Chapter 7

Monitoring and Reporting Conditions

Having developed the effluent limits for a municipal or industrial discharger, the permit writer's next step is to establish monitoring and reporting requirements. Requiring the permittee to routinely self-monitor its discharge and to report the analytical results of such monitoring provides the permitting authority with the information necessary to evaluate discharge characteristics and compliance status. Periodic monitoring and reporting also serve to remind the permittee of its compliance responsibilities and provides feedback regarding the performance of the treatment facility(s) operated by the permittee. Permit writers should be aware of and concerned with the potential problems that may occur in a self-monitoring program such as improper sample collection procedures, poor analytical techniques, and poor or improper report preparation and documentation. To prevent or minimize these problems, the permit writer should clearly detail monitoring and reporting requirements in the permit.

The monitoring and reporting conditions section of a NPDES individual permit should contain specific requirements for the following items:

- Sampling location
- Sample collection method
- Monitoring frequencies
- Analytical methods
- Reporting and recordkeeping requirements.

Several factors should be considered in determining the specific requirements to be imposed. Basic factors that may affect sampling location, sampling method, and sampling frequency are:

- Applicability of "effluent limitations guidelines" (ELG)
- Effluent and process variability
- Effect of flow and/or pollutant load on the receiving water
- Characteristics of pollutants discharged
- Permittee compliance history.

These factors must be carefully considered by the permit writer, as any error could lead to inaccurate compliance determination, misapplication of national ELGs, and/or misapplication of State water quality standards.

The following sections provide an overview of the considerations involved in determining appropriate monitoring, reporting, and recordkeeping requirements, and describe how to properly incorporate the requirements in a NPDES permit.

7.1 Establishing Monitoring Conditions

The NPDES Program is structured such that facilities that discharge pollutants in waters of the United States are required to periodically evaluate compliance with the effluent limitations established in their permit and provide the results to the permitting authority. In addition, NPDES permits can require the permittee to monitor for additional parameters or processes not directly linked to the effluent discharge such as storm water, combined sewer overflows, municipal sludge, and/or treatment plant influent. This section describes the regulatory requirements and authorities for

monitoring conditions, and describes how these conditions can be incorporated in NPDES permits.

The regulations requiring the establishment of monitoring and reporting conditions in NPDES permits are found in 40 CFR §122.44(i) and 40 CFR §122.48. Section 122.44(i) requires permittees to monitor pollutant mass (or other applicable unit of measure), effluent volume, provide other measurements (as appropriate), and to utilize the test methods established at 40 CFR §136. Section 122.41(i) also establishes that NPDES permittees (with certain specific exceptions) must monitor for all limited pollutants and report data at least once per year.

EPA regulations at 40 CFR §122.48 state that all permits must specify requirements concerning the proper use, maintenance, and installation of monitoring equipment or methods (including biological monitoring methods when appropriate). All permits must also specify the required monitoring including the type, intervals, and frequency sufficient to yield data that are representative of the activity. The following sections focus on ensuring that permit monitoring conditions properly address these regulatory requirements.

7.1.1 Monitoring Location

The NPDES regulations do not specify the exact location to be used for monitoring. The permit writer is responsible for determining the most appropriate monitoring location and explicitly specifying this in the permit. Ultimately, the permittee is responsible for providing a safe and accessible sampling point that is representative of the discharge (40 CFR §122.41(j)(1)).

Specifying the appropriate monitoring location in a NPDES permit is critical to producing valid compliance data. Important factors to consider in selecting a monitoring location include:

- The wastewater flow should be measurable
- The location should be easily and safely accessible
- The sample must be representative of the effluent during the time period that is monitored.

Technical Note

When establishing monitoring locations for determining NPDES permit compliance, permit writers must select locations that are representative of the expected wastewater discharge. Locations should be established where the wastewater is well mixed, such as near a parshall flume or at a location in a sewer with hydraulic turbulence. Weirs tend to enhance the settling of solids immediately upstream and the accumulation of floating oil or grease immediately downstream. Such locations should be avoided for sampling.

The most logical monitoring point for an effluent is just prior to discharge to the receiving water. This is particularly true for ensuring compliance with water quality-based effluent limits (WQBELs). However, there are instances when the permit writer may need to specify alternate monitoring locations in a permit.

