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Industrial Stormwater Monitoring and Sampling Guide

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Final Draft

Acknowledgements

All photos are courtesy of Tetra Tech, Inc. Sampling illustrations in Section 2 are courtesy of Washington Department of Ecology's guide on *How To Do Stormwater Sampling: A guide for industrial facilities* (available at http://www.ecy.wa.gov/pubs/0210071.pdf)

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A formatted version of this guide will be available in April, 2009.

Industrial Stormwater Monitoring and Sampling Guide

The Industrial Stormwater Monitoring and Sampling Guide ("guide") is a how-to primer for industrial facility operators on how to conduct visual and analytical monitoring of stormwater discharges. The target audience is operators of facilities subject to the U.S. Environmental Protection Agency's (EPA) 2008 Multi-Sector General Permit (2008 MSGP) or a similar State-issued industrial stormwater permit. The information presented will also be useful to anyone interested in industrial stormwater monitoring. The procedures presented in this guide, specifically related to monitoring methodology and quality assurance, will help ensure that stormwater samples yield usable information.

The 2008 MSGP covers specific industrial activities (see Appendix D of the 2008 MSGP, available at www.epa.gov/npdes/msgp) in States, territories, and Indian Country lands where EPA is the National Pollutant Discharge Elimination System (NPDES) permitting authority (i.e., in those States or territories not authorized to issue NPDES permits themselves – see Appendix C of the 2008 MSGP).

This guide does not impose any new legally binding requirements on EPA, States, or the regulated community, and does not confer legal rights or impose legal obligations upon any member of the public. In the event of a conflict between the discussion in this document and any statute, regulation, or permit, this document would not be controlling.

Monitoring vs. Sampling. **In this guide, "sampling" refers to the actual, physical collection and analysis of stormwater samples. The term "monitoring" refers to both sampling and visual observations of stormwater discharges, including the related preparation and documentation tasks.**

Interested parties are free to raise questions and objections about the substance of this guide and the appropriateness of the application of this guide to a particular situation. EPA and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those described in this guide where appropriate.

1. Introduction to Stormwater Monitoring and Sampling

Most industrial stormwater permits require installation and implementation of control measures to minimize or eliminate pollutants in stormwater runoff from your facility. The control measures you choose for your facility must be documented in your facility-specific Stormwater Pollution Prevention Plan (SWPPP). The results of your stormwater monitoring will help you determine the effectiveness of your control measures, and overall stormwater management program. Evaluation of your stormwater management program will include inspections, visual assessments, and monitoring (i.e., sampling) of specified stormwater discharges. Regular stormwater inspections and visual assessments provide qualitative information on whether there are unaddressed potential pollutant sources at your site, and whether existing control measures are effective or need to be reevaluated. Stormwater sampling provides quantitative (i.e., numeric) data to determine pollutant concentrations in runoff and, in turn, the degree to which your control measures are effectively minimizing contact between stormwater and pollutant sources, and the success of your stormwater control approach in meeting applicable discharge requirements or effluent limits.

The following are the types of industrial stormwater monitoring requirements typically included in industrial general permits:

- **Visual Assessments of Discharges.** Permittees are required to regularly and frequently (e.g., quarterly under the 2008 MSGP) take a grab sample during a rain event and assess key visual indicators of stormwater pollution – color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and other qualitative markers of pollution. The findings of these assessments are used to trigger further facility inspections and corrective actions to modify problems found at the site.

- **Indicator or Benchmark Sampling**. Stormwater samples are collected from a site's discharge points (or outfalls) for laboratory analysis and the results are compared with benchmark pollutant concentrations as an indicator of the performance of stormwater control measures. A benchmark pollutant concentration is a level above which a stormwater discharge could adversely affect receiving water quality (and control measures must be evaluated) and, if below, the facility is not expected to have an impact on receiving water quality. This type of monitoring differs from "compliance monitoring" (see below) in that exceedances of the indicator or benchmark levels are not considered violations, but rather "red flags" that could point to a problem at the site with exposed pollutant sources or control measures that are not working correctly. For instance, the 2008 MSGP includes "benchmarks" that are based to a large degree on EPA's aquatic life criteria. Where the average of samples taken over four consecutive quarters exceed the applicable benchmark concentration of a particular pollutant, the permittee is required to investigate whether the higher pollutant levels can be attributed to some pollutant source or faulty control measure(s), and to address such problems through corrective action and possibly further monitoring.

- **Compliance Sampling.** Where a facility is subject to one of the Federal effluent limitation guidelines (ELGs) addressing limits on stormwater runoff, sampling is required to determine compliance with those limits. Table 1 provides a list of the current applicable effluent limitation guidelines.

Table 1. Applicable Effluent Limitations Guidelines (2008 MSGP Part 2.1.3)

Regulated Activity	40 CFR Part/Subpart
Discharges resulting from spray down or intentional wetting of logs at wet deck storage areas	Part 429, Subpart I
Runoff from phosphate fertilizer manufacturing facilities that comes into contact with any raw materials, finished product, by-products or waste products (SIC 2874)	Part 418, Subpart A
Runoff from asphalt emulsion facilities	Part 443, Subpart A
Runoff from material storage piles at cement manufacturing facilities	Part 411, Subpart C
Mine dewatering discharges at crushed stone, construction sand and gravel, or industrial sand mining facilities	Part 436, Subparts B, C, or D
Runoff from hazardous waste landfills	Part 445, Subpart A
Runoff from non-hazardous waste landfills	Part 445, Subpart B
Runoff from coal storage piles at steam electric generating facilities	Part 423

These limits are required to be included in all general industrial permits. Typically, permits require corrective action and further sampling when an effluent limitation is exceeded. An exceedance of an applicable effluent limitation guideline constitutes a violation of the permit.

- **Monitoring Requirements for Discharges to Impaired Waters** - General industrial permits may have special monitoring requirements for facilities that discharge pollutants of concern into impaired waters.

For an explanation of these monitoring requirements in the 2008 MSGP see Part 6.2. Part 8 of the 2008 MSGP includes the benchmark and effluent limitation guideline monitoring requirements for each of the industrial sectors affected by such requirements.

2. Preparation for Monitoring

This section describes the information you will need before monitoring. While this guide is meant to be a general primer for anyone interested in industrial stormwater monitoring, Section 2 follows the organization of the 2008 MSGP. Many State general permits are very similar to the 2008 MSGP. It is EPA's hope that this format will be of use to permittees in most states. However, if you are subject to a State industrial general permit, you should compare your permit's monitoring requirements to the requirements reflected in this guide to ensure that you are following all applicable State requirements.

In general, preparation is critical to make sure that industrial stormwater monitoring is conducted properly and in a timely manner. Most of this information should have been collected previously for the purposes of submitting your permit application or Notice of Intent (NOI), and in developing the monitoring procedures section of your stormwater pollution prevention plan (SWPPP). However, this guide reviews some of the steps necessary to develop this information, such as the site map component of the SWPPP, in case facilities have not already done so. If you have already completed any of these steps in this section, you can skip to the next application section or subsection in this guide. For more information on how to develop a SWPPP, refer to EPA's guide *Developing Your Stormwater Pollution Prevention Plan: A Guide for Industrial Operators*, available on EPA's website at www.epa.gov/npdes/stormwater/msgp.

If you have already submitted your NOI, the following documents will serve as good resources for information that you will need prior to monitoring:

- A copy of your NOI or application submitted to EPA or a State, and your assigned permit registration number.

- A copy of the EPA/State response to your NOI/permit application submission if it includes specific details pertaining to your monitoring (e.g., pollutants required to be monitored, frequency of monitoring, benchmark or compliance sampling requirements, etc.).

- A copy of your applicable permit, including the accompanying fact sheet.

- A complete copy of your SWPPP, which must include a detailed site map of your facility with locations of all stormwater monitoring points, and a description of the procedures you or your

stormwater pollution prevention team will follow when conducting monitoring and visual assessments.

2.1 Determine Where Stormwater Is Discharged From Your Property

If you have not already done so, walk the grounds and perimeter of your facility during a storm event to identify where runoff discharges from the site (known as "outfalls"). Outfalls are locations where stormwater exits the facility property, including pipes, ditches, swales, and other structures that transport stormwater. If possible, walk outside the boundary of your facility to identify outfalls that may not be apparent from within your site.

Stormwater discharges to the slot drain and is conveyed offsite through a valved pipe.

You should note where:

- Concentrated stormwater exits your facility (e.g., through a pipe, ditch or similar conveyance). These outlets are usually good sampling points.

- Dispersed runoff (i.e. sheet flow) flows offsite (e.g., through a grassy area or across a parking lot). Note whether concentrated flows commingle with the sheet flow.

- Storm drain inlets or catch basins are located. Try to determine where the storm drains send your runoff (e.g., to your municipal separate storm sewer system [MS4], to a combined sewer system, to the separated sanitary sewer, or directly to a nearby waterbody).

- Authorized non-stormwater discharges commingle with stormwater prior to discharge (such commingled discharges may be covered under your permit).

- Areas where stormwater might enter your facility from neighboring facilities and commingle with your stormwater discharges.

Terms to Know:

Combined Sewer System: Combined sewer systems are sewers that are designed to collect rainwater runoff, domestic sewage, and industrial wastewater in the same pipe. Most of the time, combined sewer systems transport all of their wastewater to a sewage treatment plant, where it is treated and then discharged to a water body. During periods of heavy rainfall or snowmelt, however, the wastewater volume in a combined sewer system can exceed the capacity of the sewer system or treatment plant. For this reason, combined sewer systems are designed to overflow occasionally and discharge excess wastewater directly to nearby streams, rivers, or other water bodies.

MS4: A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) which are owned and operated by a … public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes … that discharges to waters of the United States; designed or used for collecting or conveying stormwater; which is not a combined sewer; and which is not part of a publicly owned treatment works (POTW). [40 CFR 122.26(b)(8)].

Mark these locations on your facility site map, which will be included as part of your SWPPP, and label each outfall location with unique identifiers to differentiate them. For example, you may decide to name the different outfalls according to where the stormwater is being discharged, such as MS4-1, MS4-2, etc. for outfalls discharging to the MS4 or ST-1, ST-2, etc. for outfalls discharging directly to an adjacent stream. Using unique identifiers will help you to coordinate monitoring requirements.

In addition to marking the outfalls on the map, you will need to determine the drainage area for each discharge point. If your facility is large and has significant changes in elevation, a topographic map may be necessary. However, if your facility is small and relatively flat, the best way to define the drainage area for each outfall is an on-the-ground visual assessment, preferably during a rain event. Sketch the basic drainage areas on the map for each outfall. Knowing the drainage area for each outfall is helpful when your sampling indicates problems at that outfall. You can focus your efforts on the industrial materials and activities in that drainage area, instead of the entire site, to identify what may be causing the problem.

2.2 Determine Where You Will Collect Samples

Now that you have determined the different points of discharge from your site, you will need to select the exact locations from which you will be collecting your stormwater samples. Note that Part 5.1.5.2 of the 2008 MSGP requires industrial operators to document in their SWPPPs the location where samples will be collected. Generally, industrial stormwater permits require that you sample stormwater discharges prior to the stormwater leaving your facility, and at a location downstream from all of your industrial materials and activities. The reason behind requiring such a location is so that the sample is

representative of your facility's discharge, taking into account the types of pollutants that may be contained in runoff from the property.

