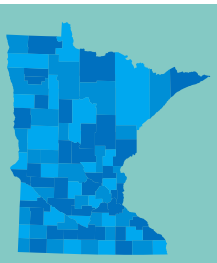
Water quality

June 2026

Industrial Stormwater Monitoring Guidance Manual

For Minnesota's Industrial Stormwater Multi-Sector General Permit.

MINNESOTA POLLUTION CONTROL AGENCY



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Contents

Introduction

This guidance document outlines suggested stormwater monitoring procedures to help keep industrial facilities in compliance with the requirements of the Minnesota Pollution Control Agency's (MPCA) Industrial Stormwater Multi-Sector General Permit (ISW General Permit). The ISW General Permit can be found on the MPCA's webpage — https://www.pca.state.mn.us/business-with-us/industrial-stormwater.

This guide will lead you through the necessary steps to complete your sampling, monitoring, and reporting requirements.

Why monitor?

Stormwater monitoring is necessary to identify industrial pollutants that have entered surface or groundwater through stormwater runoff from an industrial facility. The monitoring results indicate if the best management practices (BMPs) implemented at the Permittee's facility are working effectively to filter or remove industrial pollutants from stormwater runoff.

Any necessary changes to BMPs indicated by the monitoring results enable the facility to develop and implement or update an effective Stormwater Pollution Prevention Plan (SWPPP).

Who needs to monitor?

Stormwater monitoring is required for Permittees whose facilities, whether publicly or privately owned, have stormwater discharges as described in 40 Code of Federal Regulations (C.F.R.) 122.26(b)(14)(i-ix and xi, except x) which specifies ten categories of regulated industry. These ten industrial categories are further categorized into twenty-nine sectors based on Standard Industrial Classification (SIC) code or narrative activity.

If a facility has one of the regulated SIC codes or listed narrative activities, monitoring of the stormwater runoff from the facility is required.

In addition, the 2025 – 2030 ISW General Permit requires permitted facilities in certain industries operating under SIC codes associated with per- and polyfluoroalkyl substances (PFAS), to monitor for PFAS in their stormwater runoff or snowmelt. To determine if your facility needs to monitor for PFAS, refer to *Part XI. Per- and Polyfluoroalkyl substances (PFAS) monitoring and reporting requirements* and *Appendix D. Primary SIC codes that require per- and polyfluoroalkyl substances (PFAS) monitoring and PFAS monitoring parameters* in the 2025 – 2030 ISW General Permit. For more information about PFAS and stormwater, please visit the Industrial stormwater and PFAS webpage - https://www.pca.state.mn.us/business-with-us/industrial-stormwater-and-pfas.

What do I need to monitor?

All Permittees are required to conduct Benchmark Monitoring. Additionally, there are certain industrial activities within eight different industrial sectors which are also required to conduct effluent limit monitoring.

A facility may be required to conduct benchmark monitoring, effluent monitoring, or both.

The type of monitoring required and the parameters to test for can be found in *Appendix B. Sector-specific benchmark values and effluent limits* section of the ISW General Permit. The sampling parameters are tailored to the industrial activities and materials present at the facility.

Benchmark monitoring

Benchmark monitoring is required on a calendar quarter basis beginning the first calendar quarter following the date the facility received ISW General Permit coverage. For example:

- If permit coverage begins during April 2026, the first monitoring quarter would be from July 1 to September 30, 2026.
- If the permit coverage begins during August 2026, the first monitoring quarter would be from October 1 to December 31, 2026.

Once four separate quarters of results are obtained, the Permittee averages the results and compares the resulting value(s) to the benchmark monitoring values listed for their facility in the ISW General Permit for each parameter they are required to monitor. If an averaged value exceeds the permit benchmark value, the Permittee must make corrections or additions to the BMPs and continue quarterly sampling until the average values are below the permit benchmark monitoring values. Similarly, if any single sampling result (or the averaged value within a quarter) meets or exceeds the applicable benchmark value by four times or greater, it is considered an exceedance of the benchmark value and the steps required after a benchmark value exceedance is also required.

This adaptive management strategy is designed to help improve stormwater runoff quality.

Benchmark monitoring exceedances are not a permit violation; however, failure to make adaptive BMP corrective action **is** a permit violation.