One typical instance that necessitates establishing an alternative monitoring location occurs when a facility combines a variety of process and non-process wastewaters prior to discharge through a common outfall structure. Under certain circumstances, when a variety of wastewaters are combined, requiring monitoring only at the final combined outfall may not be appropriate. To address this situation, 40 CFR §122.45(h) allows permit writers to establish monitoring locations at internal outfalls. Examples of situations that may require designation of internal monitoring locations include:

- **To ensure compliance with effluent limitations guidelines and standards (at non-municipal facilities)**—When non-process wastewaters dilute process wastewaters regulated under effluent guidelines, monitoring the combined discharge may not accurately depict whether the facility is complying with the effluent guidelines. Under these circumstances, the permit writer may consider requiring monitoring for compliance with technology-based effluent limits (based on application of effluent guidelines) before the process wastewater is combined with the other wastewaters.
- **To ensure compliance with secondary treatment standards (for POTWs only)**—Certain POTWs include treatment processes that are ancillary to the secondary treatment process that may impact their ability to monitor for compliance with secondary treatment standards. Under these circumstances, the permit writer may consider requiring monitoring for compliance with secondary treatment standards just after the secondary treatment process (e.g., require monitoring of effluent just after secondary clarification) before any additional treatment processes.
- **To allow detection of a pollutant**—Instances may arise where the combination of process and non-process wastewaters result in dilution of a pollutant of concern that will not be detectable using approved analytical

methods. Establishing monitoring for the pollutant at an internal location will enable characterization of the pollutant prior to dilution with other wastewaters.

When establishing internal monitoring points, permit writers need to consider the location of wastewater treatment units within the facility. This is particularly true when establishing internal monitoring locations for determining compliance with technology-based effluent limits. A facility will most likely not be able to comply with technology-based effluent limits if the permit writer establishes the monitoring location prior to the wastewater treatment unit.

Permit writers may also need to require monitoring of influent to the wastewater treatment units for certain facilities. Influent monitoring must be required for POTWs to ensure compliance with the 85 percent removal condition of the secondary treatment standards. Influent monitoring at non-POTWs may also be desired to determine influent characteristics, and if additional information related to the performance of the wastewater treatment unit is needed.

Exhibit 7-1 provides examples of how to specify sampling locations in a permit either by narrative or diagram.

7.1.2 Monitoring Frequency

The frequency for monitoring pollutants should be determined on a case-by-case basis, and decisions for setting the frequency should be set forth in the fact sheet. Some States have their own recommended sampling guidelines that can help a permit writer determine an appropriate sampling frequency. The intent is to establish a frequency of monitoring that will detect most events of noncompliance without requiring needless or burdensome monitoring.

To establish a monitoring frequency, the permit writer should estimate the variability of the concentration of the parameter by reviewing effluent data for the facility (e.g., from DMRs) or in the absence of actual data, information from similar dischargers. A highly variable discharge should require more frequent monitoring than a discharge that is relatively consistent over time (particularly in terms of flow and

EXHIBIT 7-1
Examples of Specifying Sampling Locations in Permits

NARRATIVE:

Part I. SELF-MONITORING REQUIREMENTS

A. Sample Locations

1. Discharge from the Chemistry-Fine Arts Building shall be sampled at outfall 001
2. Discharge from the Duane Physics Building shall be sampled at outfall 002
3. Discharge from the Research Lab No. 1 shall be sampled at outfall 003

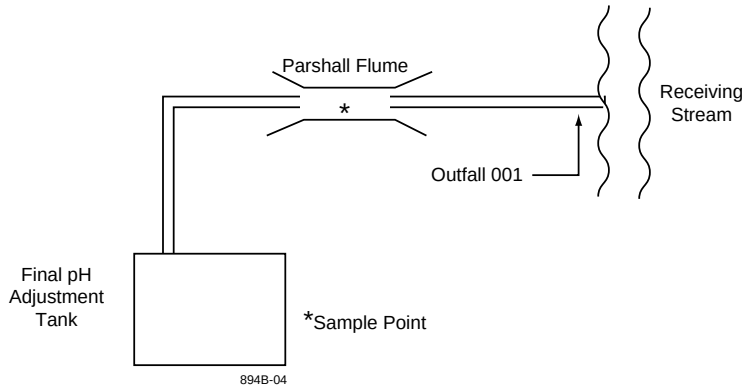
DIAGRAM:

Part I. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

A. Sample Locations

Outfall Description

001 Discharge Pipe—Discharge of wastewater generated by all regulated metal finishing processes at the facility. Samples shall be collected at the point indicated on the attached diagram.



pollutant concentration). In addition to the estimated variability, other factors that should be considered when establishing appropriate monitoring frequencies include:

- **Design capacity of treatment facility—**As an example, at equivalent average flow rates, a large lagoon system that is not susceptible to bypasses requires less frequent monitoring than an overloaded treatment facility that experiences fluctuating flow rates due to infiltration or large batch discharges from an industrial user system. The lagoon should have a relatively low variability compared to the facility receiving batch discharges.

- **Type of treatment method used—**The type of wastewater treatment used by the facility will determine the need for process control monitoring and effluent monitoring. An industrial facility with biological treatment would have similar monitoring frequencies to a secondary treatment plant with the same units used for wastewater treatment. If the treatment method is appropriate and achieving high pollutant removals on a consistent basis, the need for monitoring may be less than a plant with little treatment or insufficient treatment.
- **Post compliance record/history—**The monitoring frequency may be adjusted to reflect the compliance history of the facility. A facility with problems achieving compliance generally should be required to perform additional monitoring to characterize the source or cause of the problems or to detect noncompliance.
- **Cost of monitoring relative to discharger's capabilities—**The permit writer should not require excessive monitoring unless it is necessary to provide sufficient information about the discharge (analytical costs are addressed in Section 7.1.5).
- **Frequency of the discharge—**If wastewater is discharged in batches on an infrequent basis, the monitoring frequency should be different from a continuously discharged, highly concentrated wastewater, or a wastewater containing a pollutant that is found infrequently and at very low concentrations. The production schedule of the facility (e.g., seasonal, daily), the plant washdown schedule, and other similar factors should be considered.
- **Number of monthly samples used in developing permit limit—**The monitoring frequency should reflect the number of monthly samples used in developing the permit limits, and/or the monitoring frequencies used to develop any applicable effluent guidelines.
- **Tiered Limits—**Where the permit writer has included "tiered" limits in an NPDES permit, consideration should be given to varying the monitoring frequency requirements to correspond to the applicable tiers. For example, if a facility has seasonal discharge limits, it may be appropriate to increase the monitoring frequency during the higher production season, and reduce the frequency during the off-season.

An alternative method that can be used by permit writers to establish monitoring frequencies is the quantitative approach described in the *Technical Support Document for Water Quality-Based Toxics Control* (TSD)[30]. In short, the TSD[31] approach

[30]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

[31]ibid.

requires calculating the long-term average pollutant concentration (accounting for the expected variability of the discharge) and comparing it to the permit limit to determine the likelihood of noncompliance. The closer the long-term average is to the permit limit, the more frequent the monitoring that should be required. Obviously, this quantitative approach requires a reasonable data set from which to calculate the long-term average. Permit writers should refer to the TSD[32] for more information regarding this approach.

A permit writer may also establish a tiered monitoring schedule that reduces or increases monitoring frequency during a permit cycle. Tiered monitoring, which reduces monitoring over time, may be useful for discharges where the initial sampling shows compliance with effluent limits. If problems are found during the initial sampling, more frequent sampling and more comprehensive monitoring can be applied. This step-wise approach could lead to lower monitoring costs for permittees while still providing an adequate degree of protection of water quality.

Regulatory Update

In response to President Clinton's Regulatory Reinvention initiative, which established the goal of reducing monitoring and reporting burden by 25%, EPA issued *Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies* on April 19, 1996 (EPA-833-B-96-001). Under this guidance, NPDES reporting and monitoring requirements are reduced based on a demonstration of excellent historical performance. Facilities can demonstrate this historical performance by meeting a set of compliance and enforcement criteria and by demonstrating their ability to consistently discharge pollutants below the levels necessary to meet their existing NPDES permit limits. Reductions are determined parameter-by-parameter, based on the existing monitoring frequency and the percentage below the limit that parameter is being discharged at. The reductions are incorporated into the permit at the time of permit reissuance. To remain eligible for these reductions, permittees are expected to maintain parameter performance levels and good compliance and enforcement history that were used as the basis for granting the reductions.