Appropriate sample locations include:

- Underground pipes that collect stormwater from drop inlets and convey stormwater to an offsite location (e.g., street, curb or MS4). Be sure you collect only the stormwater discharging from your facility and not the baseflow in the pipes that is being discharged from facilities upstream. Do not enter underground locations to collect samples. Use a pole with a sampling container attached at the end to collect the sample.

- Open ditches, gutters or swales that carry stormwater from your facility to an offsite location. If these conveyances contain runoff from another facility, it is important to note that in your SWPPP;

- Facility driveways and other street access points; and

- Outlets discharging offsite from onsite stormwater detention ponds or other types of structural control measures. It is important to sample at the OUTLET of your structural control measures, as opposed to the INLET of such structures, in order to determine the quality of the water after treatment.

Where to Sample When There Are Multiple Discharge Points

You are required to monitor all outfalls that receive stormwater discharges from your industrial activity. See Part 6.1.1 of the 2008 MSGP. If you have multiple stormwater discharge points at your facility, you need to identify which outfalls are associated with industrial materials and activities, and monitor those outfalls. Understanding the hydrologic connection between your outfalls and the parts of your facility that drain to those points, and the pollutants associated with the industrial activities in these areas, will assist you in designing a monitoring program that is representative of the pollutants being discharged from your site. Developing such an understanding will also help later on when you begin to assess your sampling results and determine where improvements could be made to your stormwater control measures. The site map you prepare (see Part 5.1.2 of the 2008 MSGP) will help you understand the correlation between your areas of potential pollutant sources, the direction of stormwater flow from those areas, and the discharge points.

Note that you are not required to monitor at outfall locations that receive stormwater flow only from unregulated areas of your site (i.e., there are no industrial materials or activities in the drainage area). For instance, a hypothetical facility may have two outfalls, one that receives discharges from an area where industrial materials are handled and stored, and a second outfall that receives discharges from an unregulated parking lot used by employees. In this scenario, the industrial permittee would only collect samples from the first outfall because it discharges stormwater associated with industrial activity. Alternatively, if the site's second outfall (e.g., the outfall receiving runoff from the parking lot) also drains areas of the facility with regulated industrial activities, then this outfall would also need to be sampled. In this situation, sampling for this outfall should be done at a location prior to where the two flows commingle so that you are capturing the industrial portion of the flow. See Part 6.1.2 of the 2008 MSGP.

Where to Sample if Outfalls Are Substantially Identical

If your facility has two or more outfalls whose discharges are "substantially identical," some industrial stormwater permits, including the 2008 MSGP, allow you to monitor the discharge at just one representative outfall and apply the results to the other substantially identical outfalls. EPA defines "substantially identical" in the 2008 MSGP as follows:

> "… two or more outfalls that you believe discharge substantially identical effluents, based on the similarities of the general industrial activities and control measures, exposed materials that may significantly contribute pollutants to stormwater, and runoff coefficients of their drainage areas …." See Part 6.1.1 of the 2008 MSGP.

The flexibility provided to permittees to sample at just one location, which is considered representative of all substantially identical outfalls, is an exception to the rule stated above that samples must be taken from all outfalls at a facility. Note that this exception does not apply to compliance monitoring (effluent limitation guideline monitoring), which must be conducted at each outfall to which the effluent guideline applies.

In choosing which of the substantially identical outfalls from which to sample, you should select the outfall that has been observed to have the most consistent flow. To use the substantially identical outfall exception, you must document in your SWPPP how the two or more outfalls are substantially identical, based on the above definition. You will need to document the following information:

- The locations of the outfalls;
- Estimated size of the drainage area (in square feet) for each outfall;
- General industrial activities conducted in the drainage area of each outfall;
- Control measures being implemented in the drainage area of each outfall;
- Why the outfalls are expected to discharge similar stormwater; and
- An estimate of the runoff coefficient of the drainage areas (0.0 no runoff potential to 1.0 all precipitation runs off).

The runoff coefficient is the ratio of excess runoff to the amount of precipitation for a given time over a given area, with a 0 (zero) runoff coefficient meaning no runoff potential and 1.0 (one) meaning a completely impervious surface and all stormwater runs off. The runoff coefficient is related to the amount of impervious surfaces (buildings, pavement, sidewalks, etc.) versus pervious surfaces (grass,

graveled areas, etc.) at the site. The more impervious surface a facility has, the larger the runoff coefficient. Light industrial facilities typically have a runoff coefficient between 0.50 and 0.80 and heavy industrial facilities typically have a runoff coefficient between 0.60 and 0.90.

Here is an example where a facility could take advantage of the "substantially identical outfalls" exception: a metal recycling facility with a large scrap metal pile has three separate outfalls that are each connected by their own drainage ditch to different portions of the same pile, and the runoff that is discharged is managed using the same type of control measure in each drainage area. In this scenario, the facility's operator can use the "substantially identical outfall" exception because the industrial activities at the site are all the same, the runoff flows through exposed areas that presumably contribute the same type of pollutants, and the drainage area has the same or similar runoff coefficients. Note that the substantially identical outfall exception could not be used if there were in fact differences in any of the required components defined above.

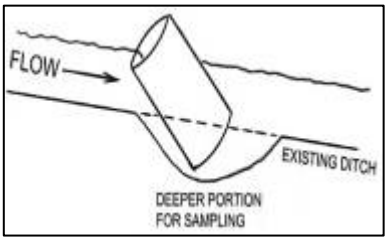
If your permit does allow you to use a substantially identical outfall exception, make sure you carefully review the type of monitoring for which this exception applies. For instance, while the 2008 MSGP allows permittees to use the substantially identical outfall exception for benchmark and visual assessment samples, the permit prohibits use of this exception for compliance monitoring (e.g., for use in showing compliance with numeric effluent limitation guidelines). Therefore, if a facility permitted under the 2008 MSGP is subject to a numeric limit based on an EPA effluent limitation guideline, it would have to monitor all outfalls at the site receiving flows from the applicable industrial activities. See Part 6.2.2.2 of the 2008 MSGP.

Where to collect a sample

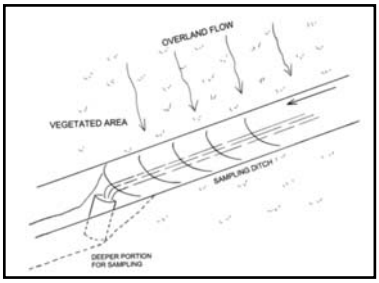
Sampling Sheet Flow

In some areas of your facility it may be difficult to obtain a sample because the runoff drains as sheet flow before it becomes concentrated enough for sampling. If the flow is too shallow to directly fill a collection bottle, you can overcome this by:

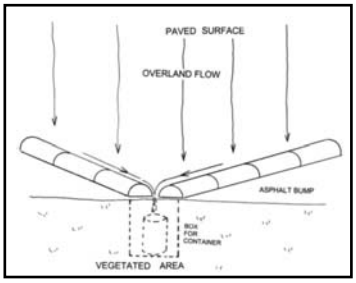
- Concentrating the sheet flow by excavating a small depression in an existing ditch or other location where stormwater runoff flows.



- Installing a trough, gutter or ditch to intercept and concentrate stormwater flow.



- Installing “speed” bumps to convey and concentrate a large area of sheet flow.



Collecting a sheet flow stormwater sample.

You should make these modifications during a period when rain is not forecast so any pollutants generated can be cleaned up before a storm hits. Also, if you dig a ditch or disturb the earth in some way, line the disturbance with concrete or plastic so that you do not contaminate your stormwater samples with sediment or other pollutants.

Sampling from a Pipe

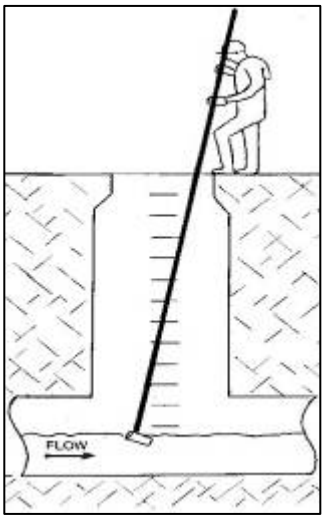
For runoff flowing through a pipe into a ditch or receiving water, you should sample the outflow directly from the pipe. For hard-to-reach pipes, it may be necessary to fasten a collection bottle to a pole (see Sampling from a Manhole in Table 2 below).

When collecting any type of stormwater sample it is imperative that the sample is collected before the stormwater reaches the receiving water.

Sampling From a Drainage Ditch or Swale

If your stormwater is discharged via a drainage ditch or vegetated swale, take a grab sample from a consistently flowing part of the ditch / swale. If the ditch / swale is too small or shallow, install a barrier device in the channel or deepen a small area so you are able to sample directly into the bottles. Allow sufficient time to pass after disturbing the bottom so that any solids stirred up do not contaminate your sample.

Sampling From a Stormwater Detention / Retention Basin or Other Treatment Device



If it is necessary for you to sample from a detention or retention basin, do so at the outfall of the structure. Collecting samples from stagnant or slowly moving water inside a pond will not yield a representative sample as the pollutants might not be adequately mixed. Stormwater basins may hold stormwater for long periods of time. Collect your sample within 30 minutes from when the pond begins to discharge.

Potential Sampling Issues

Depending on the location of your monitoring points, you may encounter additional challenges beyond deciding which sampling technique to employ at each site. Table 2 identifies some stormwater sampling problems common to industrial facilities and guidance for how EPA suggests you address them if they occur at your site.

Table 2. Solutions to Typical Stormwater Sampling Problems

Problem	Solution
Run-on from Neighboring Properties	Ideally, your stormwater samples will contain only runoff from your site. However, stormwater from a neighboring facility can "run on" and commingle with your own regulated discharge, possibly adding contaminants not found at your facility. You are responsible for any and all pollutants discharged from your site irrespective of the pollutants' origin and whether the other facility has permit coverage. This responsibility includes run-on discharges from neighboring properties if this discharge commingles with your own regulated discharge. To accommodate stormwater run-on, EPA requires as part of the SWPPP site description that you document the locations and sources of run-on. As part of this documentation, if you collect and analyze samples of the run-on, you will need to report all such findings in your SWPPP.
Stormwater from industrial areas commingles with stormwater discharges from non-industrial areas or areas not regulated under the MSGP before it reaches the surface water body or MS4.	Attempt to sample the industrial stormwater discharge before it mixes with stormwater from non-industrial areas.
Adverse Weather Conditions	High tides and high flow or flood conditions can cause stormwater conveyances to reach maximum capacity, pipes to become clogged or submerged, and other unrepresentative flow situations. High flows could also be dangerous, so you should use your best professional judgment when selecting sampling locations. In some cases you may need to sample at a point before the intended outfall location.
There are numerous stormwater outfalls in one area.	Construct an impound channel or join together flows by building a weir or digging a ditch to collect discharge at a low point for sampling purposes. This artificial collection point should be lined with plastic to prevent infiltration and the introduction of

Problem	Solution
	sediment. Or, alternatively, sample at several locations to represent total site runoff.
The outfall is inaccessible (examples include underwater discharges or unreachable discharges such as a pipe discharging out of a cliff).	Go upstream of the discharge until a sample can be taken (i.e., to the nearest manhole or inspection point). You may need to sample at several locations to best represent runoff from this discharge point if you cannot access an upstream location.
A facility has many sampling locations making it difficult to collect all of the samples during the first 30 minutes of discharge, as required by the 2008 MSGP.	Have a sampling crew ready when storms are forecast so that all outfalls can be sampled during the first 30 minutes. Also, automatic samplers may be used to collect samples within the first 30 minutes, triggered by the amount of rainfall, the depth of flow, flow volume or time.
A stormwater sample location is beneath a manhole.	For accessibility and safety, use a sampling pole to collect samples from a manhole. Before a person can enter a manhole to collect a sample, they must be trained in confined space entry.
Stormwater from more than one industry type is commingled.	You must comply with monitoring requirements for all applicable sectors and SIC codes.

