateral or service line continues from the building sewer and has no other common sewers discharging into it. This may be either a private lateral, typically on private property, or a public lateral within the public right-of-way or public easement. Sewerage service lines from buildings are to be constructed in accordance with either the Uniform Statewide Building Code of Virginia or the SCAT Regulations, depending on jurisdictional considerations. Lateral connections are made to sewer mains with branch fittings, such as a "y"-type connection.
- Submain is a sewer that receives flow from two or more lateral sewers. These lines are typically 6" minimum in diameter.
- Main or trunk means a sewer that receives sewage flow from two or more submain sewers. Mains are a minimum of 8" in diameter and may be as large as 12". In order to provide appropriate maintenance and inspection, mains typically include manhole structures at each change in direction or pipe size and a minimum of 300' distance on straight runs.
- Interceptor means a sewer that receives sewage flow from a number of gravity mains, trunk sewers, sewage force mains, etc. Such interceptors are typically gravity lines, but in some cases such as in larger regional systems may include pressurized force mains and associated pump stations.

Gravity mains are designed based on peak design capacity when flowing full, although most of the time they flow only partly full, under the hydraulic regime of open channel flow. Conversely, pressurized force mains are designed to flow full at all times based on maximum and minimum velocities.

Submains, mains, and interceptors are installed with uniform slope and pipe size, and a straight alignment between manholes. Sewers are designed and constructed to give average velocities, when flowing full, of not less than 2 feet per second, based on Manning's formula using an appropriate pipe material roughness coefficient ("n") value. The SCAT Regulations present the minimum slopes that should be provided for gravity sewers and many other design requirements.

Pump Stations

There are various locations within the collection system that may require that wastewater flows be conveyed by pumping (pressurized pipe) rather than gravity, open channel flow. Such areas are generally located at such a distance from the treatment plant (or existing pump station service area) where gravity sewers become too deep (generally greater than approx 16') and are thus economically and practically infeasible to construct.

Furthermore, pump stations can be described by the location/type of ultimate discharge. Specifically, stations whose force main discharges to a gravity system and may be repumped or directly conveyed to the POTW are generally referred to as *lift stations*; those that discharge into a pressurized system, in many cases along with other pump stations (manifolded force mains), are referred to as *terminal pump stations*.

Pump Hydraulics. Pumps installed in a station must be capable of discharging the peak hour design flow at the associated discharge pressure/system head. State regulations require that the station capacity as defined above shall be with the largest

pump out of service; therefore, the station must have an installed standby pump and be capable of handling the peak flows without this standby pump operating.

Pumps are selected based on design points for both flowrate and discharge head. The most commonly used collection system wastewater pump, a centrifugal pump, will have a pump characteristic curve capable of a broad range of flows, all based on the total dynamic head that the pump must operate against. The total dynamic head is defined as a combination of static head (how much energy is required based on the water column vertical lift the pump must overcome), friction head (how much energy must be overcome based on the suction and discharge pipe velocity and roughness), and the system head (how much energy must be overcome to get into the existing pressurized system). Accordingly, each pump is specially designed for its particular conditions, and during design it is important to consider how to minimize the energy required through such factors as pipe sizing (velocity), siting of station and depth of wet well (static lift), and the location of the system tie-in location (system head).

In most cases, there is not only a range of inflow to the station that must be handled but a broad range of pressures as well. Flows to be handled include the maximum peak hour as well as the daily average and daily minimum flows. Consequently, it is not uncommon to initially see smaller pumps installed and/or to see variable speed pumps used to handle a broader range of flows and pressures, while still trying to remain within the range of normal pump operating efficiencies. Conversely, force mains and the inherent costly construction within roadways over great lengths make it more difficult to phase the discharge lines. Generally speaking, while force main velocities are considered in design, it is normal practice to construct such mains considering the minimum 20-year life time of the facilities and to use a planning period accordingly.

Pump Station Reliability. Most collection system pump stations are required to be Reliability Class I, which means that they must be provided not only with spare pumps but are also required to be able to be operated continuously, including during power outages. Therefore, most stations will include an emergency electrical generator (diesel or natural gas driven) for such purposes. Some facilities incorporate a standby diesel engine-driven pump alternatively.

As part of the reliability requirements, remote pump stations are required to include an array of alarms to indicate fault conditions and failures in the station, and to relay those alarms (and sometimes other digital signals such as wet well level) to a centralized monitoring facility. This insures that the stations are monitored on a 24/7 basis and alerts operators and maintenance personnel of imminent conditions that could lead to backups in the system or overflows. Such systems are often referred to as SCADA (Supervisory Control and Data Acquisition) systems.