7.1.3 Sample Collection Methods

In addition to establishing the frequency of monitoring, the permit writer must specify the type of sample that must be collected. The two basic sample collection methods include "grab" and "composite."

The analytical methods specified in 40 CFR Part 136 are required for all monitoring performed under the NPDES Program, unless the permit specifically

[32]USEPA (1991). *Technical Support Document for Water Quality-Based Toxics Control*. EPA-505/2-90-001. Office of Water Enforcement and Permits.

requires alternate methods. For many analytical procedures, the sample collection method (grab or composite) is not specified in 40 CFR Part 136, thus it should be specified in the discharge permit. 40 CFR Part 136 specifies that grab samples must be collected for pH, temperature, dissolved oxygen, chlorine, purgeable organics, sulfides, oil and grease, coliform bacteria and cyanide. The reason grab samples must be taken for these parameters is that they evaluate characteristics that may change during the time necessary for compositing.

A "grab" sample is a single sample collected at a particular time and place that represents the composition of the wastestream only at that time and place. When the quality and flow of the wastestream being sampled is not likely to change over time, a grab sample is appropriate. Grab samples should be used when:

- The wastewater characteristics are relatively constant.
- The parameters to be analyzed are likely to change with storage such as temperature, residual chlorine, soluble sulfide, cyanides, phenols, microbiological parameters and pH.
- The parameters to be analyzed are likely to be affected by the compositing process such as oil and grease and volatiles.
- Information on variability over a short time period is desired.
- Composite sampling is impractical or the compositing process is liable to introduce artifacts of sampling.
- The spatial parameter variability is to be determined. For example, variability through the cross section and/or depth of a stream or a large body of water.
- Effluent flows are intermittent from well-mixed batch process tanks. Each batch dumping event should be sampled.

Grab samples can measure maximum effect only when the sample is collected during flows containing the maximum concentration of pollutants toxic to the test organism.

Another type of grab sample is sequential sampling. A special type of automatic sampling device collects relatively small amounts of a sampled wastestream, with the interval between sampling either time or flow proportioned. Unlike the automatic composite sampler, the sequential sampling device automatically retrieves a sample and holds it in a bottle separate from other automatically retrieved samples. Many individual samples can be stored separately in the unit, unlike the

composite sampler which combines aliquots in a common bottle. This type of sampling is effective for determining variations in effluent characteristics over short periods of time.

A "composite" sample is a collection of individual samples obtained at regular intervals, usually based upon time or flow volume. A composite sample is desirable when the material being sampled varies significantly over time either as a result of flow or quality changes. There are two general types of composites and the permit writer should clearly express which type is required in the permit:

- Time composite samples collect a fixed volume at equal time intervals and are acceptable when flow variability is not excessive. Automatically timed composited samples are usually preferred over manually collected composites. Composite samples collected by hand are appropriate for infrequent analyses and screening.

  Composite samples can be collected manually if subsamples have a fixed volume at equal time intervals when flow variability is not excessive.
- Flow-proportional compositing is usually preferred when effluent flow volume varies appreciably over time. The equipment and instrumentation for flow-proportional compositing have more downtime due to maintenance problems.

  When manually compositing effluent samples according to flow where no flow measuring device exists, use the influent flow measurement without any correction for time lag. The error in the influent and effluent flow measurement is insignificant except in those cases where extremely large volumes of water are impounded, as in reservoirs.

There are numerous cases where composites are inappropriate. Samples for some parameters should not be composited (pH, residual chlorine, temperature, cyanides, volatile organics, microbiological tests, oil and grease, total phenols). They are also not recommended for sampling batch or intermittent processes. Grab samples are needed in these cases to determine fluctuations in effluent quality.

For whole effluent toxicity (WET), composite samples are used unless it is known that the effluent is most toxic at a particular time. Some toxic chemicals are short-lived, degrade rapidly, and will not be present in the most toxic form after lengthy compositing even with refrigeration or other forms of preservation. Grab samples should be required for bioassays to be taken under those circumstances.

If a sampling protocol is not specified in the regulations, the duration of the compositing time period and frequency of aliquot collection is established by the permit writer. Whether collected by hand or by an automatic device, the time frame within which the sample is collected should be specified in the permit. The number of individual aliquots which compose the composite should also be specified. NPDES application requirements specify a minimum of four aliquots for non-stormwater discharges lasting four or more hours.