2.3 Determine Which Types of Monitoring Requirements Apply At Each Outfall

The next step in preparing for monitoring at your site is to determine the type of monitoring requirements that correspond to each outfall. The type of monitoring requirements to which you are subject will differ according to your permit. Different monitoring requirements may also apply to individual outfalls on your property based on the type of industrial activity discharging to that point, and even the receiving water to which you are discharging. Using your permit, determine the type of monitoring requirements to which your specific facility is subject, and document in your SWPPP the specific monitoring requirements that applies to each outfall, including the frequency of monitoring and the specific parameters that must be monitored.

Recall that it is not necessary to monitor an outfall if it does not have any industrial activity associated with it (e.g., discharge from an employee parking lot that does not commingle with stormwater runoff from an area of industrial activity) or if the outfall does not drain to a surface water (i.e. the outfall drains to a sanitary sewer or combined sewer system).

The following applies to the types of monitoring required under the 2008 MSGP. If you are not subject to the 2008 MSGP, consult your State permit to determine your monitoring requirements.

- ***Visual Assessments*** (Part 4.2 of the 2008 MSGP) – All 2008 MSGP permittees are required to collect samples of their stormwater discharge for visual inspection. The following qualitative characteristics must be assessed:

    - color;
    - odor;
    - clarity;
    - floating solids;
    - settled solids;
    - suspended solids;
    - foam;
    - oil sheen; and

- other obvious indicators of stormwater pollution.

Visual assessments must be conducted at all outfalls, although if several outfalls are "substantially identical" then only one visual assessment must be conducted on the set of outfalls. The sampling frequency for visual assessments under the 2008 MSGP is quarterly. The monitoring quarters are: January 1 – March 31, April 1 – June 30, July 1 – September 30, and October 1 – December 31.

- ***Benchmark Monitoring*** (Part 6.2.1 of the 2008 MSGP) – This type of analytic monitoring applies to certain industrial sectors regulated under the 2008 MSGP. Permittees subject to these requirements must take periodic grab samples of their stormwater discharge to compare the concentrations of key indicator pollutants to their corresponding benchmark concentrations. The benchmark values are based in large part on EPA's aquatic life water quality criteria and are meant to serve as indicators of how well a facility's stormwater control efforts are working. If a particular benchmark is exceeded, this indicates to a permittee that there may be a problem at the site, such as a spill, exposed pollutant source, or a faulty control measure, and triggers a required review of the potential problem to determine what corrective actions are necessary. For example, a total suspended solids (TSS) concentration found in a benchmark sample of greater than 100 mg/L, which is the applicable benchmark concentration for TSS, would require a facility to re-evaluate and potentially revise control measures implemented to control dust, soil erosion, or other sources of suspended solids. Note that the exceedance of the benchmark is not a violation (because benchmarks are typically not enforceable limits), but the failure to conduct the follow-up investigation and applicable corrective actions would be a violation of the permit.

Be sure to update your SWPPP and site map whenever you change or add new control measures. Control measure maintenance activities must be documented (preferably in a log), and such records must be kept with your SWPPP and stormwater file.

Determine whether you are subject to any benchmark monitoring requirements based on your particular industrial sector or subsector. The benchmark monitoring requirements differ based on the sector or subsector under which a particular facility falls. Note that not all sectors are subject to this type of monitoring. Appendix D in the 2008 MSGP provides the Standard Industrial Classification (SIC) code and activity codes categorized by sectors and subsectors. Use Appendix D to link your industrial activities with their associated SIC code sectors / subsectors. Your facility will have a primary industrial activity and associated SIC or activity code (which is the major determinant of your permit requirements), and, possibly, additional secondary sectors / subsectors with additional requirements for which you must comply. Next, using Part 8 of the 2008 MSGP, under your particular sector or subsector, determine whether you are subject to any benchmark monitoring requirements, and the corresponding benchmark that applies. Consider the following example: if you operate a gold mine (subsector G2) you are subject in Part 8.G.8.2 to the following benchmark monitoring requirements:

Table 3. Subsector G-2.		
Subsector (Discharges may be subject to requirements for more than one sector/subsector)	**Parameter**	**Benchmark Monitoring Cutoff Concentration**
Subsector G2. Iron Ores; Copper Ores; Lead and Zinc Ores; Gold and Silver Ores; Ferroalloy Ores, Except Vanadium; and Miscellaneous Metal Ores (SIC Codes 1011, 1021, 1031, 1041, 1044, 1061, 1081, 1094, 1099) (Note: when analyzing hardness for a suite of metals, it is more cost effective to add analysis of calcium and magnesium, and have hardness calculated than to require hardness analysis separately)	Total Suspended Solids (TSS)	100 mg/L
	Turbidity	50 NTU
	pH	6.0-9.0 s.u.
	Hardness (as $CaCO_3$; calc. from Ca, Mg)[1]	no benchmark value
	Total Antimony	0.64 mg/L
	Total Arsenic	0.15 mg/ L
	Total Beryllium	0.13 mg/L
	Total Cadmium[1]	Hardness Dependent
	Total Copper[1]	Hardness Dependent
	Total Iron	1.0 mg/L
	Total Lead[1]	Hardness Dependent
	Total Mercury	0.0014 mg/L
	Total Nickel[1]	Hardness Dependent
	Total Selenium	0.005 mg/L
	Total Silver[1]	Hardness Dependent
	Total Zinc[1]	Hardness Dependent

Based on this table, you then know the pollutant parameter for which you must conduct benchmark monitoring, and the corresponding benchmark concentration against which you will compare each individual grab sample. Each sector or subsector subject to benchmark monitoring requirements includes a similar table in Part 8 of the 2008 MSGP.

After you have determined which (if any) benchmark sampling requirements apply, document in your SWPPP which outfalls are subject to such requirements, the frequency of monitoring, and the parameters that must be analyzed. If your facility has multiple outfalls, be aware that there may be different requirements for different outfalls depending on the type of industrial activity conducted in the drainage area of each outfall. You are only required to conduct benchmark monitoring for those outfalls with discharges from the specific sectors / subsectors that are affected by such requirements. Where an outfall includes no discharges from those sectors or subsectors for which benchmark monitoring requirements apply, then no benchmark samples need to be taken at that outfall.

The required benchmark monitoring frequency under the 2008 MSGP is quarterly. The monitoring quarters, beginning with the first quarter on April 1, 2009 are: April 1 – June 30, July 1 – September 30, October 1 – December 31 and January 1 – March 31.

Exceptions for Inactive and Unstaffed Sites (Part 6.2.1.3 of the 2008 MSG) – The requirement for benchmark monitoring does not apply to inactive and unstaffed facilities, providing there are no industrial materials or activities exposed to stormwater. This exception only applies to benchmark monitoring requirements and not to the other types of monitoring described above.

To claim this special exemption, you must note on the next quarterly benchmark monitoring report that your facility is inactive and unstaffed, and you must keep an inactive and unstaffed certification onsite (see Part 4.2.1.3). The requirement for conducting a quarterly visual assessment also does not apply inactive and unstaffed sites, as long as there are no industrial materials or activities exposed to stormwater. If you are invoking the exception for inactive and unstaffed sites, maintain a signed and certified statement onsite with your SWPPP stating that the site is inactive and unstaffed, and that there are no industrial materials or activities exposed to stormwater.

Hardness-Dependent Benchmarks (Appendix J of the 2008 MSGP) **–** The benchmark values of some metals are dependent on the level of hardness in your receiving waters (see 2008 MSGP, Appendix J). Hardness is a characteristic of water that results from the presence of dissolved salts, especially calcium sulfate or bicarbonate, and is usually reported as carbonate, noncarbonate or calcium + magnesium (Ca + Mg). If you are required to monitor for a hardness-dependent pollutant, you must first determine the hardness of your receiving water before you can establish the corresponding benchmark concentration.

- ***Effluent Limitations Monitoring*** (Part 6.2.2 of the 2008 MSGP) – Eight of the 2008 MSGP's 29 industrial sectors are required to monitor to determine if they comply with EPA-defined effluent limitation guidelines. These monitoring requirements are included in Part 8 of the 2008 MSGP. Effluent limitation guidelines are legally enforceable limitations that must not be exceeded in stormwater discharges.

  Similar to the benchmark monitoring requirements, samples only need to be taken at those outfalls with discharges from the specific activities that are subject to effluent limitation guidelines; otherwise these requirements do not apply. As stated previously, permittees subject to these monitoring requirements must take samples at all applicable outfalls, and no exceptions are given for substantially identical outfalls. However, if you are required to monitor a pollutant both for benchmark and effluent limitation guideline purposes, you only need to take one sample for both requirements.

When monitoring requirements overlap, e.g., TSS once per year for an effluent limit and once per quarter for benchmark monitoring, you may use a single sample to satisfy both monitoring requirements (i.e., one of your four quarterly benchmark samples would be used for your yearly effluent limit sample).

Table 4 identifies the industrial activities that are subject to effluent limitation guideline monitoring requirements and the associated sampling parameters. Effluent limitation guideline samples must be taken once per year (see Part 8 of the 2008 MSGP for the numerical values of each effluent limit).

Table 4. Required Monitoring for Effluent Limitations Guidelines

Regulated Activity	Where in 2008 MSGP	Sector	Effluent Limit Parameters
Discharges resulting from spray down or intentional wetting of logs at wet deck storage areas	Part 8.A.7	A	debris, pH
Runoff from phosphate fertilizer manufacturing facilities	Part 8.C.4	C	total P, fluoride

Regulated Activity	Where in 2008 MSGP	Sector	Effluent Limit Parameters
Runoff from asphalt paving and roofing emulsion facilities	Part 8.D.4	D	total suspended solids (TSS), oil and grease, pH
Runoff from material storage piles at cement manufacturing facilities	Part 8.E.5	E	TSS, pH
Mine dewatering discharges at crushed stone, construction sand and gravel, or industrial sand mining facilities	Part 8.J.9	J	TSS, pH
Runoff from hazardous waste landfills	Part 8.K.6	K	biochemical oxygen demand (BOD_5), TSS, ammonia, alpha terpineol, benzoic acid, p-cresol, phenol, total recoverable zinc, pH, aniline, naphthalene, pyridine, total recoverable chromium,
Runoff from non-hazardous waste landfills	Part 8.L.10	L	biochemical oxygen demand (BOD_5), TSS, ammonia, alpha terpineol, benzoic acid, p-cresol, phenol, total recoverable zinc, pH
Discharges from coal storage piles	Part 8.O.8	O	TSS, pH

Determine whether you are subject to any effluent limitation guideline monitoring requirements. Document in your SWPPP which outfalls are subject to such requirements, the frequency of monitoring, and the parameters that must be analyzed.