System Operations

Localities must also be concerned with asset maintenance and operations, as well as maintenance of the collection systems, in order to preserve the integrity of the infrastructure that has now become the underpinning of this public health and water quality protection system.

Several sources of information for operators include the construction related as-

builts, shop drawings, and Operation and Maintenance (O&M) manuals. O&M manuals including the monitoring and operating requirements contained in 9 VAC 25-790-260 through 9 VAC 25-790-300 are normally prepared for all sewerage systems and pumping stations.

When flow escapes the collection system, the event is called a Sanitary Sewer Overflow (SSO). SSOs can threaten public health and water quality by allowing untreated sewage into basements, streets, and streams. SSO that reach or have reasonable potential to reach state waters must be reported to the DEQ by phone within 24 hours of the event and a follow-up letter must be submitted within 5 days. Recently, both the Virginia DEQ and the federal EPA have been taking increased enforcement action in SSO cases. It is not unusual for a a Virginia locality to be under a Consent Order for either CSOs or SSOs, as appropriate to the region's system. In the Hampton Roads area, all localities, including the Hampton Roads Sanitation District, are under a Regional Consent Order as of August 2007. This order requires that a Regional Wet Weather Management Plan be developed jointly by 2011 to determine the nature and extent of SSOs and to propose a management plan for resolving such overflows in the future. The Phase II program, over subsequent years, will outline the programs and projects needed to address such future overflows.

A part of the orders, and normal practice, involves developing Capacity Management, Operation, and Maintenance (CMOM) plans to insure appropriate caretaking of the system and to assist in preventing SSOs to the maximum extent practicable. These CMOM plans include requirements for capacity studies to insure that systems are designed adequately and maintenance O&M plans to insure that the systems are operated and maintained properly in order to perform as designed. At the time of this writing, final CMOM regulations have not been promulgated but regulators have been following guidance initiated by Region IV of the EPA, where a pilot CMOM program was developed.

The two most common causes of SSOs are line blockages and excessive flows. Blockages are generally caused by root intrusion or buildups of fats, oils, and greases (FOG). Most municipalities have ordinances prohibiting excess discharge of FOG and require restaurants to install and maintain grease traps. Even where these ordnances are strictly enforced, some cleaning of sewers is required to prevent SSOs caused by blockages, and tree roots still need to be controlled. Rain-driven high flows also cause SSOs.

As mentioned above, infiltration can enter sanitary sewer systems as groundwater through cracks in pipes, joints, and manhole barrels; inflow from rainwater/runoff can also enter from sources such as roof gutters and basement sumps connected directly to sanitary sewers. Together, I/I can cause extreme peaks in sanitary sewer flows; these peaks can exceed by six to ten times the normal sanitary flow and overwhelm treatment systems, causing basement backups and SSOs from manholes or other escape points in the sewer system. Excess I/I can also negatively impact treatment efficiency at the wastewater plant. While inflow ceases shortly after the rain stops, infiltration due to elevated groundwater can continue for long periods after rain events. While inflow can often be controlled by maintenance of municipally owned assets under the streets, infiltration is more problematic. Modern ordinances generally prohibit the connection of area drains,

downspouts, and sump pumps to sanitary sewers in new construction. However, these were common practices in the past and correcting inflow problems can be very difficult or not impracticable for a number of reasons including cost, significant excavation on private property, and lack of land area or stormwater pipes for ground infiltration or drainage. Also, it can be difficult to document and require a private property owner to make repairs to deficiencies on the portions of the service lateral found on private property. Many communities have developed innovative methods to help property owners update the features of older properties in accordance with modern codes for new construction, including grants and tax credits for property improvements.

Periodic sanitary sewer system evaluations should be performed to determine the condition of the system and the vulnerability to inflow. System evaluations are a critical part of asset management and valuation. New accounting practices require public entities to report asset condition and valuation as defined in the GASB 34 standard; CMOMs and Consent Orders also mandate such periodic inspections, both of pipelines and pump stations. Collection system evaluations involve smoke testing, flow monitoring, and closed circuit television (CCTV) to inspect for cracks and pipe deterioration. Periodic sanitary sewer system evaluations are essential for assessing system conditions and making long-term capital improvement plans for asset rehabilitation and, if need be, replacement.