Effluent limit monitoring

Effluent limit monitoring is required by the federal Clean Water Act for certain industrial sectors based on the pollutants present in their industrial materials or activities.

There are seven industrial subsectors with effluent limit monitoring requirements:

- Subsector A4: Facilities with discharges from wet deck storage areas
- Subsector C1: Phosphate fertilizer manufacturing facilities
- Subsector D2: Asphalt emulsion facilities
- Subsector E3: Cement manufacturing facilities
- Subsector K2: Discharges from hazardous waste landfills subject to effluent limitations in 40 C.F.R. pt. 445, subp. A
- SubsectorL3: Any landfill that discharges to surface water(s), stormwater that has directly contacted solid waste (pursuant to 40 C.F.R. pt 455, subp. B)
- Subsector O3: Steam electric generation facilities with coal storage piles

Effluent limit monitoring differs from benchmark monitoring in two major areas:

- Effluent limit monitoring is required twice per year, for the entirety of the permit cycle. The two samples need to be collected at least 30 days apart, at each effluent monitoring location.
- An exceedance of the effluent limit values listed in the permit **is** a permit violation.

If an effluent limit monitoring exceedance occurs, the Permittee:

- shall immediately make every effort to verify the exceedance by collecting additional samples
- shall immediately investigate the cause of the exceedance and take action to prevent further violations
- shall modify the SWPPP and document all corrective actions necessary to meet the applicable effluent limit
- shall conduct follow-up monitoring within 30 calendar days (or during the next qualifying runoff event, should none occur within 30 days) of implementing modified corrective actions

Violations posing a threat to human health, the drinking water supply, or represent a significant risk to the environment shall be immediately reported to the Minnesota Department of Public Safety Duty Officer at 800-422-0798.

When do I sample?

Choosing the correct stormwater runoff event

The Permittee can sample at any time during their monitoring quarter provided there is enough stormwater runoff to collect a sample.

The sample should be taken within thirty minutes of when the stormwater runoff begins. It is not necessary to collect samples outside the facility's normal operating hours, but the Permittee can choose to do so.

The Permittee may take more than one sample during their monitoring quarter, provided there have been at least 72 hours with no rainfall or snowmelt between sampling events.

There may be times when the rainfall tapers off during the sampling event, preventing collection of an adequate sample. If this occurs, try another sampling time during the quarter.

There may also be times when it's not possible to get to the facility within the first 30 minutes of the start of a runoff event. When this occurs, finish collecting the sample and indicate the late collection on the Stormwater Monitoring Report (SWMR) submitted to MPCA.

Winter thaw sampling

Winter monitoring is included in the quarterly benchmark monitoring timeframes as thawing of the snowpack during warmer winter weather has the potential to carry significant amounts of accumulated pollutants offsite in the meltwater.

Winter thaws of snow usually occur when the temperature is at 32° F or higher for two or more days.

What if I can't collect a sample?

There may be occasions when Permittees are unable to obtain a sample.

If a sample cannot be collected, the Permittee must report on the SWMR that no samples were collected and explain the reason(s) why. The SWMR must still be submitted by the 21st day of the month following the end of each monitoring period electronically via e-Services.

The Stormwater Monitoring Report must be submitted, even if a sample was not collected.

Where do I take samples?

A facility may have more than one monitoring location, depending on how many areas of industrial materials or activities are exposed to stormwater.

Permittees are required to have a minimum of one benchmark or effluent limit monitoring location.

Common monitoring locations include stormwater drain inlets, parking lot runoff (sheet flow), ditches, and other low spots.

Benchmark monitoring location selection

The benchmark monitoring location(s):

- are located on the facility property
- receive discharge from an area of the facility's industrial activities, processes, and significant materials
- are down-gradient of the final BMP and where stormwater runoff leaves the Permittee's property
- are in locations that minimize or eliminate stormwater run-on from offsite sources
- yield a sample that best represents the pollutants the Permittee is required to monitor

Representative benchmark monitoring

It may be possible to collect a sample at one benchmark monitoring location that represents multiple locations on the facility property.