- ***Impaired Waters Monitoring*** (Part 6.2.4 of the 2008 MSGP) – The 2008 MSGP requires facilities to monitor, at least in the first year of permit coverage (and yearly thereafter depending on the sample results in the first year), for the presence of any pollutant causing an impairment to their receiving water. This requirement is triggered regardless of whether the particular pollutant is used or stored at the industrial site; however the facility may be able to discontinue monitoring after the first year if the pollutant is not present in the sample and is not expected to be present in any discharge. In advance of conducting this monitoring, you should already have a good idea of whether the pollutant will be found in your discharge. When you developed your SWPPP, you conducted a complete inventory of your site to determine what pollutants or pollutant constituents could be discharged in stormwater runoff. See Section 3.1 of EPA's guide, *Developing Your Stormwater Pollution Prevention Plan: A Guide for Industrial Operators*, particularly the discussion about conducting an "Inventory of Materials and Pollutants". Using this inventory from your SWPPP, you will be able to determine if any materials stored or used at your facility could contribute to impairment of your receiving water.

  The next section of this guide includes specific steps to help you determine if you are subject to impaired waters monitoring requirements. After following those steps, document in your SWPPP which outfalls are subject to impaired waters monitoring requirements, the frequency of sampling, and the parameters that must be monitored.

- ***State / Tribal Monitoring Requirements*** (Part 6.2.3 of the 2008 MSGP) – The 2008 MSGP includes a number of additional monitoring requirements that are unique to individual States

and/or Indian Country lands. These requirements are set out in Part 9 of the permit. These requirements may include additional or more frequent benchmark monitoring requirements, alternative benchmark thresholds, or additional parameters that must be monitored to establish compliance with applicable water quality standards.

Based on the State or Indian Country land in which they are located, each 2008 MSGP permittee must consult the applicable Part 9 section to determine what, if any, additional monitoring requirements apply. If you are subject to such requirements, you must document in your SWPPP which outfalls are subject to these provisions, the frequency of applicable sampling, and the parameters that must be monitored

- ***Additional Monitoring Required by EPA –*** It is possible EPA may require additional monitoring (see 2008 MSGP Part 6.2.5). You will be notified by the Agency if additional monitoring is required.

2.4 Determine if Your Facility is Subject to Impaired Waters Monitoring Requirements

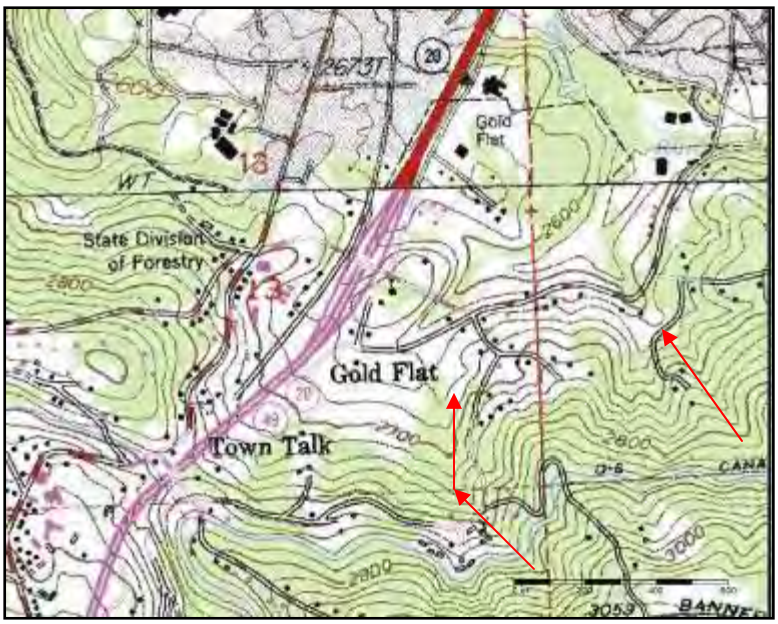
If you are required by your industrial stormwater permit to monitor for pollutants that cause impairment to your receiving water, you must first identify the receiving waters (e.g. ditch, creek, intermittent stream, lake, arroyo, etc.) into which your facility discharges stormwater and mark them on your site map. Note that you will have already identified your receiving waters if you filed an NOI to be covered by the 2008 MSGP.

A. Identify Your Receiving Water(s)

Do these monitoring requirements apply to me if I discharge into a dry ditch?
Yes, if the ditch eventually conveys the runoff to a waters of the United States.

There are several ways to identify your receiving waters. Your receiving water may be a lake, stream, river, ocean, wetland or other waterbody, and may or may not be located adjacent to your facility. Your facility might discharge directly into its receiving water, or indirectly to the receiving water by discharging first through an MS4, ditch, or other conveyance.

If the discharge from your facility does not discharge into an underground storm sewer system, you can use your site map and local topographic maps to pinpoint the closest waterways. Using the contours on the topographic map and your facility's outfall locations, determine the direction stormwater runoff flows from your facility. Once you know the direction of flow, you should be able to identify the receiving waters into which you discharge.



Sample section of a U.S.G.S. quadrangle map, with arrows showing direction of flow.

After identifying where your stormwater enters a waterbody, identify any additional interconnected waters for at least one linear mile downstream from the entrance point of your discharge (in case there are concerns about impacts to these downstream waters).

Resources to help you identify receiving waters:

- EPA's Water Locator Tool (available at www.epa.gov/npdes/stormwater/msgp) allows you to locate nearby receiving waters and impaired waterbodies within a 10 mile radius of your facility.

- EPA's Enviromapper (www.epa.gov/enviro/emef) enables you to find nearby waterbodies by entering your facility's zip code, address, facility name or identification number, EPA Region, watershed, or latitude/longitude data. Additional information on the location of impaired waterbodies can also be obtained.

- Topographic maps, which can be obtained from the U.S. Geological Survey (USGS) at http://topomaps.usgs.gov/ordering_maps.html, or through a retailer.

If your stormwater drains into an MS4, you will likely need to contact the operator of the system (e.g., the local public works department, the highway department, etc.) to identify the first receiving water your stormwater is released to after entering the MS4. Some MS4s have their storm sewer infrastructure maps available online.

Remember, the MS4 into which your facility's stormwater discharges is NOT your receiving water. The first waterbody that the MS4 discharges to after receiving your stormwater is the receiving water for your facility.

B. Determine if Your Receiving Water is Impaired and Whether a TMDL Has Been Completed

Once you have identified your receiving water(s), you will need to find out if the waterbody is impaired, and, if so, whether a total maximum daily load (TMDL) has been approved or established.

- **Water quality impairment status.** You need to determine whether your facility's receiving water is listed by your State as impaired and/or has an approved or established Total Maximum Daily Load (TMDL). EPA's Water Locator Tool (available at www.epa.gov/npdes/stormwater/msgp) will help find impaired waters within a 10 mile radius of your facility. Another place to check is EPA's website on Water Quality Assessment and TMDL information (www.epa.gov/waters/ir) or you can also contact your State water agency (cfpub2.epa.gov/npdes/contacts.cfm?program_id=6&type=STATE).

"Impaired waters" are streams, rivers, and lakes that do not currently meet their applicable designated uses and water quality standards. States, territories, and authorized tribes are required under the Clean Water Act to compile lists of known impaired waters, called 303(d) lists. Stormwater discharges to impaired waters may trigger additional control measures and monitoring requirements. For facilities subject to EPA's 2008 MSGP, see Part 2.2 for a more detailed discussion of water quality-based effluent limitations and conditions for discharging to impaired waters.

If your receiving water is impaired, use EPA's Water Locator Tool or Water Quality Assessment and TMDL website, or a State agency to help you determine:

- For what pollutant(s) is the water impaired? Make a separate list of all pollutants that have caused your waterbody to be impaired.

- Has an approved TMDL been completed for each of the pollutants? Some TMDL documents include information suggesting the type of monitoring that should be conducted to improve the understanding of the impairment or to demonstrate achievement of applicable wasteload allocations (WLAs).

C. Determine What Monitoring Requirements Apply

Having determined the pollutants that cause the impairment, you should now consult your permit to determine the type of monitoring that must be conducted, the frequency of monitoring, and whether any exceptions apply to certain pollutants. As discussed in Section 2.3 above, this must all be documented in your SWPPP so that it is clear which requirements apply to which outfall.

The 2008 MSGP lists several exceptions to and clarifications of the requirement to monitor for each impairment pollutant. In Part 6.2.4.1 of the 2008 MSGP, the permit clarifies that no monitoring is required when a waterbody's biological communities are impaired but no pollutant is specified as causing the impairment, or when a waterbody's impairment is related to hydrologic modification, impaired hydrology, or temperature. The permit also clarifies that monitoring is only required for pollutants for which a standard analytical method exists as defined in 40 CFR Part 136. In addition, certain exceptions exist that enable the permittee to be excused from sampling after the first year if it is found either that:

- The pollutant for which the waterbody is impaired is not detected above natural background levels in the discharge, and it is documented that the pollutant is not expected to be present above natural background discharges; or

- The pollutant for which the waterbody is impaired is not present and not expected to be present in the discharge.

Both the parameters that must be sampled and the frequency of monitoring for impairment pollutants may be subject to State- or Indian Country land-specific requirements. Therefore, each 2008 MSGP permittee must also consult Part 9 of the permit when determining which impaired waters sampling requirements apply.

2.5 What Type of Storm Events Qualify for Monitoring

In addition to understanding which monitoring requirements apply and where, it is also critical to develop an understanding of what type of discharge event you will be sampling. Under the 2008 MSGP, two preconditions must be met before a storm or snowmelt event is considered adequate to be monitored (see Part 6.1.3 of the 2008 MSGP).

- The storm / snowmelt event must create an actual discharge from your site ("measurable storm event"). This storm event will vary based on numerous factors at your site, the most obvious being the actual size and duration of the storm event. However, the amount of impervious surface at your facility will impact this as well. If your facility is covered mostly by grass or another type of vegetation with only a small amount of paved surfaces or roofs, it will take a larger storm to create a discharge from your site than it would at a facility that is entirely paved. Another factor affecting whether and how frequently you have a measurable storm event will be how frequently rain occurs at your facility and the size of the most recent storms. Saturated soil will generate a stormwater discharge more quickly than dry soil; however, VERY dry soil can also become compacted and become nearly impervious to rain, thereby converting precipitation to runoff quickly as well. You will need to pay attention to your facility's particular characteristics to develop an understanding of what type of rain events or snowmelt results in a discharge.

- At least 72 hours must have elapsed since the previous measurable storm event (unless you are able to document that less than a 72-hour interval is representative for local storm events during the sampling period, or if you are monitoring snowmelt consistent with Part 4.2.1 [quarterly visual assessments] or Part 6.2.1 [benchmark monitoring] of the 2008 MSGP).

In order to properly characterize rain events at your facility, it is a good idea to begin by documenting each event as part of your facility's routine maintenance activities. You can purchase a simple rain gauge and keep a notebook handy in order to document the dates on which rain occurred and the amount of rain that fell. You should also consider documenting whether or not an actual discharge from your facility occurred for each rain event. Tracking rainfall amounts and discharge information will help you to better predict which storm events will be measureable and result in a discharge.

In order to be prepared to take advantage of storms that will result in a "measurable storm event":

- Be familiar with local precipitation trends, storm patterns, and seasonal variations.

- Check weather forecasts so you can prepare to sample upcoming precipitation events.

- In addition to your local television news and the Weather Channel, you can get weather information online from http://www.wrh.noaa.gov (National Weather Service) and http://www.weather.com.

Note: You should try to collect both benchmark samples and visual monitoring samples concurrently so you can compare visual observations with the laboratory results, and reduce your field activities burden.