Trenchless techniques for rehabilitating sewers systems, such as slip-lining, sometimes allow extensions of the useful life of sewers at lower cost and disruption than replacement. Operating a system of buried assets while maintaining original design capacity requires regular ongoing renewal and replacement.

Chapter 8: Industrial Pretreatment

Industrial discharges or spills into publicly owned treatment works (POTWs) have the potential to affect the biological treatment systems and cause plant upsets, interfere with treatment, or cause the pass through of pollutants. To prevent this from occurring, the EPA adopted and implemented a pretreatment program which requires POTWs designed to treat 5 million gallons per day or more to regulate the industrial discharges to their facilities.

Background

The federal pretreatment regulations were established in 1972 under Section 307(b) of the Clean Water Act, which called for the EPA to develop national pretreatment standards to control industrial discharges into sewage systems for the protection of s POTWs The Pretreatment Regulations have been amended several times with the most recent amendments in 2006. The objectives of the Federal Pretreatment Regulations (found in Title 40 of the Code of Federal Regulations at Section 403.2) are to

- Prevent the introduction into POTWs of pollutants which will interfere with the operation of the POTW including interference with its use or disposal of municipal sludge;
- Prevent the introduction into POTWs of pollutants which pass through the treatment works into receiving waters or which might otherwise be incompatible with the treatment works;
- Improve opportunities to reclaim and recycle municipal and industrial wastewaters and sludges; and
- Reduce the health and environmental risk of pollution caused by the discharge of toxic pollutants to the POTWs.

Pretreatment Program Administration

Federal, state, and local government agencies are all involved in establishing pretreatment programs. In general, the federal government requires that states develop pretreatment programs; the states, in turn, review, approve, and oversee the programs of local POTWs through the issuance of the NPDES permits. The pretreatment regulations require all large POTWs (5 MGD or larger) or small POTWs with significant industrial discharges to establish a local pretreatment program.

To accomplish the purposes and objectives, the pretreatment program relies on a pollution control strategy composed of three elements:

- National Categorical Standards: National technology-based standards developed by EPA Headquarters, setting industry-specific effluent limits.
- National Prohibited Discharge Standards:
  - General Prohibitions: National prohibitions against pollutant discharges from any non-domestic user which cause pass-through or interference with the treatment processes.
  - Specific Prohibitions: National prohibitions against pollutant discharges from any non-domestic user causing the following:
    - Fire or explosion hazard,
    - Corrosive structural damage,
    - Interference due to flow obstruction,
    - Interference due to flow rate or concentration, and

    - Interference due to heat.
- Local Limits: Enforceable local requirements developed by POTWs to address federal standards as well as state and local regulations. These limitations are based on the specific pollutants being discharged to the POTW and the POTWs ability to treat these pollutants.

States that have NPDES authority are required to develop pretreatment programs for EPA approval and are referred to as pretreatment delegated states. The POTWs develop local pretreatment programs which are approved either by the state (in a pretreatment delegated state) or by the EPA. Once a program is approved, the state or the EPA conducts periodic checks or audits to ensure that the program is operating properly.

The purposes of a local pretreatment program are as follows:

- Regulate the disposal of industrial wastewater into the sanitary wastewater collection system.
- Protect the physical structures and the safety of operation and maintenance personnel of the wastewater system (collection and treatment).
- Protect the health and safety of the public and the environment.
- Achieve compliance with pretreatment regulations as required under the Federal General Pretreatment Regulations and Categorical Standards and local source control ordinances.
- Prevent illegal discharge of industrial pollutants into storm sewers.

If a POTW does not have an approved pretreatment program, national pretreatment standards and requirements are enforced by the EPA (in non-pretreatment delegated states) or the state (in pretreatment delegated states). Therefore, pretreatment regulations may be enforced by either the EPA, state, or the POTW, depending upon the status of program approvals for a given community.

As a generator of pollutants, industry is responsible for the removal of contaminants present in quantities that might cause problems in the collection system, the treatment plant, or the outside environment. Industry must own and operate any pollution control equipment or facilities necessary to comply with federal pretreatment regulations or local pollution control limits in order to prevent damage to human health or the environment.

Elements of a Pretreatment Program

To be successful, the local pretreatment program must have the following elements:

- Building Blocks
    - Local sewer use ordinance (SUO) provides the authority to implement the local program and sets out the requirements for non-domestic users of the sewer system.
    - Information on each of the industrial users (IUs) includes a characterization of the waste being discharged to the POTW and information on the POTW removal efficiency for each of the pollutants.
    - Staffing to implement the program is dependent on the size of the wastewater treatment plant compared to its industrial wastewater loads and characteristics.
    - Funding to implement the program can be obtained in a number of ways: through direct budgeting and

billing of the industries, industrial permit application fees, pollutant loading surcharge fees, etc.