In order to designate representative benchmark monitoring locations, the stormwater discharges must be 'substantially similar'. Substantially similar means the activities and exposure are the same, the BMPs are the same, the pollutants are the same, the topography of the drainage area is similar and the receiving waters are similar. If any of the above listed criteria are not substantially similar, then multiple monitoring locations must be designated.

Modifying benchmark monitoring locations

It may be possible to modify chosen monitoring location(s), provided the monitoring results from the location(s) are not exceeding benchmark values.

Any change in monitoring location will result in a new monitoring calendar, any existing monitoring results become invalid, and the facility will begin new quarterly monitoring cycles beginning the next calendar quarter after the location change was approved.

A new location may be chosen provided the new location is:

- more representative of facility activities
- in a safer location
- in a location that is physically easier to collect samples

To modify a benchmark monitoring location(s), the Permittee shall complete a permit modification application via e-Services. Modifying a monitoring location is considered a coverage modification and will require a permit modification fee of $400.

Permittees who are currently exceeding benchmark values and are considering relocating monitoring locations must discuss with MPCA staff prior to submitting a permit application for modification.

Effluent limit monitoring location selection

The effluent monitoring location(s):

- are located on the facility property
- are immediately below the most down-gradient BMP and prior to where the discharge comingles with stormwater from other sources
- receive discharge from an area of industrial activities, processes, and significant materials
- yield a sample that represents the contribution of the pollutants the Permittee is required to monitor

Some circumstances may allow the Permittee to use the same monitoring location to collect both benchmark monitoring and effluent limit monitoring samples. Further guidance with identifying benchmark monitoring and effluent monitoring locations can be found in the Industrial stormwater benchmark and effluent monitoring location diagrams guidance document, located on the MPCA's webpage – https://www.pca.state.mn.us/business-with-us/industrial-stormwater-guidance.

Sample testing laboratories and sampling equipment

Choosing and notifying testing laboratories

The Permittee should contact the laboratory well before the first sampling quarter begins. The laboratory can provide the necessary sampling equipment and chemical preservatives based upon the parameters the facility is required to monitor for, as well as helpful information about sample shipping and manifest tracking.

Using a Minnesota Department of Health-certified laboratory located nearest to your facility's location for the sample analyses may help ensure hold times are not exceeded. A list of statewide certified laboratories is available at https://eldo.web.health.state.mn.us/public/accreditedlabs/labsearch.seam;jsessionid=4A25FA6501E127B56B84F1252B6D95BF?cid=2435

All samples must be collected and analyzed in compliance with 40 C.F.R. § 136.3. Contact your laboratory for more information on sample collection, preservation and analysis for each parameter you are required to monitor.

Sampling equipment

Contact the laboratory in advance to see what materials are needed for the samples you are required to collect. In many cases, the laboratory can supply the sampling containers and preservatives. A sampling equipment checklist can be found in Appendix B of this manual.

Basic sampling equipment

- sample containers of different volume amounts
- preservatives for certain samples
- waterproof labels, sampling notebook, pens
- laboratory paperwork
- rain and safety gear
- eye wash bottle
- paper towels
- powder-free disposable nitrile or latex gloves
- new resealable gallon plastic bag(s)
- pH meter if required to sample for pH (do not use Litmus paper)
- cooler with ice
- chain of custody (COC), provided by your laboratory

How do I collect my samples?

Samples should be collected within the first 30 minutes of measurable runoff. Measurable runoff is any runoff sufficient in volume to collect a stormwater sample at a monitoring location.

A sampling checklist in Appendix B of this manual is available and can be updated as needed for each facility. For more sampling information, please refer to the MPCA's ISW Sampling webpage — https://www.pca.state.mn.us/business-with-us/step-7-sampling.

Most stormwater sampling will be done by hand or using a bottle-pole collector to safely collect the sample. Any of the sampling options listed below may be used; the selection will depend upon which is best-suited for the monitoring location.

Pipe or grab sampling

If stormwater is being discharged through a pipe, collect the sample as it falls from the end of the pipe. If necessary, the bottle can be attached to a pole to reach the sampling point.

MPCA water monitoring photo. *Photo courtesy of Minnesota Pollution Control Agency.*

Hold the bottle with the opening facing upstream and submerge the bottle into the main part of the flow. Do not overfill sampling bottles.

Manhole sampling

If a sample is being collected from a manhole or an inlet to a municipal storm drain, remember to contact the municipality before sampling.