Eight types of composite samples and the advantages and disadvantages of each are shown in **Exhibit 7-2**. As shown in Exhibit 7-2, samples may be composited by time or flow and a representative sample will be assured. However, where both flow and pollutant concentration fluctuate dramatically, a flow-proportioned composite sample should be taken because a greater quantity of pollutant will be discharged during these periods. As an alternative, time-proportioned samples may be taken with flow records used for weighing the significance of various samples.

Continuous monitoring is another option for a limited number of parameters such as flow, total organic carbon (TOC), temperature, pH, conductivity, fluoride and dissolved oxygen. Reliability, accuracy and cost of continuous monitoring vary with the parameter. Continuous monitoring can be expensive, so continuous monitoring will usually only be an appropriate requirement for the most significant dischargers with variable effluent. The environmental significance of the variation of any of these parameters in the effluent should be compared to the cost of continuous monitoring.

Technical Note

When establishing continuous monitoring requirements, the permit writer should be aware that the NPDES regulations concerning pH limits allow for a period of excursion when the effluent is being continuously monitored (40 CFR §401.17).

7.1.4 Analytical Methods

The permit writer must specify the analytical methods to be used for monitoring. These are usually indicated as 40 CFR Part 136 in the standard conditions of the permit [40 CFR §§122.41(j)(4) and 122.44(i)]. In particular, analytical methods for industrial and municipal wastewater pollutants must be conducted in accordance with

EXHIBIT 7-2
Compositing Methods

Method	Advantages	Disadvantages	Comments
Time Composite			
• Constant sample volume, constant time interval between samples	Minimal instrumentation and manual effort; requires no flow measurement	May lack representativeness, especially for highly variable flows	Widely used in both automatic samplers and manual handling
Flow-Proportional Composite			
• Constant sample volume, time interval between samples proportional to stream flow	Minimal manual effort	Requires accurate flow measurement reading equipment; manual compositing from flowchart	Widely used in automatic as well as manual sampling
• Constant time interval between samples, sample volume proportional to total stream flow at time of sampling	Minimal instrumentation	Manual compositing from flowchart in absence of prior information on the ratio of minimum to maximum flow; chance of collecting too small or too large individual discrete samples for a given composite volume	Used in automatic samplers and widely used as manual method
• Constant time interval between samples, sample volume proportional to total stream flow since last sample	Minimal instrumentation	Manual compositing from flow chart in absence of prior information on the ratio of minimum to maximum flow; chance of collecting either too small or too large individual discrete samples for a given composite volume	Not widely used in automatic samplers but may be done manually
Sequential Composite			
• Series of short period composites, constant time intervals between samples	Useful if fluctuations occur and time history is desired	Requires manual compositing of aliquots based on flow	Commonly used; however, manual compositing is labor intensive
• Series of short period composites, aliquots taken at constant discharge increments	Useful if fluctuations occur and time history is desired	Requires flow totalizer; requires manual compositing of aliquots based on flow	Manual compositing is labor intensive
Continuous Composite			
• Constant sample volume	Minimal manual effort, requires no flow measurement	Requires large sample capacity; may lack representativeness for highly variable flows	Practical but not widely used
• Sample volume proportional to stream flow	Minimal manual effort, most representative especially for highly variable flows	Requires accurate flow measurement equipment, large sample volume, variable pumping capacity, and power	Not widely used

the methods specified pursuant to 40 CFR Part 136, which references one or more of the following:

- Test methods in Appendix A of 40 CFR Part 136[33]
- *Standard Methods for the Examination of Water and Wastewater, 18th Edition*[34]
- *Methods for the Chemical Analysis of Water and Wastewater*[35]
- *Test Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*.[36]

The analytical methods contained in 40 CFR Part 136 are test methods designed only for priority and conventional pollutants, and some nonconventional pollutants. In the absence of analytical methods for other parameters, the permit writer must still specify the analytical methods to be used. An excellent source of analytical method information is the Environmental Monitoring Methods Index (EMMI). The EMMI is an official EPA database linking 50 EPA regulatory lists, 2,600 substances and 926 analytical methods on EMMI. EMMI data correlate EPA's regulated substances with their associated analytical methods, published detection limits, and regulatory limits. For more information, call NTIS at (703) 321-8547 for system requirements.