- Effluent Limits
  - National pretreatment standards must be adopted by the locality as a part of the SUO and must at a minimum reference the prohibited discharge standards and the categorical pretreatment standards. The appropriate standards must then be incorporated in each industrial user's industrial pretreatment permit.
  - Local limits adoption authority must be provided in the SUO and local limits must be established by the POTW.
- Implementation Activities
  - Notification of the effluent limitations applicable to that facility must be sent to IUs.
  - Permits must be issued to IUs to sanction the discharge of wastewater to a POTW and establish conditions and permit terms for the IUs discharge. An IU permit is typically effective for a limited time period, usually 5 years. At a minimum, the permit includes the federal standards, local limits and monitoring and reporting requirements.
  - Industrial self-monitoring is also a requirement of the pretreatment permit to ensure that the IU is complying with the effluent limitations contained in the permit. Federal regulations require most IUs to sample twice a year at a minimum.
  - POTW monitoring and inspection activities provide a check on the IU to ensure compliance with permit requirements. Federal regulations require the POTW to inspect at least once per year and to sample each IU at least twice a year.
  - Enforcement action is taken when an IU violates its permit conditions. The POTW must adopt an Enforcement Response Plan that outlines what action will be taken for certain violations including civil penalties of at least $1000 per day of violation and criminal penalties for knowingly falsifying information.
- Information Handling and Public Access
  - Pretreatment programs must include a data management system and must provide mechanisms to allow the public to have access to information about the program, IUs' discharges and to comment on program elements.

Chapter 9: Biosolids Management

Biosolids and residuals are byproducts of wastewater treatment plants. Biosolids consist of primary and waste activated solids, which have been processed to reduce pathogens, and are often used for beneficial programs such as land application. Residuals are products such as grit, scums and incinerator ash, which are removed from the treatment plant, and are typically disposed of at landfills.

Regardless of the treatment technology utilized for wastewater treatment, excess solids are generated which must be managed in some manner. The four primary biosolids methods are land application, composting, incineration, and landfill. Each method has advantages and drawbacks, and there is no single solution for all applications.

Land Application

Land application is often referred to as beneficial reuse and is generally considered the most sustainable of the biosolids management methods. Land application includes applying stabilized biosolids to agricultural land, forested land, and land restoration projects, such as coal mine reclamation. However, because land application has the potential to put biosolids in relatively close proximity to people, it has been the most heavily regulated and has come under the greatest public scrutiny. Odors generated from land application projects have generated considerable public comment in some areas.

Prior to land application, biosolids must be stabilized to meet Class A or Class B definitions, as defined hereafter, to reduce volatile solids concentration, vector attraction, and pathogens. Stabilization processes include anaerobic digestion, aerobic digestion, and lime stabilization.

Unless the site is included in the POTW's VPDES permit, a Virginia Pollution Abatement (VPA) permit must be obtained for each land application site and the site must be monitored to confirm that biosolids application does not result in contamination of adjacent property, surface waters, or groundwater.

Composting

Composting is an alternate method of land application, which involves the blending of stabilized or partially stabilized biosolids with a bulking agent (typically wood chips) and aerating the blended material for an extended period. Aeration can be accomplished by mechanical blowers that draw air through a "static pile" of the blended material or by periodically turning a windrow of the blended material. The aeration process elevates the blended material to produce a Class A biosolid product. After removing the bulking agent, the compost is aged and then is made available as a mulch or soil conditioner to landscapers.

Incineration

Incineration of biosolids is an attractive alternative for several reasons. It does not require trucking the biosolids off site to either a land application or landfill area. The generator retains complete control of compliance with applicable regulations on the site. Newer incinerator types such as fluidized bed incinerators do not require additional fuel, once combustion is established. Also, new designs recover

much of the heat generated for space heating or even electric generation. However, incinerators are subject to air emission regulations which are unfamiliar to many operators and can be fairly stringent. No matter how efficient, incinerators also produce some quantity of ash which must be managed as well, usually by landfill.