What To Do If You Are Unable To Sample – EPA acknowledges there may be times you are unable to complete required monitoring. The following are guidelines on how you should deal with such times.

- *Areas with Intermittent Stormwater Runoff* **–** If your facility experiences limited rainfall for extended periods of the year (i.e., in arid or semi-arid climates), or freezing conditions that often prevent runoff from occurring, then the quarterly monitoring events may be distributed during seasons when discharging does occur. If you are unable to collect four samples in one year because of insufficient runoff, document this fact in your SWPPP and continue quarterly monitoring until you have collected four samples.

- *Snowmelt Sampling* – If you are located where appreciable snow is common, one of your samples must include the capture of snowmelt discharge. If, however, you experience prolonged subfreezing temperatures, you may only be able to acquire a sample once over two quarters. You will then have to complete the monitoring requirements as above.

- *Adverse Weather Conditions* **–** When adverse weather prevents sampling per your monitoring schedule, you must sample during the next qualifying storm event. Adverse conditions are those that are dangerous or create inaccessibility for personnel, caused by such things as flooding, high winds, electrical storms or situations that otherwise make sampling impractical (e.g., drought or extended frozen conditions).

2.6 Select the Monitoring Team

Identify the members of your facility's pollution prevention team (which you identified in your SWPPP) who will collect samples and conduct visual assessments of discharges. To be considered as a member of the monitoring team, applicable staff must be familiar with the SWPPP, especially the site plan, the layout of the facility, potential pollutant sources, and the monitoring and reporting program. They also need to possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at your facility, and be able to evaluate the effectiveness of control measures. Typically, monitoring staff are based near the site to enable them to be available on short notice to sample storm events.

Ideally, the pollution prevention team consists of at least one individual from each shift so that a team member is always present during normal operating hours.

It is also important that monitoring staff understand and follow all quality assurance quality control (QAQC) techniques and procedures to ensure that the data is good. You should discuss these techniques with your laboratory prior to taking samples and properly train all sampling staff.

2.7 Select a Laboratory to Analyze the Samples

Your stormwater samples will need to be analyzed for the parameters you identified in section 2.3 by a qualified laboratory. Labs must use the approved methodologies found at 40 CFR Part 136 and return a report with chemical concentrations including data quality assurance information.

EPA recommends that you select a laboratory that is a participant in the EPA's Discharge Monitoring Report - Quality Assurance (DMRQA) Program, and, if possible, be approved by the National Environmental Laboratory Accreditation Program (NELAP). NOTE: for ELG compliance monitoring, participation in DMRQA is a minimum requirement.

Things to discuss with the laboratory

- What type and size of bottle will be provided for each test?
- How full do I fill the bottle?
- Are there any safety concerns with materials provided by the lab?
- What is the best way to preserve the samples?
- What kind of labels will be supplied and how should I fill them out?
- Will the lab deliver the supplies or do I need to pick them up?
- What are the maximum holding times for each water quality parameter to be sampled?
- Will the lab provide pH paper? Samples need to be tested for pH within 15 minutes of collection to be valid, typically in the field.
- Will the lab pick up the samples from my facility or do I need to deliver them?
- Can you walk me through filling out the chain-of-custody forms?
- Is the quantitation limit for each parameter less than the benchmark or effluent limitation concentration?*

* The quantitation limit is the minimum concentration of a parameter that the lab can accurately report using a particular method.

- A comprehensive list of NELAP-approved laboratories can be found at www.nelac-institute.org/accred-labs.php

- To ensure your chosen laboratory is eligible and reliable, you may want to request documentation showing they are certified to analyze environmental samples, and evidence they participate in DMRQA or other performance evaluation testing results.

You should ask the laboratory about any additional services and products they offer. Such as:

- pre-labeled bottles and pre-printed chain-of-custody forms;

- training on sample collection, documentation and data interpretation;

- sampling and courier services; and

- complete sampling kits which include bottles, packing materials, bottle labels, coolers and chain-of-custody forms; many laboratories provide free sampling kits.

2.8 Document Monitoring Procedures in Your SWPPP

Ensure your monitoring procedures are correctly documented in your SWPPP (see 2008 MSGP Part 5.1.5.2). The required information includes:

- The monitoring requirements that specifically apply to your facility.
- Information related to the substantially identical outfall exception, if you will use it.
- Your sampling procedures.
- Your procedures for performing quarterly visual assessments of stormwater discharges. This SWPPP element includes the routine facility inspections and comprehensive site inspections required by the 2008 MSGP (see 2008 MSGP Part 4.1 and 4.3, respectively).

Figure 1 is an example of a completed MSGP Industrial Stormwater/Snowmelt Monitoring Summary Form. You should fill out this form (Appendix A) with the sampling locations and monitoring requirements that apply to your facility and include a copy in your SWPPP.

Benchmark Levels and ELGs					
Industry Sector	Pollutant	Benchmark Level	ELG		
			Daily Max	Monthly Average	Instant Min/Max
D	TSS	100	23	15	
D	Oil and Grease		15	10	
D	pH				6 - 9
E2	Iron	1			
E2	TSS	100	50		
E2	pH				6 - 9

Sample Summary									
Outfall Identifier	Industry Sector (SIC)	Basis	Frequency	Timing	Total Suspended Solids (SM 2540D)	pH	Oil and Grease (EPA Method 1664A)	Iron (EPA Method 200.9)	
e.g. 001-A	Sector D (SIC 2951)	Benchmark	1/Quarter	1st wk of month	✓	✓	✓		
e.g. 001-A	Sector D (SIC 2951)	ELG	1/year	January	✓				
e.g. 001-B	Subsector E2 (SIC 3271)	Benchmark	1/Quarter	1st wk of month	✓			✓	
e.g. 001-B	Subsector E2 (SIC 3271)	ELG	1/Year	January	✓	✓			

Figure 1. Example MSGP Industrial Stormwater/Snowmelt Monitoring Summary Form with monitoring requirements, sampling locations and industry sectors.

3. Conduct Monitoring

This section describes sampling preparation, choosing the right storm event to monitor, how to collect stormwater samples, how to conduct quarterly visual assessments, quality control considerations, and how to report the results.

The information contained in this section is not specific to monitoring for the 2008 MSGP or any particular general industrial permit.

3.1 What to Have In Place Prior to Collecting Stormwater Samples

Preparation is essential, especially if you are in a climate where measureable storm events are infrequent.

- ***In-Office Preparations*** – Your in-office preparations should include the following:
    - Contacting the lab well ahead of time so that you have the sample bottles before a measurable storm event.
    - Paying attention to weather forecasts so that you are tracking patterns that are likely to result in a measurable storm event.
    - Knowing who your monitoring personnel are and how to contact them when a measurable storm event is expected.
    - Having sampling gear assembled and checked for readiness.
    - Preparing sample bottle labels using waterproof ink with the following information (if not already done by the lab):
        - Facility name and address
        - Sample location identifier (e.g., Outfall 001)
        - Name or initials of sampling personnel
        - Parameter and associated analytical method (e.g., TSS, Method # 0160.2; consult with your contract laboratory for analytical method numbers)
        - Sample type (generally will be “grab” samples)
        - Sample preservation notes
        - Date and time after completing sampling event
    - Having chain-of-custody forms ready for use.

The chain of custody form is a document that travels with the sample from collection through analysis. Each individual that handles the sample will place their name, date, and time on the chain-of-custody form. The form is used to maintain the integrity of the sample by providing documentation of the control, transfer, and analysis of samples (see Section 3.4 below for a more detailed discussion of chain-of-custody).

- ***Sampling Supplies*** – Collect the following supplies and keep them ready for quick use:

  - Clean, sterilized sample bottles, sized appropriately for the parameter to be analyzed (many labs provide the appropriate bottles or will tell you what size to get). Glass must be used for oil and grease samples; plastic containers can be used for other parameters. Use Teflon or aluminum-lined caps.

    For rinsing sample bottles, use only distilled water

  - If bottles are new but not pre-cleaned, they must be pre-conditioned before use by filling with water for several days (the duration can be reduced by using a dilute solution of hydrochloric acid).

  - Additional glass or clear plastic bottles suitable for visual assessments.

  - Visual monitoring forms (see example in Appendix B).

  - Clipboard and site-specific monitoring checklist.

  - If needed, a pole (sold at field supply stores) on which to attach sample bottles and attachment clips or strapping tape to secure the bottle to the pole.

  - Safety equipment, including first aid kit.

  - Hand sanitizer solution.

  - Carrying case for sampling equipment or backpack for carrying equipment to remote locations.

  - Powder-free disposable nitrile or latex gloves (sold by medical and laboratory suppliers or may be provided by your contract laboratory). Do *not* use powdered gloves as they may contaminate your samples.

  - Indelible pens / markers that can write on wet surfaces.

  - Foul-weather gear including footwear appropriate for the conditions at your sampling locations (e.g., non-slip boots).

  - Sturdy cooler and ice or ice packs for stowing and preserving your samples en route to the lab (the lab may provide an appropriate container).

  - Field notebook or field forms for your sampling records (waterproof notebooks are available at office supply stores).

  - pH paper and appropriate chemical preservatives for adding to sample bottles (obtain from your laboratory).

Preparing sampling supplies.

- ***Optional or as-needed supplies:***
    - Sodium bicarbonate (for safety reasons if using acid preservative additives)
    - A graduated stick to measure water depth for determining safe / wade-able sampling access locations (if a sampling pole will be used, you can modify it with depth markings)
    - Mosquito repellent
    - Flashlight in case of sudden loss of light or darkness under storm conditions
    - Flagging tape for marking access to remote or overgrown locations
    - Camera, used for:
        - Recording evidence of potential pollutants or sampling conditions.
        - Especially useful if different people will do the sampling throughout the permit term.
        - Pictures of sample appearance along with the visual inspection records can help “normalize” visual assessments.
        - Pictures of the sampling location can help you find the same spot for subsequent sampling events.

Develop a stormwater sampling checklist to ensure consistency and continuity across sampling events. Since stormwater sampling is not a regular part of a facility's workload, a checklist of things to have prepared before sampling, sampling activities, and sampling locations will help you remember from quarter to quarter. You can make the checklist by noting the things you did for the first sampling event to remember for future sampling events. Keep the checklist updated as you gain experience with sampling.

3.2 Collect Stormwater Samples

Contact the lab prior to collecting stormwater samples so they know to expect the samples and have adequate staff available to conduct the analyses within the applicable holding times (the lab may offer courier service). Inform them of the pollutant parameters for which your samples will be analyzed.

A stormwater grab sample is collected directly into the sample container.

Follow the protocol below to obtain an accurate grab or manual sample. A grab sample is a single sample "grabbed" by filling up a container, either by hand or attached to a pole. Obtaining accurate data is vital to your ability to assess how your stormwater control measures are performing.

- Wear disposable powder-free gloves for sampling; never touch the inside of the lid or bottle.
- For oil and grease: fill the glass sample bottle directly from the discharge; never collect in a container first and then transfer to the sample bottle because oily residue will collect along the inside of the first collection bottle and make the sample inaccurate.

Remember, oil and grease must be collected directly into the glass sample bottle.

- If you have problems accessing the stormwater discharge point (e.g., access is too far or dangerous), use a pole or other appropriate sampling apparatus.

- Sample only stormwater discharging from your facility (i.e., do not sample from puddles, ponds or retention basins).