Never enter a manhole unless you are trained to enter confined spaces by OSHA.

Sample the flow with a bottle-pole collector or obtain samples above ground by placing the sample bottle in the runoff stream. Do not scrape the bottle against the sides or bottom of the pipe. Ensure the collection location is not receiving run-on from sources outside of your permitted facility.

Ditch or swale sampling

Stormwater samples can be collected from ditches or swales provided they are only conveying the facility's stormwater. (e.g., no offsite or up-gradient run-on).

The sample can be collected by placing the opening of the bottle upstream into the stormwater flow. Do not scrape the bottle against the sides or bottom of the ditch or swale.

Sheet flow sampling

Sheet flow sampling is used to collect stormwater samples from impervious surfaces such as parking lots by concentrating the stormwater flow to enable adequate sample collection. To concentrate sheet flow, install a barrier device to intercept and redirect the stormwater flow to a collection area. Barriers can be

permanent or temporary, and can include berms, troughs, or gutters. The MPCA's short video "How to Collect a Sheet Flow Sample" outlines the easy steps to accomplish this – http://www.youtube.com/watch?v=AmEJUNp44aU.

Stormwater detention pond sampling

Stormwater detention ponds are designed to hold large volumes of storm water for a certain period of time before discharging it. The sample must be collected within 30 minutes of when the pond begins to discharge.

Please refer to Appendix C of this manual for other sampling options.

Sampling for pH

Only Permittees with pH as a monitoring parameter need to sample for pH. Permittees can review their SWMR, or *Appendix B. Sector-specific benchmark values and effluent limitations* of the ISW General Permit to determine if pH is a sampling requirement.

To measure pH in the field, use of a calibrated pH meter is required. Test strips such as litmus paper are not an approved sampling and analysis method and cannot be used.

Make sure the pH meter is calibrated before use. Permittees should consult directions from the manufacturer on calibration and use of the pH meter before taking samples. All onsite analysis records including pH meter calibration records must be maintained within the SWPPP.

How do I report sampling results?

Benchmark monitoring and effluent limit monitoring sampling results must be reported electronically via e-Services. SWMRs are due the 21st day of the month following the reporting period (either quarterly for benchmark monitoring or annually for effluent limit monitoring).

A SWMR is required to be submitted every monitoring period, even if samples were not collected. If a sample was not collected, the SWMR shall be submitted with the "No Sample Taken" option selected and a comment describing why a sample was not collected. If a facility conducts more benchmark sampling than required in the monitoring period, all sampling results from the monitoring period must be averaged and submitted on the SWMR. Effluent limit samples are not necessarily able to be averaged within a reporting period. Effluent limited parameters must be reported based on the limit type in the permit. Be sure to check which limit type is listed for each effluent limited parameter you are reporting.

Once four quarters of benchmark monitoring has been completed and the four-quarter average is less than the benchmark value, monitoring for these parameters ceases and SWMRs are not required to be submitted during the remainder of the permit cycle for benchmark monitoring. Effluent limit monitoring is continuous throughout the permit cycle and results are required to be submitted as long as the permit is effective.

For more information on how to set up an e-Services account and how to submit SWMRs via e-Services, please visit the MPCA's ISW sampling webpage — https://www.pca.state.mn.us/business-with-us/step-7-sampling.

Adjusting values for water hardness

For information about adjusting a limit for hardness, please see *Appendix C. Calculating hardness in discharge waters for hardness dependent metals* of the ISW General Permit. If the facility meets these requirements, the facility can submit the relevant information in the permit application service. Once the MPCA receives the information via the permit application, the benchmark values for the facility will be modified and reflected in the Notice of Coverage issued to the Permittee. All hardness data collected must be retained with your SWPPP on site.

Appendix A: Monitoring waivers

There are three different monitoring waivers available to facilities.

- General Benchmark Monitoring Waiver
- Run-on Demonstration Waiver
- Natural Background Pollutant Waiver

The waivers are only applicable to benchmark monitoring; they cannot be used for effluent monitoring.

Permittees can only submit an Industrial Stormwater Waiver Request Form to MPCA with a permit application and a $400 permit application fee via e-Services. The waiver must be approved by the MPCA in writing prior to ceasing benchmark monitoring. The Permittee must document the waiver use in the facility SWPPP.