Incinerators are regulated by the DEQ to meet federal Clean Air Act regulations (Title V) and Virginia's Regulations for the Control and Abatement of Air Pollution (9 VAC 5-20-160). Operators are required to keep detailed records of quantity and quality of sludge incinerator and operating parameters such as combustion temperature and stack O2 and CO levels.

Landfill

Landfill of biosolids is often considered the least sustainable management method due to the finite availability of landfill space. However, it is still attractive in some situations due to the lower requirement for treatment prior to disposal and associated economic considerations. Generally, landfilling is only an attractive alternative for small facilities and as an emergency backup for other management options.

Prior to landfilling, biosolids must be stabilized to meet Class B definitions and must meet minimum dry solids concentrations and metals and Toxicity Characteristic Leachate Procedure testing, as defined hereafter.

Testing and Reporting

Testing and reporting on biosolids depends on the method of disposal – land application (Class A or Class B), composting, landfilling, incineration – and must be in accordance with 40CFR503 regulations. These regulations detail the parameters that must be tested. The frequency of testing ranges between 1 to 12 times per year depending on the quantity of solids disposed.

Reporting of the test results must be submitted annually to EPA. Each annual report includes the monthly disposal rates and analytical results, if applicable, along with the yearly totals of solids disposal.

Public Health and Concerns

There is increasing public concern regarding potential hazards and health concerns from land application of biosolids. Much research has been conducted since 1990 regarding pathogens in biosolids. The EPA manual Control of Pathogens and Vector Attraction in Biosolids was authored in 1999. The National Research Council of National Academy of Sciences performed research in 1996 on land application. The published report concluded that the removal of pollutants by wastewater treatment plants and existing regulations governing use of biosolids in crop production were sufficient to protect human health and the environment and presented negligible risk to consumers of crops grown in biosolids-applied lands. In the 2002 published report, "Biosolids Applied to Land: Advancing Standards and Practice," the National Academy concluded that there was no documented scientific evidence that 40 CFR Part 503 rule failed to protect public health. Although public officials and citizens sometimes assume that Class A biosolids are a far safer product the federal regulations are designed to provide proper handling by specifying requirements specific to each class. EPA policy does not express a preference between Class A and Class B biosolids treatment.

More recently, two significant governmental reports have been issued in Virginia. In 2007, a report by the Virginia Department of Health (Jenkins et al) concluded that "there does not seem be strong evidence of serious health risks when biosolids are managed and monitored appropriately" while also recognizing there is much to be learned about biosolids. Similarly, the December 2008 report of the Biosolids Expert Panel convened under House Joint Resolution 694 (2007) reported that the panel found no causal link between health issues and biosolids land application. This report also recommended continuing research and other measures in support of land application program.

Federal Regulation

Biosolids first came under federal regulation with the 40 CFR Part 257 in the 1970s. In 1987, the Federal Clean Water Act (CWA) was amended by the addition of Section 405 to govern the disposal and use of biosolids. This also included a comprehensive program to reduce potential environmental risks and to maximize beneficial uses of biosolids. Following evaluation of numerous pollutants contained in typical biosolids in 1993, the EPA promulgated the major federal biosolids regulations at 40 CFR Part 503, which superseded the earlier Part 257 regulations.

Part 503, Subpart B sets pollution limits for arsenic, cadmium, copper, lead, mercury, nickel, and zinc and sets forth management practices, reporting, and record keeping requirements. Definitions were created for Class A and Class B land applied biosolids. Class A biosolids must be void of detectable pathogen levels and must meet vector attraction reduction requirements. Class B biosolids contain some levels of pathogens and therefore include additional control requirements.

The disposal of biosolids in municipal landfills is regulated under 40 CFR Part 258 and the Resource Conservation Recovery Act (RCRA), Subpart D for criteria for non-hazardous municipal solid waste landfills that accept biosolids. Under these criteria, biosolids can be approved by the governing state agency as a cover material in landfills. Approximately 17 percent of biosolids generated from municipal wastewater treatment plants nationwide are disposed of in municipal landfills.

State Regulation of Biosolids

As allowed by the CWA, Virginia has enacted state laws specific to biosolids land application that are more stringent than the federal requirements. These state requirements address items such as site approval criteria, nutrient management and buffers, as well as procedural requirements including public comment and hearings. The Virginia Supreme Court has ruled that localities have very limited ability to establish locality-specific requirements for land application due to the comprehensive state permitting program for land application. Over the past decade, Virginia's land application laws and regulations have often been the subject of new state laws and regulations specifying additional requirements.