- Sample from a turbulent section in the central part of the flow; avoid touching the bottom or sides of the stormwater conveyance.

- Fill the sample bottle nearly to the top (meniscus almost at the rim) by holding the opening into the flow of water; do not rinse or overfill the bottles.

Sample bottles labeled with location, date, time, sample collector, analysis, and preservative type.

While stormwater samples are typically grab samples, in some situations the use of an automatic sampler may be appropriate. Automatic samplers are mechanical devices that monitor site conditions and collect a sample when needed. The automatic sampler can be set up well in advance of a storm, or set up as a permanent installation, and the technician can retrieve the sample after the storm when conditions are favorable. Advantages of automatic samplers include low labor costs, convenience, and safety – personnel are not out in the storm trying to collect one or more samples. The major disadvantage is cost; automatic samplers are expensive. Secondarily, the automatic sampler cannot collect visual observations, and they cannot be used for collection of certain measurements.

After the samples have been collected:

- Place the samples in a sturdy cooler partially filled with ice. As a general rule, samples should be kept at approximately 39°F (4°C) until the cooler is delivered to the lab.

- Put a completed chain-of-custody form enclosed in a re-sealable plastic bag inside the cooler. If you have several

pH has a 15 minute holding time; therefore, the sample must be analyzed within 15 minutes of collection.

coolers complete a separate chain of custody form for each cooler.

- Deliver the samples to the lab (e.g. drive, arrange same-day pick-up by the lab, or use an express / overnight service) as soon as possible, bearing in mind the holding times for each parameter sampled.

Stormwater samples packed for delivery to the lab, note the chain of custody forms attached to the lid.

3.3 Record Information for Each Monitoring Event

For each individual sample collected, you should note the following information:

- The sample / outfall identifier.
- The duration between the storm event you sampled and the end of the previous storm event that resulted in a discharge of stormwater from your site (i.e., a “measurable storm event”).
- The date and duration of the storm event sampled.
- Rainfall measurement or estimate (in inches).
- Estimate of the total volume of the discharge sampled from the outfall.

You should record this information on a Stormwater Collection Form (see appendix C for an example).

3.4 Quality Assurance Considerations

The following actions must be followed explicitly. Quality assurance (QA) helps maintain the accuracy and integrity / legal defensibility of your monitoring results by documenting the stewardship of your samples, by minimizing biases in sampling and lab procedures, and by helping to assess the accuracy and precision of the lab's analyses.

Holding Times and Sample Preservation

Samples that cannot be delivered to the lab on the same day may need to be preserved, often by cooling to 4°C (i.e., in an ice bath) and/or with added chemical preservatives (laboratory-supplied bottles may already include preservatives). If your samples need to be analyzed for more than one parameter you may need to bottle more than one sample at an outfall using different preservatives. In addition, you should be aware of the maximum holding time allowed for a particular parameter before which the sample must be analyzed. Following is a table with typical preservation and holding requirements for benchmark parameters and additional potential pollutants of concern (the latter will not have a numeric value in parentheses). Work with your laboratory service providers to develop a list of containers to optimize "sharing" of containers across different parameters. Not all laboratories provide the same container types for the different parameters. Laboratories frequently provide pre-completed custody records and seals, and will provide pre-labeled sample bottles for ease of use in the field as part of their routine "value-added" services. Pre-completed custody records and labels require only time, date, and samplers' initials in order to complete this critical documentation. Your laboratory may also have additional sampling, sample handling, or shipping instructions helpful to your sample collection personnel. NOTE: Whenever possible, minimize the amount of lead time sample containers / kits are outside of the laboratory. Extended storage of pre-preserved containers for some analytes may present opportunity for blank contamination, even under ideal storage conditions.

Table 5. Sample Preservation and Hold Times

Parameter (Benchmark Level, mg/l or as specified)	Preservation		Maximum Holding Time	Sample Container
	Cool to 4º C?	Additional		
Aluminum, Total Recoverable (0.75)	N	HNO_3 (nitric acid) to pH <2	6 months	500 mL HDPE
Ammonia (2.14)	Y	H_2SO_4 (sulfuric acid) to pH <2	28 days	500 mL HDPE
Antimony, Total Recoverable (0.64)	N	HNO_3 to pH <2	6 months	500 mL HDPE
Arsenic, Total Recoverable (0.15)	N	HNO_3 to pH <2	6 months	500 mL HDPE
Beryllium, Total Recoverable (0.13)	N	HNO_3 to pH <2	6 months	500 mL HDPE
Biological Oxygen Demand, BOD_5 (30)	Y	None	48 hours	1L HDPE or glass
Cadmium, Total Recoverable (0.0005 – 0.0053)*	N	HNO_3 to pH <2	6 months	500 mL HDPE
Chemical Oxygen Demand, COD (120.0)	Y	H_2SO_4 to pH <2	28 days	100 mL HDPE or glass
Chromium (0.58 – 3.82)*	N	HNO_3 to pH <2	6 months	500 mL HDPE

Parameter (Benchmark Level, mg/l or as specified)	Preservation		Maximum Holding Time	Sample Container
	Cool to 4º C?	Additional		
Copper, Total Recoverable (0.0038 – 0.0332)*	N	HNO_3 to pH <2	6 months	500 mL HDPE
Cyanide, Total (0.022)	Y	NaOH (sodium hydroxide) to pH >12, refrigerate in dark	14 days; 24 hours if sulfide present	1 L HDPE
Fluoride		None	28 days	100 mL HDPE
Hardness (as CaCO3)		HNO_3 or $H_2SO_4$to pH <2 (method dependent)	6 months	100 mL HDPE
Iron, Total Recoverable (1.0)	N	HNO_3 to pH <2	6 months	500 mL HDPE
Lead, Total Recoverable (0.014 – 0.262)*	N	HNO_3 to pH <2	6 months	500 mL HDPE
Magnesium, Total Recoverable (0.064)	N	HNO_3 to pH <2	6 months	500 mL HDPE
Mercury, Total Recoverable (0.0014)	N	HNO_3 to pH <2	28 days	500 mL HDPE
Nickel, Total Recoverable (0.15 – 1.02)*	N	HNO_3 to pH <2	6 months	500 mL HDPE
Nitrate + Nitrite Nitrogen (0.68)	Y	H_2SO_4 to pH <2	28 days	200 mL HDPE
Oil and Grease	Y	HCl or H_2SO_4 to pH <2	28 days	1L Boston round glass
pH (6.0 – 9.0 s.u.)	N	None	15 min (Field test)	50 mL
Phenols, Total Recoverable	Y	H_2SO_4 to pH <2	28 days	500 mL HDPE
Phosphorous, Total (2.0)	Y	H_2SO_4 to pH <2	28 days	500 mL HDPE
Radium, Total Recoverable		HNO_3 to pH <2	6 months	1L HDPE
Radium, dissolved		Field-filtered HNO_3 to pH <2; if not field filtered - none	Field filtered, preserved 6months; if not field filtered, filter on receipt, preserve to pH <2 6 months	1L HDPE
Selenium, Total Recoverable (0.005)	N	HNO_3 to pH <2	6 months	500 mL HDPE
Silver, Total Recoverable (0.0007 – 0.0183)*	N	HNO_3 to pH <2	6 months	500 mL HDPE
Total Suspended Solids, TSS (100)	Y	None	7 days	200 mL HDPE
Turbidity (50 NTU)	Y	store in the dark	48 hrs	100 mL HDPE
Uranium		HNO_3 to pH <2	6 months	500mL HDPE
Zinc, Total Recoverable (0.04 – 0.26)*	N	HNO_3 to pH <2	6 months	500 mL HDPE
Landfill Parameters				
Alpha Terpineol	Y	NA	7 days to extraction 40 days to analysis	1L Amber glass
Aniline	Y	NA	7 days to extraction 40 days to analysis	1L Amber glass
Benzoic Acid	Y	NA	7 days to extraction 40 days to analysis	1L Amber glass
Napthalene	Y	NA	7 days to extraction	1L Amber glass

Parameter (Benchmark Level, mg/l or as specified)	Preservation		Maximum Holding Time	Sample Container
	Cool to 4º C?	Additional		
			40 days to analysis	
p-Cresol	Y	NA	7 days to extraction 40 days to analysis	1L Amber glass
Pyridine	Y	NA	7 days to extraction 40 days to analysis	1L Amber glass

*These values are hardness dependent.

Field Blanks

Field blanks are distilled or de-ionized water samples prepared when you are collecting stormwater samples. Field blanks are prepared, in the field, after cleaning the sampling equipment but before collection of water quality samples. Blanks are prepared by pouring distilled de-ionized water into each scoop, dipper, etc. used for sample collection and then into sample bottles as if they were actual field samples. The field blanks are processed and analyzed in an identical manner as the stormwater samples. If the lab detects any contamination in the blanks, your sampling results could be considered tainted (either from contamination or errors in sampling or analysis). Collection and analysis of field blanks is not required by the 2008 MSGP; however, field blanks are used for quality control to assess whether contamination was introduced during sampling, and may prove useful in interpretation of results.

Chain of Custody Forms and Procedures

Samples must be traceable from the point of collection until the sampling results are reported. To do this, document who is in possession of the samples using the chain of custody procedures below. One person should be responsible for the care and custody of the samples, and for generating the chain of custody record until the samples are properly transferred or relinquished to the laboratory. Chain of custody tasks include:

- Ensure that the sample labels are properly filled in.
- Complete the chain of custody form with the date, time, parameter and sample locations for each sample, and sign the form.
- During the transfer of custody of the samples, both the persons relinquishing and receiving the cooler (including lab personnel) must record the date and time on the chain of custody form and sign it.
- Record the shipping method, courier name(s), and other pertinent information as remarks on the chain of custody form.
- The original chain of custody form remains with the samples and a copy must be provided to the facility for inclusion in project records.

Chain of custody records are critical to ensure that no tampering occurs between sample collection and analysis. Your analytical service provider may provide training or written instructions to assist in your completion of accurate custody records. This is another key area where many laboratories invite the opportunity to work with their clients as part of their value-added services.

3.5 Conducting Visual Assessments of Stormwater Discharges

All facilities covered by the 2008 MSGP must perform quarterly visual assessments, irrespective of benchmark monitoring.

Visually inspecting stormwater samples from a measurable discharge at your sampling outfalls is an inexpensive way of assessing the performance of your control measures. The sample should be collected and analyzed in a colorless glass or plastic bottle. It is recommended that you take photographs of the discharges at the time of observation in case more than one person is doing the assessments and because photos can be helpful in determining the effectiveness of your control measures and any need to make changes to control measures.

Assess the general appearance, as an indicator of contaminants, of your discharges for these characteristics:

- ***Color*** – If the discharge has an unusual color, such as reddish, brown, or yellow hue, this may indicate pollutants or suspended sediment.
- ***Odor*** – If the discharge has a noticeable odor, for instance if it smells like gasoline fumes, rotten eggs, raw sewage, or solvents odor, or has a sour smell, this could be indicative of pollutants in the discharge.
- ***Clarity*** – If the discharge is not clear, but is instead cloudy or opaque, this could indicate elevated levels of pollutants in the discharge.
- ***Floating solids*** – If you observe materials floating at or near the top of the bottle, take note of what the materials appear to be.
- ***Settled solids*** – You should wait about a half hour after collection, then note the type and size of materials that are settled at the bottom of the bottle.
- ***Suspended solids*** – Particles suspended in the water will affect its clarity, and color and could be attributable to pollutant sources at your facility.
- ***Oil sheen*** – You should check the surface of the water for a rainbow color or sheen; this would indicate the presence of oil or other hydrocarbons in the discharge.
- ***Foam*** – You should gently shake the bottle and note whether there is any foam.
- ***Other obvious indicators of stormwater pollution.***

To record your visual monitoring results you can use the optional “Quarterly Visual Monitoring Form” in Appendix B (or a comparable one of your own).