1. General Benchmark Monitoring Waiver

This waiver is applicable if a facility utilizes infiltration devices or stormwater ponds as treatment options. The infiltration devices or stormwater ponds must be designed and constructed to the standards described in Part VI of the ISW General Permit.

Some industrial sectors and sub-sectors are prohibited from utilizing this waiver. These are:

- Sub-sector A2: Wood Preserving
- Sector K: Hazardous Waste Facilities
- Sub-sector M1: Auto Salvage Yards
- Sub-sector N1: Scrap Recycling Facilities
- Sector S: Air Transportation Facilities

Permittees should review Part VIII Sector-specific Requirements in the permit to determine whether the facility is allowed to utilize the general benchmark monitoring waiver.

2. Run-on Demonstration Waiver

If stormwater flowing onto a facility's property causes an exceedance of benchmark monitoring values for the Permittee, a Run-on Demonstration Waiver may be allowed.

It is the Permittee's responsibility to demonstrate the following:

- The run-on cannot be diverted.
- The run-on has caused the benchmark value exceedance.
- There is no reasonable way to separate the run-on from the facility's stormwater discharge.

Criteria to be considered when demonstrating applicability for the run-on waiver include:

- Sampling a minimum of four different storm events to demonstrate run-on over a full sampling year.
- Employing standard methods for determining flows found in engineering handbooks.
- Digital photos of up-gradient and down-gradient discharges.

If the Run-on Demonstration Monitoring Waiver is granted, the facility SWPPP must contain a narrative description of the run-on by including the following:

- The nature of the run-on and description of the adjacent property.
- Dates and lab results of samples taken.
- A statement that run-on is directly affecting a particular monitoring location.
- Efforts taken to divert or minimize the run-on.
- Calculations used to demonstrate waiver applicability.
- Any other pertinent information.

If the run-on waiver is granted, all appropriate sections of the SWMR must still be completed and submitted to MPCA.

To obtain the Run-on Demonstration Waiver, the Permittee must submit the Industrial Stormwater Waiver Request along with documentation of the items identified above to the MPCA via an e-Services permit application along with the $400 application fee. The MPCA may disallow the waiver if it finds the documentation inadequate.

Stormwater Run-on Waiver example:

For this example, a calculation will be used to determine if a permittee is eligible for the run-on waiver due to upstream Total Suspended Solids (TSS) contributions. The following equations will be used:

(1) $F_T = F_U + F_F$

(2) $L = C \times F$

(3) $L_T = L_U + L_F = C_T F_T = C_U F_U + C_F F_F$

Where:

- *F_T=Total Flow (Down-gradient)*
- *F_U=Upland Flow (Up-gradient run-on)*
- *F_F=Facility Flow*
- *C_T=Total Concentration (Down-gradient)*
- *C_U=Upland Concentration*
- *C_F=Facility Concentration*
- *L_T=Total Load (Downgradient)*
- *L_U=Upland Load (Upgradient)*
- *L_F=Facility Load*

Before calculating the impact of the run-on, the facility must attempt to prevent co-mingling of upstream stormwater run-on with facility discharges. If this is possible, the run-on waiver is not applicable. If this is not possible, proceed to Step 1.

1. Measure the concentration of up-gradient run-on, C_U, and down-gradient runoff, C_T, by collecting at least four samples during separate storm events and averaging the results. In order to qualify for the waiver, the average run-on concentration must exceed the benchmark value. If C_U does not exceed the benchmark, the Permittee does not qualify for the waiver.

In this example, the Permittee took four samples; the average of C_U exceeded the TSS benchmark of 100 mg/L, so the Permittee can continue with the calculation.

	C_U (mg/L)	**C_T (mg/L)**
Sample 1:	180	120
Sample 2:	201	134
Sample 3:	220	175
Sample 4:	203	152
Average:	201	145

2. At the same time the concentration samples are taken, flows need to be measured for up-gradient run-on, F_U, and down-gradient runoff, F_T. The flow can be measured in any standard unit for flow (e.g. cubic feet per second, cubic meters per second, etc.) but be careful to use the same units for all of the data points and all calculations.