Chapter 10: Financing

Most wastewater authorities and municipal wastewater departments are Enterprise Funds, meaning all costs associated with operation and maintenance of the wastewater system are funded by fees collected from the wastewater customers. A few smaller wastewater departments might also receive supplemental funds from the municipal general fund. Wastewater system costs include staff salaries, electricity and other utilities, chemicals, debt service (loan repayments), fuel and lubricant, routine replacement parts and supplies, sewer system repair and rehabilitation, and routine subcontract services (which could include lab testing, janitorial services, lawn maintenance, sludge disposal, etc.).

The primary wastewater system revenue source is the monthly or bi-monthly user fee, typically billed as a percent of the metered water consumed by each customer (the water bill). This revenue is intended to pay the cost of regular wastewater system operation and maintenance. Wastewater authorities and municipal departments also charge a one-time connection or availability fee to new customers. This revenue is intended to pay the cost of wastewater system construction and major repair and replacement. This revenue is held in a separate account until the money is needed for wastewater system improvements.

Costs for wastewater system operation and maintenance are projected and budgeted annually by the wastewater system manager. Once the wastewater system budget is adopted by the authority board or municipal council or supervisors, the budget controls the cost of wastewater system operation and maintenance throughout the year. As a result, unexpected wastewater system maintenance requirements that occur during the year might have to be deferred because the cost was not included in the annual budget. For this reason, it is extremely important that a good preventive maintenance and replacement program be developed for the wastewater system and the program costs included in the annual wastewater system budget.

Before major wastewater system maintenance and expansion costs can be budgeted, a source of revenue to pay for the costs must be identified. Funds might come from the Enterprise Fund account, from the municipal general fund, or from the sale of bonds. There are two types of bonds that can be used to fund major wastewater system maintenance and expansion costs: General Obligation Bonds are paid back from the general revenues of the municipality, and Revenue Bonds are paid back from wastewater system fees. The decision on a revenue source is the responsibility of the wastewater authority board or municipal council or supervisors.

A loan from the Virginia Revolving Fund is frequently used to fund wastewater system construction expansion costs. A grant from the Water Quality Improvement Fund is generally used to fund a portion of POTW improvements to achieve nitrogen and phosphorus reduction when the treatment facility is located in Virginia's portion of the Chesapeake Bay watershed. These grants pay from 35 to 90 percent of the eligible costs of nutrient removal technology as determined by DEQ. However, if the plant fails to achieve the agreed to nitrogen or phosphorus removal performance, a portion of the grant must be re-paid. Consequently, the wastewater treatment plant operator has an important role in maintaining the financial stability of

the wastewater system authority or department. The Virginia Revolving Fund and Water Quality Improvement Fund are administered by the Virginia Department of Environmental Quality.

Chapter 11: Licensure

The Virginia Sewage Collection and Treatment (SCAT) Regulations, promulgated by the Virginia Department of Environmental Quality (VDEQ), define the design and operating, staffing, sampling, testing, reporting, and operator licensure requirements for all wastewater treatment plants in Virginia.

Operator Credentials

Table 1 in Section 9 VAC 25-790 of the SCAT Regulations is entitled "Classification of Treatment Works and Recommended Minimum Hours of Attendance by Licensed Operators and Operating Staff." This table assigns a "Treatment Works Classification," and the corresponding licensure requirement for the operator in responsible charge at the wastewater treatment plant, according to the capacity and treatment process method utilized at the plant. The Treatment Works Classification is important because an operator can only gain experience toward application for a higher license classification at a wastewater treatment plant having the corresponding Treatment Works Classification. Below (Table 11-1) is a summary of the Treatment Works Classifications.

Table 11-1
Summary of Treatment Works Classifications

Treatment Works Classification	Plant Capacity	Treatment Process Methods
IV	Greater than 1,000 GPD and up to 40,000 GPD	Secondary Biological Treatment only
IV	Greater than 1,000 GPD and up to 1 MGD	Natural Treatment (No Mechanical Aeration)
III	Greater than 40,000 GPD and up to 0.5 MGD	Secondary Biological Treatment only
III	Greater than 1,000 GPD and up to 0.1 MGD	Advanced Waste Treatment, beyond Secondary Biological Treatment
III	Greater than 1 MGD	Natural Treatment (No Mechanical Aeration)
II	Greater than 0.1 MGD and up to 2.5 MGD	Advanced Waste Treatment, beyond Secondary Biological Treatment
II	Greater than 0.5 MGD and up to 5 MGD	Secondary Biological Treatment only
I	Greater than 2.5 MGD and up to 5 MGD	Advanced Waste Treatment, beyond Secondary Biological Treatment
I	Greater than 5 MGD	No Distinction