4. Evaluate Monitoring Results

The primary purpose of any industrial stormwater monitoring program, consisting of analytic chemical monitoring and visual assessments, is to provide feedback on the performance of your selection and implementation of control measures. Visual evidence of pollution in a stormwater sample, a spike in the concentration of a benchmark pollutant, or the exceedance of a numeric effluent limitation provides an indicator that modifications or additions to the site's control measures need to be considered to improve the effectiveness of your stormwater program.

The following will aid you in interpreting your monitoring results and revising your control measures, if necessary.

4.1 Evaluating Quarterly Visual Assessment Results

For anything but colorless and odorless stormwater in your discharge, you should investigate what area of your site or what specific pollutant sources are contributing to the contamination of your site's runoff. To search for the source of pollutants, you should move upstream from the discharge point. You should scrutinize your exposed industrial materials and activities (material handling equipment, industrial machinery, raw materials, finished product, wastes, or products that are stored, used or created onsite, etc.). Examine where material handling activities occur, such as: storage, loading and unloading, and material transporting. Be aware, the source could be from an ongoing activity or the result of a spill or other infrequent occurrence. In looking at your samples, consider the following:

- When there is a distinct color or odor, are the abnormalities associated with any raw materials, chemicals or other materials used at the site?

- Muddiness or sediment may have been picked up from areas where there is disturbed earth or other unpaved areas lacking adequate control measures.

- Foam or oil sheen may be the result of a leak or spill of materials.

- Cloudiness indicates suspended solids such as dust, ash, powdered chemicals, and ground up materials. Determine whether you use any of these materials and whether they are exposed to stormwater.

Clean up all sources of potential contamination, make changes to your control measures, and update your SWPPP, as necessary.

4.2 Evaluating Benchmark Monitoring Results

The analysis of your benchmark monitoring results can yield valuable information about the characteristics of your runoff and how well your control measures are working. Once you have received your lab results for your benchmark samples, compare these concentrations to the benchmark values that apply to your facility. The 2008 MSGP requires that you conduct four benchmark samples in your first year, and then compare the average value to the applicable benchmark. If the average concentration of your samples exceeds the benchmark, then you are required under the permit to evaluate whether changes to your control measures are necessary. See Parts 6.2.1.2 and 3.2. However, prior to the completion of the four samples, if one or more sample results makes an exceedance of the benchmark mathematically certain, you are required to conduct this evaluation without waiting for the results of the remaining benchmark samples.

Table 6 will help you decide a course of action depending on the results of your benchmark samples.

Table 6. Evaluation of Benchmark Monitoring Results

Does the average of your four quarterly benchmark samples for any pollutant exceed the applicable benchmark concentration? OR If you have not yet completed your four quarterly benchmark samples, does the total value of your samples already make an exceedance of the benchmark mathematically certain (e.g., the sum of the concentration of your samples exceeds four times (4X) the benchmark concentration)?	
YES	**NO**
You must evaluate whether modifications to the stormwater control measures used at your site are necessary. You will need to consider whether there is a problem in the selection, design, installation, and/or operation of applicable control measures. Follow the evaluation and corrective action process in Parts 3.2, 3.3, and 3.4. An exceedance of a benchmark does not necessarily mean that your control measures are insufficient. Continue reading below for additional items to consider as you proceed.	Sample results below benchmark limits provide an indication that your control measures are working as intended to minimize the discharge of pollutants. Although your samples indicate properly functioning control measures, you should continue to note changes to your site that may affect the quality of stormwater runoff, and to link such changes to your future monitoring results. You are still required to meet all requirements in the permit affecting the implementation and maintenance of your control measures, despite the good results of your benchmark monitoring.

If benchmarks were exceeded:

- Did you sample correctly?
    - Did you start with clean sample collection jars and were the samples preserved and submitted to the lab within the allotted time frame?
    - Did you properly sample the discharge flowing from the site or did you collect the sample from a low spot or stagnant pool?

- Was anything atypical going on at the site prior to or during the storm? Atypical activities could include:

  - A leak or spill that was not adequately cleaned up.
  - Construction, painting and paving activities.
  - Having a large amount of material (raw materials, wastes or products) recently delivered or being prepared for shipment.

- Did you observe anything during visual inspections that may have indicated that stormwater runoff would have been exposed to pollutants? If so, are control measures in place to address the pollutant sources?

The more the benchmark was exceeded, the greater your facility's problems may be, necessitating a more robust response. For example, if your results for TSS were over the benchmark value by a relatively small amount (e.g., TSS values of 110 to 150 mg/L, compared to the 100 mg/l benchmark level assigned to TSS), then simply performing additional housekeeping measures (e.g., frequent sweeping) may reduce the values below the benchmark of 100 mg/l by the next storm. However, an exceedance above 150 mg/l may warrant new or supplementary control measures (assuming your control measures are performing as designed) that more effectively reduce the potential for sediment in discharges (e.g., installing storm inlet filters, seeding / stabilizing disturbed areas, implementing dust and debris controlling procedures). TSS values exceeding benchmarks by orders of magnitude indicate a serious problem, and may require structural control measures (e.g., paving, installing berms around piles of loose material, placing operations under cover, placing grassy swales or basins in the discharge flow path to trap sediment).

Until your visual observations and sampling results show that pollutants are not found in your discharges or are present in concentrations below benchmark values, the pollution prevention team should engage in an iterative process in which control measures are selected, implemented, evaluated and modified until determined to be completely effective.

There may be circumstances where benchmark values cannot be reasonably achieved because of local natural background concentrations (see 2008 MSGP Part 6.2.1.2). In such cases, EPA allows for benchmark exceedances. For example, high natural background levels of iron in soils or groundwater could cause exceedances of a benchmark value. This provision exempts facilities from further control measure evaluation and benchmark monitoring when natural background levels are solely responsible for the exceedance of a benchmark value.

To make this determination, natural background pollutant concentrations must be greater than the corresponding benchmark value, and there is *no* net facility contribution of the pollutant (i.e., average concentration detected in runoff from all monitored outfalls over four separate events minus the average natural concentration of the parameter for four separate events does not exceed zero).

For example, if the natural background concentration of TSS from an undisturbed watershed is 200 mg/L, an exemption from further benchmark monitoring / control measure evaluation is available if the average of your four benchmark samples is equal to or lower than 200 mg/L. There are additional requisites for claiming a natural background level exemption, including documentation. Details of these are contained in the 2008 MSGP in Part 6.2.1.2 and the Fact Sheet.

4.3 Effluent Limitation Guideline Monitoring Results

What happens if your facility is subject to numeric effluent limits (for ELG compliance monitoring) and your stormwater sample exceeds the effluent limits for one or more parameters? Within 24 hours of receiving the lab report you must prepare a corrective action report, including:

- Identification of the condition triggering the need for corrective action review;
- Description of the problem identified; and
- Date the problem was identified.

Within 14 days of receiving the lab report, you must document the following information:

- Summary of corrective action(s) taken or to be taken;
- Notice of whether any modifications to your control measures and any related changes to your SWPPP are necessary as a result of this discovery or corrective action;
- Date corrective action initiated; and
- Date corrective action completed or expected to be completed.

You must submit these reports with your annual report and retain a copy onsite with your SWPPP

The 2008 MSGP requires that you conduct follow-up monitoring within 30 calendar days of implementing corrective actions (or during the next qualifying runoff event, should none occur within 30 days, see Part 3 of the 2008 MSGP). Monitoring must be performed for any pollutant(s) that exceeded the effluent limit. If the results from the follow-up monitoring exceed the effluent limit(s), you are required to submit an Exceedance Report to EPA no later than 30 after receipt of your lab results. The exceedance report must include:

- NPDES permit tracking number;
- Facility name, physical address, and location;
- Name of receiving water;
- Monitoring data from this and the preceding monitoring event(s)

- An explanation of the situation; what you have done and intend to do (should your corrective actions not yet be complete) to correct the violation; and
- An appropriate contact name and phone number.

In addition to preparing the Exceedance Report, you must continue to monitor, at least quarterly, until your stormwater discharge is in compliance with the effluent limits or until EPA waives the requirement for additional monitoring.

4.4 Specific Pollutants and Control Measure Options

All facilities need to gear their control measures toward their specific pollutants of concern, as determined by the materials and activities onsite. Below is a brief discussion of some of the most common pollutants and control measure options.

- **Total Suspended Solids (TSS)**. Small sediment particles are easily suspended and carried by surface water flows. These particles may be blown onto the site from unpaved areas within or adjacent to your facility as well as being tracked in on the tires of vehicles. Excess particles may be self-generated, particularly in the concrete, asphalt, scrap recycling, automobile salvage, and mining sectors. See the discussion above for control measure options for controlling TSS.

- **Oil and Grease.** Often, oil and grease may be observed as a film, sheen or discoloration on the top of a discharge or receiving water. But such a surface anomaly may not be obvious, in which case detection by a lab would be the only way. This could be a pollutant of concern for any facility, especially if there are exposed vehicles or equipment. Therefore, it is vital that due diligence regarding "reportable quantity" (RQ) spills or leaks be observed. Basically, an RQ for oil is any quantity of oil that causes a film, sheen or discoloration on a receiving water surface (and for which there are separate reporting requirements to regulatory agencies). If detected you must find the source and mitigate it. Start with the vehicle / equipment maintenance and storage areas or where shipping / receiving and the like are done. Above ground storage tanks and waste storage are other likely sources.

  Available control measures range from regularly monitoring these areas and applying an absorbent material (choose a bio-based absorbent like Nature's Broom, not a clay-based material) as soon as an oil leak or spill is observed. Consider coverage of and secondary containment for storage areas where oil or grease are stored, transferred or disposed of. An oil water separator downstream of the area(s) most likely to contain oil or grease could provide enough treatment to reduce oil and grease to acceptable levels in the discharge.

- **pH**. pH values below benchmark range indicate that acidic substances are exposed to stormwater. In this case you need to determine whether any of your industrial processes use acids and if so, where. Does your facility do plating, or are lead-acid batteries used or stored on-site? If acids are being used to clean parts, for example, where are the parts stored after being treated with the acid? Where are waste acids stored and how are they disposed? Which operations could expose acids to stormwater? Coal piles are also a source of acidified runoff.

  High pH values indicate that a base or alkaline material (such as lye) is exposed to stormwater. Cement and some cleansers can produce high pH values.

  Control measures applicable to controlling pH include housekeeping (sweeping and cleaning areas where materials that affect pH could be exposed to stormwater); overhead coverage and disposal of waste materials in covered receptacles. Low or high pH runoff can be collected and neutralized by adding an appropriate agent to neutralize pH values to the 6.0 – 9.0 range. Alternatively, flow can be directed to come in contact with a neutralizing substance (e.g., acidic coal pile runoff directed to flow through a limestone channel).