7.1.5 Other Considerations in Establishing Monitoring Requirements

The regulations do not specifically require a permit writer to evaluate costs when establishing monitoring conditions in a permit. However, as a practical matter, the permit writer should consider the cost of sampling that he/she imposes on the permittee. The sample frequency and analyses impact the analytical cost. The estimated 1994-1995 costs for analytical procedures are shown in **Exhibit 7-3**.

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[33]*Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act (40 CFR Part 136)*. (Use most current version)

[34]American Public Health Association, American Water Works Association, and Water Pollution Control Federation (1992). *Standard Methods for the Examination of Water and Wastewater*, 18th Ed.

[35]USEPA (1979). *Methods for the Chemical Analysis of Water and Wastewater*. EPA-600/4-79-020. Environmental Monitoring and Support Laboratory.

[36]USEPA (1982). *Test Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. EPA-600/4-82-057.

EXHIBIT 7-3
Estimated Costs for Common Analytical Procedures[1]

BOD_5	$30
TSS	$15
TOC	$60
Oil and Grease	$35
Odor	$30
Color	$30
Turbidity	$30
Fecal coliform	$15
Metals (each)	$15
Cyanide	$35
Gasoline (Benzene, Toluene, Xylene)	$100
Purgeable Halocarbons (EPA Method 601)	$113
Acrolein and Acrylonitrile (EPA Method 603)	$133
Purgeables (EPA Method 624)	$251
Phenols (EPA Method 604)	$160
Organochlorine Pesticides and PCBs (EPA Method 608)	$157
Polynuclear Aromatic Hydrocarbons (EPA Method 610)	$175
Dioxin (2, 3, 7, 8-TCDD (EPA Method 613))	$400
Base/Neutrals and Acids (EPA Method 625)	$434
Priority pollution scan[2]	$2,000
Acute WET	$750
Chronic WET	$1,500

[1] Based on 1994–1995 costs.

[2] Includes 13 metals, cyanide, dioxin, volatiles (purgeables), base/neutral and acids, pesticides and PCBs, and asbestos.

If simple or inexpensive indicator parameters (e.g., BOD_5 acts as an indicator for the priority pollutants in the Wood and Gum Chemicals category) or alternate parameters will produce data representative of the pollutant present in the discharge, then the indicators or surrogate pollutants or parameters should be considered. Complex and expensive sampling requirements may not be appropriate if the permit writer cannot justify the need for such analyses.

7.1.6 Establishing Monitoring Conditions for Unique Discharges

There are a variety of discharges that are regulated under the NPDES permit program that are different than traditional wastewater discharges. A permit writer needs to account for these unique discharges in establishing monitoring requirements. This section discusses several of these unique discharges including storm water, combined sewer and sanitary sewer overflows, WET, and municipal sludge.

Storm Water Monitoring Considerations

Monitoring requirements vary according to the type of permit regulating the storm water discharge and the activity. Storm water discharges may be regulated by State programs, provided the State is authorized to administer the NPDES Storm Water Program, or EPA Regions. At the Federal level, several permitting options are available; depending on the type of activity, industrial facilities may seek coverage under an individual permit, the Baseline Industrial General Permit, or the Multi-sector General Permit. In addition, construction activities that disturb 5 or more acres of land are regulated under the Baseline Construction General Permit. Municipalities serving over 100,000 people are also regulated, but on an individual permit basis. Each of these permitting mechanisms establishes different monitoring programs. Several States have used the Federal permits as models for their permit conditions.

Specific monitoring conditions for the Federal general permits are detailed in the following documents:

- "*Final NPDES General Permits for Storm Water Discharges Associated With Industrial Activity*," *Federal Register*, September 9, 1992. (Baseline Industrial General Permit).

- "*Final NPDES General Permits for Storm Water Discharges from Construction Sites*," *Federal Register*, September 9, 1992. (Baseline Construction General Permit).
- "*Final NPDES Storm Water Multi-Sector General Permit for Industrial Activities*," *Federal Register*, September 9, 1992. (Multi-Sector General Permit).