Licensure Requirements

Wastewater Works Operator licensure in Virginia is regulated by the Virginia Department of Professional and Occupational Regulation (DPOR) under the Code of Virginia 18VAC160-20. Virginia DPOR has a website at www.dpor.virginia.gov. Virginia DPOR can also be contacted at the following:

Department of Professional and
Occupational Regulation
Perimeter Center, Suite 400
9960 Mayland Drive
Richmond, VA 23233
Telephone (804) 367-8500

Licensure is required for operators of all wastewater works serving more than 400 persons. Operator licensure requirements are defined by the Regulations of the Board for Wastewater and Wastewater Works Operators and Onsite Sewage System Professionals, last updated January 1, 2010. Licensure in Virginia, classified as Class 6 to Class 1 Wastewater Works Operator, requires completion of specific education and training, submission of an application for examination, payment of an application fee, and successful examination by the DPOR Board of Waterworks and Wastewater Works Operators. Experience must be directly related to wastewater works operations, must be gained under the supervision of an operator holding a valid license of the same or higher class, and must be certified by the applicant's supervisor. Experience solely limited to the operation and maintenance of wastewater collection systems, laboratory work, plant maintenance, and other non-operating duties are not counted as operator experience.

A Wastewater Works Operator licensed in another state is entitled to apply for examination in Virginia for the equivalent classification. In 2010, the licensure application fee was $100 and the re-application fee was $80. Licensure is for a period of 2 years, expiring on the last day of February of each odd-numbered year.

Education and training/experience requirements are tabulated below (Table 11-2). Longer periods of experience may be applied to reduce educational requirements. Operators without a high school diploma or GED, have longer experience requirements than shown in table 11-2. Completion of Training Credits can be applied to reduce the experience requirements by up to 50 percent. Refer to the Code of Virginia 18 VAC160-20-90 for a full description.

Table 11-2
Education and Training/Experience Requirements

Class	Education	Training/Experience
6	HS Diploma or GED	6 months as operator-in-training at Class 6 or higher wastewater works
5	HS Diploma or GED	6 months experience at Class 5 or higher wastewater works
4	HS Diploma or GED	6 months experience at Class 4 or higher wastewater works
3	Bachelor's Degree	1 year experience at Class 4 or higher wastewater works
2	Bachelor's Degree	1½ years experience at Class 3 or higher wastewater works
1	Bachelor's Degree	Class 2 License and 2-1/2 years experience at Class 2 or higher wastewater works

Training Credits – Virginia-Approved Specialized Training Programs/Courses

The DPOR Board of Waterworks and Wastewater Works Operators has approved specific educational programs that may be applied toward licensure training/ experience requirements. The programs are listed on the DPOR website and include programs offered by the Hampton Roads Sanitation Commission, Virginia Rural Water Association, Virginia Polytechnic Institute and State University, Virginia Department of Environmental Quality, John Tyler Community College, Spotsylvania Vocational Center, Virginia Department of Health, Virginia Highlands Community College, Water Environmental Federation, Virginia Pollution Biology, Alexandria Sanitation Authority, and Control Equipment Company. The approved programs also include numerous distance learning programs. Additionally, numerous courses are offered by Virginia colleges and universities, including Career Studies programs offered at several community college campuses, which are not on the list. Successful completion of these programs results in the award of Training Credits (TC) that can be applied toward licensure training/experience requirements.

Virginia Department of Environmental Quality Operator Training and Assistance Program

The VDEQ Operator Training and Assistance Program offers specialized training workshops related to process control and sampling and testing. Workshops, which are typically presented at the VDEQ regional offices or at host treatment plants or municipal offices, qualify as training credits toward licensure training/experience requirements. Course offerings are listed on the VDEQ website at www.deq.state.va.us under "Programs-Wastewater Treatment."

The VDEQ Operator Training and Assistance Program also offers license examination review programs to provide an opportunity for the participant to learn about technologies and skills that may not have been part of their current job responsibilities. The license examination review programs are offered at selected community colleges around the state.

The VDEQ Operator Training and Assistance Program also offers an Annual Wastewater Operator Short School at the Virginia Tech campus in Blacksburg. The short school is normally conducted in August, and four levels of training are offered.