- **Chemical Oxygen Demand (COD)**. COD is the amount of dissolved oxygen in water consumed by the chemical breakdown of organic and inorganic matter (i.e., COD is not a specific component in the discharge). Therefore, a high COD value indicates elevated quantities of pollutants in runoff, especially carbon. Examples of facilities that handle materials which could cause high COD levels include the wood and paper product industries. Control measures applicable to controlling COD levels are the basic stormwater ones: good housekeeping and covering materials with the potential to allow carbon or other organic materials to be carried by stormwater.

- **Metals.** Metals originate from many sources and consequently a number of industries must monitor for metals, including facilities such as wood preservative and agricultural chemical makers, mines, and foundries. Depending on a facility's activities, metals can be found in a dissolved form and/or adsorbed to particles or sediment. It is because both the dissolved and particulate forms can occur at the same time is why stormwater discharges are analyzed for "total recoverable metals." After identifying those operations that could expose stormwater to metals sources, implement control measures capable of reducing metals concentrations, including good housekeeping (sweeping and disposing of metal wastes in covered containers), covering / shielding operations, and directing run-on away from any critical outdoor areas. Ion exchange techniques can also be employed to remove dissolved metals.

5. Record-Keeping and Reporting

It is important that accurate record-keeping of monitoring activities become a standard operating procedure at your facility. You need to be able to show that monitoring and sampling events not only meet all permit requirements, but are defensible and abide by all QA/QC procedures. It is always preferable to document too much as opposed to too little when dealing with any sort of permit compliance. Create easy to use log books for keeping track of rain events. Be sure that your site map is up to date and easy to understand. Develop simple instruction sheets for recording sampling, visual assessments, or other monitoring activities. The instructions should be kept in logical locations (e.g. in sample kits, in the SWPPP notebook) and updated as needed.

When possible, use standardized forms such as those provided in the appendices of this monitoring guide to record your monitoring activities. This will provide consistency in information reported. Example forms are provided in this guide in Appendix A (2008 MSGP Industrial Stormwater Monitoring Form), Appendix B (2008 MSGP Visual Monitoring Form), and Appendix C (2008 MSGP Industrial Stormwater Collection Form).

If possible, regularly transfer sampling records and sample results into databases or spreadsheets. This will provide back-up records for hard-copy logs or forms as well as providing an easy way to analyze your sampling data.

5.1 Reporting Monitoring Data

Each state industrial stormwater permit has different requirements for how monitoring data should be reported. Facilities subject to EPA's 2008 MSGP must submit to EPA all monitoring data collected no later than 30 days after receiving complete lab results for all monitored outfalls. You must submit even if your facility is reporting "no discharge" or a change in status from "active and staffed" to "inactive and unstaffed."

Facilities must use the online eNOI system (www.epa.gov/npdes/eNOI) to report results. EPA's Electronic Notice of Intent (eNOI) system is an online electronic permit application system that enables stormwater entities to submit NOI forms to EPA. eNOI also allows registered eNOI users to report discharge monitoring data and submit annual reports and other reporting information to EPA.

If you cannot access eNOI, the paper MSGP Discharge Monitoring Report (MDMR) reporting form (available at www.epa.gov/npdes/stormwater/msgp) can be submitted to the appropriate address identified in the 2008 MSGP (Part 7.6.1).

Even if you submit monitoring data via eNOI, the paper MDMR form can help ensure you have the information you need to complete all the required fields. Rather than go line by line through the MDMR, which the instructions do, this Guide will highlight the information needed to fill out the MDMR.

You will need the following information to submit monitoring data via eNOI and complete the MDMR, at a minimum:

1. Permit tracking number
2. The facility SWPPP

3. Monitoring records
4. Lab reports
5. Corrective actions

Permit Tracking Number – The permit tracking number is a unique identifier assigned to your facility by EPA. EPA tracks report submittals using the Permit Tracking Number rather than facility name or address. Thus, if you do not include the Permit Tracking Number you may not get credit for submitting the MDMR.

Facility SWPPP – The facility SWPPP includes several pieces of information needed for the MDMR, including:

- The number of stormwater outfalls.
- Which, if any, of the outfalls discharge substantially identical effluents.
- Alternative monitoring periods, if the facility is located in an area of irregular stormwater runoff.

Monitoring Records – Detailed monitoring records will make completing the MDMR easier. As previously discussed, monitoring records must include:

- The date(s) of all monitoring events during the MDMR reporting period.
- Any stormwater outfalls that did not have a discharge during the MDMR reporting period.
- Whether the discharge resulted from rainfall or snowmelt.
- The duration of the storm event.
- The number of inches of rainfall from the monitored storm event(s).
- The number of days since the previous measurable storm event, which may or may not be the previous *monitored* measurable storm event.

Lab Reports – The lab will provide a detailed report with the results of your stormwater analyses and detailed QA/QC data to verify that the results are accurate. For each parameter the lab will typically report one of three results to be reported on the MDMR.

1. The measured concentration to be compared against the benchmark or effluent limitation guideline.
2. BQL or below quantitation limit means that the parameter is present at some amount greater than zero but less than the quantitation limit but the method used is not precise enough to give an exact concentration. Report BQL and the numeric quantitation limit on the MDMR.
3. ND or not detected means that the parameter was not detected in the sample. Report ND and the detection limit on the MDMR. Note that the ND level is typically three to five times less than the quantitation limit.

Other lab reports you may need include receiving water hardness results if any of your required parameters are hardness dependent, and data on natural background pollutant levels if you are claiming that an exceedance of a benchmark limit is due to natural background conditions.

Corrective Actions – The 2008 MSGP requires you to implement corrective actions if the lab report indicates an exceedance of one or more numeric effluent limits or if the average of four quarterly samples exceeds the applicable benchmark. You must document discovery of effluent limit(s) or

benchmark concentration(s) exceedances within 24 hours of receiving the lab report, including the condition triggering the need for corrective action review; a description of the problem; and the date the problem was identified. Within 14-days of receiving the lab report you must summarize the corrective action that was taken or will be taken, including a description of the corrective action; start and end dates; and whether the SWPPP will be modified. You can submit the corrective action report(s) via eNOI or along with the paper MDMR form.

6. Train Personnel

You must train your stormwater pollution prevention team in the proper procedures for sample collection, visual assessments, tracking and reporting. Trainings should be held regularly to update staff on any permit or SWPPP changes. New employees that become members of the stormwater pollution prevention team should be trained in general stormwater awareness as well as the following monitoring-specific topics:

- How to anticipate a measurable storm event.
- Where to monitor.
- How to collect and document the collection of stormwater samples including the assembling of "field blank" samples.
- How to perform and document visual assessments.
- How to handle and send the samples to the lab.
- How to interpret the results.
- How to keep accurate and complete records and report appropriate information to the permitting authority.

7. References

APHA (American Public Health Association). 1998. *Standard Methods for the Examination of Water and Wastewater, 20th Edition*. American Public Health Association, 20th Edition.

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USEPA (U.S. Environmental Protection Agency). 1992. *NPDES Storm Water Sampling Guidance Document*. EPA 833-8-92-001. U.S. Environmental Protection Agency, Office of Water, Washington D.C.

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Appendix A – 2008 MSGP Industrial Stormwater Monitoring Form

MSGP Industrial Stormwater/Snowmelt Monitoring Summary Form

Name of Facility:

Address:

Permit Tracking Number:

Pollutants to sample (Method)

Benchmark Levels and ELGs

Industry Sector	Pollutant	Benchmark Level	ELG		
			Daily Max	Monthly Average	Instant Min/Max

Sample Summary

Outfall Identifier	Industry Sector (SIC)	Basis	Frequency	Timing

Appendix B – 2008 MSGP Visual Monitoring Form

MSGP Quarterly Visual Assessment Form

(Complete a separate form for each outfall you assess)

Name of Facility:		Permit No.:		
Street Address:		City:	State:	Zip Code:
Outfall Number:	"Substantially Identical Outfall"? □ No □ Yes (identify substantially identical outfalls):_____			
Quarter/Year:	Substitute Sample?: □ No □ Yes (identify quarter/year when sample was originally scheduled to be collected):			
Person(s)/Title(s) collecting sample:				
Person(s)/Title(s) examining sample:				
Date & Time Storm or Snowmelt Began:	Date & Time Sample Collected: _____	Date & Time Sample Examined: _____		
Nature of Discharge: □ Rainfall □ Snowmelt				
Rainfall Amount: inches	Previous Storm Ended > 72 hours Before Start of This Storm? □ Yes □ No* (explain):			
Parameter				
Color	□ None □ Other (describe):			
Odor	□ None □ Musty □ Sewage □ Sulfur □ Sour □ Petroleum/Gas □ Solvents □ Other (describe):			
Clarity	□ Clear □ Slightly Cloudy □ Cloudy □ Opaque □ Other (describe): _____			
Floating Solids	□ No □ Yes (describe):			
Settled Solids**	□ No □ Yes (describe):			
Suspended Solids	□ No □ Yes (describe):			
Oil Sheen	□ None □ Flecks □ Globs □ Sheen □ Slick □ Other (describe): _____			
Foam (gently shake sample)	□ No □ Yes (describe):			
Other Obvious Indicators of Storm Water Pollution	□ No □ Yes (describe): _____			

* The 72-hour interval can be waived when the previous storm did not yield a measurable discharge or if you are able to document (attach applicable documentation) that less than a 72-hour interval is representative of local storm events during the sampling period.

** Observe for settled solids after allowing the sample to sit for approximately one-half hour.

Sampling not performed due to adverse conditions: □ No □ Yes (explain): _____

_____

Sampling not performed due to no measurable storm event occurring that resulted in a discharge during the monitoring quarter:
□ No □ Yes (explain): _____

Detail any concerns, additional comments, descriptions of pictures taken, and any corrective actions taken below (attach additional sheets as necessary).

Certification by Facility Responsible Official (Refer to MSGP Subpart 11 Appendix B for Signatory Requirements)

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 gathered and evaluated 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.

A. Name _____ B. Title _____

C. Signature_____ D. Date Signed_____

Appendix C – 2008 MSGP Industrial Stormwater Collection Form

MSGP Industrial Stormwater/Snowmelt Discharge Collection Form

Name of Facility:

Address:

Person(s)/Title(s) collecting sample:

Permit Tracking Number:

Outfall Numbers/Sample Locations:

Discharge Information

Nature of Discharge (circle one): Rainfall or Snowmelt

Rainfall Amount (inches):

Date of Discharge Sampling:

Date & Time Storm Began:

Date & Time Storm Ended:

Date & Time of Previous Measurable Storm Event:

Sample Collection Information

Date & Time Sample Collection Began:

Date & Time Sample Collection Ended (if different):

Shaded area for laboratory use only

Date	Time	Sample Identification/Outfall	Preservative (Y/N)	Number of Containers	Type of Analyses Required								Collection Method	Laboratory Log Number

Sampled by: (*signature*)	Date/Time:	Relinquished by: (*signature*)	Date/Time:	Received by: (*signature*)	Date/Time:
Received by: (*signature*)	Date/Time:	Received by: (*signature*)	Date/Time:	Received by: (*signature*)	Date/Time:

The 72-hour interval can be waived when the previous storm did not yield a measurable discharge or if you are able to document (attach applicable documentation) that less than a 72-hour interval is representative of local storm events during the sampling period.

Detail any concerns, additional comments, descriptions of pictures taken, and any corrective actions below (attach additional sheets as necessary).

Certification by Facility Responsible Official (Refer to MSGP Subpart 11 Appendix B for Signatory Requirements)

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 gathered and evaluated 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.

A. Name____ B. Title____

C. Signature____ C. Date Signed____