Monitoring Combined Sewer Overflows and Sanitary Sewer Overflows

EPA's CSO Control Policy (59 *FR* 18688) requires monitoring to characterize the combined sewer system, assist in developing the Long-Term Control Plan (LTCP), and illustrate compliance with permit requirements. Monitoring as part of the nine minimum controls (NMC) is done to develop an initial system characterization and includes analyzing existing data on precipitation events, on the combined sewer system and CSOs, on water quality, and conducting field inspections. As part of the LTCP, a permittee is required to develop a more complete characterization of the sewer system through monitoring and modeling. Finally, to illustrate compliance with the permit requirements, the permittee is required to conduct a post-construction compliance monitoring program. Specific monitoring requirements of this post-construction compliance monitoring program will be unique to each permittee's LTCP and should be established as specific monitoring conditions in the individual NPDES permit. These monitoring conditions should require monitoring of a representative number of CSOs for a representative number of wet weather events for certain key parameters along with ambient water quality monitoring to ascertain attainment with water quality standards. EPA is currently preparing eight guidance manuals on various aspects of the CSO Control Policy, including one on monitoring, *Combined Sewer Overflows: Guidance for Monitoring and Modeling (draft)*.[37]

A facility's permit may also contain monitoring requirements for sanitary sewer overflows (SSOs). These would be developed on a case-by-case basis.

[37]USEPA (1995). *Combined Sewer Overflows–Guidance for Monitoring and Modeling*. (DRAFT). EPA-832/R-95-005.

Whole Effluent Toxicity Monitoring

The use of whole effluent toxicity (WET) testing to evaluate the toxicity in a receiving stream was discussed in Chapter 6. The biomonitoring test procedures were promulgated in 40 CFR Part 136 on October 16, 1995 (60 *FR* 53529). WET monitoring conditions included in permits should specify the particular biomonitoring test to be used, the test species, required test endpoint, and QA/QC procedures. EPA has published recommended toxicity test protocols in four manuals:

- *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*.[38]
- *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*.[39]
- *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*.[40]
- *NPDES Compliance Monitoring Inspector Training: Biomonitoring*.[41]

Samples for WET may be composite or grab samples. Twenty-four hour composite samples are suggested **except** when (1) the effluent is expected to be more toxic at a certain time of day; (2) toxicity may be diluted during compositing; and (3) the size of the sample needed exceeds the composite sampler volume (e.g., 5 gallons).

WET tests are relatively expensive (see Exhibit 7-3 on costs). Therefore the test frequency should be related to the probability of any discharger having whole

[38]USEPA (1991). *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*

[39]USEPA (1991). *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms*. EPA-600/4-91-003. Environmental Monitoring and Support Laboratory.

[40]USEPA (1991). *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Third Edition*. EPA-600/4-91-002. Environmental Monitoring and Support Laboratory.

[41]USEPA (1990). *NPDES Compliance Monitoring Inspector Training: Biomonitoring*. Office of Water.

effluent toxicity. Samples should be evenly spaced throughout the year so that seasonal variability can be ascertained.

Municipal Sludge Monitoring

The purpose of monitoring municipal sludge is to ensure safe use or disposal. The 40 CFR Part 503 sludge regulations require monitoring of sewage sludge that is applied to land, placed on a surface disposal site, or incinerated. The frequency of monitoring is based on the annual amount of sludge that is used or disposed by these methods. POTWs that provide the sewage sludge to another party for further treatment (such as composting) must provide that party with the information necessary to comply with 40 CFR Part 503. Sewage sludge disposed of in a municipal solid waste landfill unit must meet the requirements in 40 CFR Part 258, which is the criteria for municipal solid waste landfills.

Exhibit 7-4 shows the minimum monitoring requirements for sewage sludge prior to use and disposal established in 40 CFR Part 503. More frequent monitoring for any of the required or recommended parameters is appropriate when the POTW:

- Influent load of toxics or organic solids is highly variable
- Has a significant industrial load
- Has a history of process upsets due to toxics, or of adverse environmental impacts due to sludge use or disposal activities.

The sampling and analysis methods specified in 40 CFR §503.8 should be followed for monitoring the required parameters. In the absence of any specific methods in 40 CFR Part 503, guidance on appropriate methods is contained in *Part 503 Implementation Guidance*,[42] *Control of Pathogens and Vector Attraction in Sewage Sludge*,[43] and *POTW Sludge Sampling and Analysis Guidance Document*.[44]

[42]USEPA (1995). *Part 503 Implementation Guidance*. EPA 833-R-95-001. Office of Water.