In this example, flows were reported in cubic feet per second (ft^3/s). Add all of the flows; then subtract total F_U from total F_T to get the total flow generated by the facility, F_F.

	C_U (mg/L)	**C_T (mg/L)**
Sample 1:	0.2	0.6
Sample 2:	0.3	0.6
Sample 3:	1.1	1.4
Sample 4:	0.8	1.1
Sum of Flows:	2.4	3.7
$F_F = F_T - F_U = 3.7 ft^3/s - 2.4\ ft^3/s = 1.3\ ft^3/s$		

3. Calculate the load for each upland and down-gradient sample by multiplying the measured flow and concentration. This will yield a load in units of mg/L-ft^3/s.

Add all of the loads for L_U and L_T; then subtract total L_U from total L_T to get the load generated by the facility, L_F.

	$L_U = C_U \times F_U$ (mg/L-ft^3/s)	**$L_T = C_T \times FT$ (mg/L-ft^3/s)**
Sample 1:	[180mg/L x 0.2 ft^3/s] = 36	[120mg/L x 0.6 ft^3/s] = 72
Sample 2:	60	80
Sample 3:	242	245
Sample 4:	162	167
Sum of Flows:	500	564
$L_F = L_T - L_U$ = 564 mg/L-ft^3/s - 500 mg/L-ft^3/s = 64 mg/L-ft^3/s		

4. The facility load, L_F, is then divided by the facility flow, F_F, to obtain concentration, C_F. C_F is then compared to the Benchmark value.

Total Suspended Solids (TSS) Permit Benchmark Value = 100 mg/L
$C_F = L_F/F_F$ = 64 mg/L-ft^3/s / 1.3 ft^3/s = 49.2 mg/L
49.2 mg/L < 100 mg/L

Criteria			Example Values			Meets Criteria?
C_T	>	Benchmark Value	145 mg/L	>	100 mg/L	Yes
C_U	>	Benchmark Value	201 mg/L	>	100 mg/L	Yes
C_U	>	C_F	201 mg/L	>	49.2 mg/L	Yes
C_F	<	Benchmark Value	49.2 mg/L	<	100 mg/L	Yes

This facility meets the criteria and therefore qualifies for the Run-on Demonstration Waiver.

3. Natural Background Pollutant Waiver

There may be situations where the natural background concentrations for a benchmark monitoring parameter are unusually high at a permitted facility. The high concentration may be a result of geology, soil conditions, or natural characteristics of the stormwater before it contacts the Permittee's materials and activities. As these background levels are naturally occurring, not the result of industrial activities, the facility may qualify for a Natural Background Pollutant Waiver for some monitoring parameters.

Natural background pollutants do not include contaminated precipitation, legacy pollutants from earlier activity on the site, or pollutants found in run-on from neighboring sources that are not naturally occurring. Natural background parameters could include metals derived from natural mineral deposits and nutrients attributable to background soil, vegetation or wildlife sources.

To apply for this waiver, the Permittee must be able to demonstrate that benchmark levels would have been met if the background pollutant was not present. If the Permittee qualifies for the natural background pollutant waiver, the Permittee will not be required to monitor for the background pollutant causing the exceedance.

A reference site shall be used to demonstrate natural background conditions are causing sampling parameter exceedances. Pollutant concentration in stormwater runoff from a local, non-human impacted site will need to be used as a reference point. This can be done by an evaluation of the following:

- Ambient monitoring data at the reference site using the same sample collection, preservation and analysis methods as required for benchmark monitoring.
- Information from peer-reviewed publications.
- Data from a local, state, or federal government publication specific to runoff or stormwater in the immediate region.

Studies from different geographic areas or based on different topographies or soils cannot be used as ambient monitoring data. When no data are available and there are no known sources of the pollutant, the background concentration should be assumed to be zero.

Historic monitoring data may be used to calculate natural background values, but if the site is no longer accessible or no longer meets reference site acceptability criteria, documentation such as historic land use maps must be included to show:

- There was no human activity on the site at the time the historic data were collected.
- The site did meet reference site criteria prior to becoming inaccessible.