Examination Requirements. A license applicant who is unsuccessful in passing the examination is allowed to retake the examination an unlimited number of times within one year after the application for examination was approved. After the one-year period, the applicant must re-apply for examination. Applicants can complete examinations online. DPOR has contacted with PSI, a testing and assessment organization, to prepare and conduct the examination process.

Continuing Professional Education Requirements. Continuing professional education is essential for all wastewater treatment operators to maintain and increase the competence required to assure the public's protection. Effective January 1, 2010 Continuing Professional Education (CPE) contact hours must be completed by all licensed operators. Class 1, 2, and 3 operators must complete 20 contact hours

during each license renewal cycle. Class 4 operators must complete 10 contact hours, Class 5 operators must complete 8 contact hours and Class 6 operators must complete 4 contact hours. Operators must maintain evidence of completion of the CPE provisions as defined in the Regulations.

Continuing professional education can be obtained by attending the Virginia Water Environment Association Annual Conference technical sessions, Industrial Wastewater Treatment Conference, Laboratory Practices Conference, or Regional Activities presentations. Additionally, continuing professional education can be acquire by attending training courses offered by your employer or by host engineers or manufacturers' representatives. There are also many online and distance-learning programs.

Chapter 12: Resources

Other resources available to wastewater treatment plant operators include the following organizations:

Associations / non-profit organizations

National Association of Clean Water Agencies (NACWA) – www.nacwa.org

Virginia Association of Counties (VACo) – www.vaco.org

Virginia Association of Municipal Wastewater Agencies (VAMWA) – www.vamwa.org

Virginia Nutrient Credit Exchange Association – www.theexchangeassociation.org

Virginia Biosolids Council – www.virginiabiosolids.com

Virginia Municipal League (VML) – www.vml.org

Virginia Water Environment Association (VWEA) – www.vwea.org

Water Environment Federation (WEF) – www.wef.org

Water Environment Research Foundation (WERF) – www.werf.org

Governmental Agencies

Virginia Department of Conservation and Recreation – www.dcr.state.va.us

Virginia Department of Environmental Quality (DEQ) – www.deq.state.va.us

United States Environmental Protection Agency (EPA) – www.epa.gov

Chapter 13: Abbreviations

BAT ..... Best Available Technology Economically Achievable
BMP ..... Best Management Practice
BPT ..... Best Practicable Control Technology Currently Available
CMOM ..... Capacity Management, Operation and Maintenance
CAA ..... Clean Air Act
CWA ..... Clean Water Act
CCTV ..... Closed Circuit Television
CFR ..... Code of Federal Regulations
CSO ..... Combined Sewer Overflows
DCR ..... Department of Conservation and Recreation
DEQ ..... Department of Environmental Quality
VDH ..... Department of Health
DPOR ..... Department of Professional and Occupational Regulation
DMR ..... Discharge Monitoring Report
e-DMR ..... Electronic Discharge Monitoring Report
EPA ..... Environmental Protection Agency
FOG ..... Fats, Oils and Greases
HSWA ..... Federal Hazardous and Solid Waste Amendments
FWPCA ..... Federal Water Pollution Control Act
GIS ..... Geographic Information System
GASB ..... Government Accounting Standards Board
I&I ..... Infiltration and Inflow
MS4 ..... Municipal Separate Storm Sewer System
NAAQS ..... National Ambient Air Quality Standards
NPDES ..... National Pollutant Discharge Elimination System
NSPS ..... New Source Performance Standards
NOV ..... Notice of Violation
O&M ..... Operation and Maintenance
PIN ..... Personal Identification Number

POTW .....Publicly Owned Treatment Works
RCRA..... Resource Conservation Recovery Act
SDWA..... Safe Drinking Water Act
SSO .....Sanitary Sewer Overflow
SUO.....Sewer Use Ordinance
SMP..... Sludge Management Plan
SWCB .....State Water Control Board
SWMP..... Stormwater Management Program
SAV..... Submerged Aquatic Vegetation
SCADA .....Supervisory Control and Data Acquisition
TMDL ..... Total Maximum Daily Load
TCLP..... Toxicity Characteristic Leachate Procedure
TC .....Training Credit
VAC .....Virginia Administrative Code
VPDES.....Virginia Pollutant Discharge Elimination System
VSMP .....Virginia Stormwater Management Program
WET..... Whole Effluent Toxicity
WLA ..... Waste Load Allocation
WQIF .....Water Quality Improvement Fund
WQMP .....Water Quality Management Planning
WQS.....Water Quality Standards