[43]USEPA (1992). *Control of Pathogens and Vector Attraction in Sewage Sludge*. EPA-625/R-92-013. Office of Research and Development.

[44]USEPA (1989). *POTW Sludge Sampling and Analysis Guidance Document*. Office of Water, Permits Division.

EXHIBIT 7-4
Minimum Requirements for Sewage Sludge Monitoring, Based on Method of Sludge Use or Disposal

Method	Monitoring Requirements	Frequency	Citation
Land Application	(1) Sludge weight and % total solids Metals: As, Cd, Cu, Pb, Hg, Mo, Ni, Se, and Zn Pathogen Reduction Vector Attraction Reduction	(1) 0< and < 290*, annually 290< and < 1,500, quarterly 1,500< and < 15,000, bimonthly 15,000 = or <, monthly	40 CFR Part 503.16
Co-disposal in Municipal Solid Waste Landfill	(1) Sludge weight and % total solids (2) Passes Paint-Filter Liquid Test (3) Suitability of sludge used as cover (4) Characterize in accordance with hazardous waste rules	(1), (2), (3), and (4) Monitoring requirements or frequency not specified by 40 CFR Part 503. Determined by local health authority or landfill owner/operator	40 CFR Part 258.28
Surface Disposal: Lined Sites with leachate collection and Unlined Sites	(1) Sludge weight and % total solids Pathogen Reduction Vector Attraction Reduction Metals: As, Cr, Ni (Unlined Sites Only) (2) Methane gas	(1) Based on sludge quantity (as above) (2) Continuously	40 CFR Part 503.26
Incineration	(1) Sludge weight and % total solids Metals: As, Cd, Cr, Pb, and Ni (2) Be and Hg (Nat. Emissions Standards) (3) THC or CO, O_2, moisture, combustion temperatures (4) Air pollution control device operating parameters	(1) Based on sludge quantity (as above) (2) As required by subparts C and E of 40 CFR Part 61 as may be specified by permitting authority (local air authority) (3) Continuously (4) Daily	40 CFR Part 503.46

Notes: 1. Monitoring frequencies required under 40 CFR Part 503 may be reduced after 2 years of monitoring, but in no case shall be less than once per year.

2. A successful land application program may necessitate sampling for other constituents of concern (such as nitrogen) in determining appropriate agronomic rates. This will be determined by the permit writer.

*Dry weight of sludge in metric tons per year.

7.2 Reporting and Recordkeeping Requirements

The NPDES regulations at 40 CFR §§122.41(l)(4)(j) and (l) require the permittee to keep records and periodically report on monitoring activities. Discharge Monitoring Reports (DMRs) (see form in **Exhibit 7-5**) must be used by permittees to report self-monitoring data. Data reported include both data required by the permit and any additional data the permittee has collected consistent with permit requirements. All facilities are required to submit reports (on discharges and sludge use or disposal) at least annually per 40 CFR §122.44(i)(2). POTWs with pretreatment programs are required to submit a pretreatment report at least annually per Section 403.12(i). However, the NPDES regulation states that monitoring frequency and reporting should be dependent on the nature and effect of the discharge/sludge use or disposal. Thus, the permit writer can require more frequent than annual reporting.

Records must be kept by the permittee for at least 3 years and this time may be extended by the Director upon request. An exception is for sewage sludge records which must be kept 5 years or longer if required by 40 CFR Part 503. The permit writer should designate where records should be located. Monitoring records include:

- Date, place, time
- Name of sampler
- Date of analysis
- Name of analyst
- Analytical methods used
- Analytical results.

According to 40 CFR §122.41(j), monitoring records must be representative of the discharge. Records which must be retained include continuous strip chart recordings, calibration data, copies of all reports for the permit, and copies of all data used to compile reports and applications. Sludge regulations under 40 CFR §§ 503.17, 503.27, and 503.47 establish recordkeeping requirements that vary depending on the use and disposal method for the sludge. The same recordkeeping requirements should be applied to other sludge monitoring parameters not regulated by the 40 CFR Part 503 rule.

EXHIBIT 7-5.
Discharge Monitoring Report (DMR)