To qualify for the Natural Background Waiver:

1. Determine the natural background concentration of each sampling parameter using
    a. Ambient monitoring
    b. Information from peer-reviewed publications
    c. Local, state, or federal government published data specific to stormwater runoff in the immediate region
    d. Historic monitoring data
2. Collect a minimum of four benchmark samples over the course of at least one year:
    a. Calculate the average concentration.
    b. Compare the average concentration to the natural background concentration.
3. Subtract the natural background concentration value from the averaged concentration value:
    a. If the resulting value is less than the permit benchmark value, the facility can apply for the Natural Background Waiver.

If the Natural Background Pollutant Waiver is granted, the following must be kept onsite with the facility's SWPPP:

- Data, including literature studies, describing the levels of natural background pollutants in the facility stormwater discharge include:
    - Documentation from at least four separate sampling events.
    - Dates, locations, and lab reports of all samples taken.
    - Any previously collected data which supports the claim.
    - Calculations used to determine waiver applicability.
- A map with elevations showing the reference site location in relation to the facility.
- Photographs showing land cover information and site vegetation.
- Reference site geology and soil information.
- Reference site reconnaissance survey data indicating roads, outfalls, or other human-made structures.
- Records from relevant state or federal agencies indicating no known mining, forestry, or other human activities upstream of the reference site during the time the record collection occurred.
- The rationale used for determining the exceedances were caused by natural background pollutant levels.
- An explanation of why the presence of the pollutant causing the benchmark exceedance is not related to the activities at the facility.
- Any other pertinent information.

Appendix B: Sampling kit checklist

Item	Yes	No	Notes
Flashlight	☐	☐	
Hard hat	☐	☐	
Safety goggles	☐	☐	
Reflective vests	☐	☐	
Gloves (Latex or Nitrile)	☐	☐	
Rain wear	☐	☐	
Safety Shoes	☐	☐	
Traffic cones	☐	☐	
Rain gauge	☐	☐	
Eye wash bottle	☐	☐	
Paper towels	☐	☐	
Ice cooler/shipping cooler	☐	☐	
Field sampling notebook	☐	☐	
Waterproof pens	☐	☐	
pH meter (if applicable)	☐	☐	
Sampling bottles	☐	☐	
Preservatives	☐	☐	
Waterproof labels	☐	☐	
First-aid kit	☐	☐	
Re-sealable plastic bag(s)	☐	☐	
Laboratory Paperwork (chain of custody (COC) form)	☐	☐	

Appendix C: Other sampling methods

While the industrial stormwater permit primarily focuses on taking grab samples to accomplish monitoring requirements, there are other options. Though grab samples are the easiest to conduct, they may not always be the best option. Listed below are some other types of acceptable sampling methods:

1. Flow-weighted composites

Automated samplers are programmed to collect an aliquot (a set sample size) for a set volume of discharge. More samples are collected during the peak of the hydrograph than towards the trailing edge of the hydrograph. All of the aliquots are combined into one container, so the pollutant concentration for the rain event is weighted by flow.

2. Time-based discrete samples

Automated samplers are programmed to take an aliquot at set time intervals with a separate bottle for each aliquot. Each bottle is processed separately, thereby characterizing the changes in pollutant concentrations throughout the rain event.

3. Time-based composites

Automated samplers are programmed to take an aliquot after a set period of time, and the aliquots are combined into one container. All parts of the rain event receive equal weight with this method, and the large number of aliquots can produce a reasonably accurate composite concentration.

4. A composite of discrete samples from first 30 minutes

The automated sampler is programmed to take an aliquot at set intervals and the aliquots are combined into one container. The sampler stops collecting samples after 30 minutes.

5. Time composite sheet flow samples

A programmable sheet flow sampler takes an aliquot of sheet flow after a set period of time and combines each sample into one bottle. All of the parts of the hydrograph receive equal weight in the final concentration, and the large number of aliquots can produce a reasonably accurate composite concentration.

Appendix D: Minnesota rainfall information

Forecasting of rainfall amounts

Use the National Weather Service's "Forecasting of Rainfall Amounts" to get storm event information and optimize monitoring opportunities at https://www.weather.gov.

In general, Permittees in the Twin Cities and surrounding metropolitan area can expect approximately four to eight storm events per month.

Table 1. Days per month with storms greater than 0.1 inch (rainfall equivalents)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
N	31	31	31	31	31	31	31	31	31	31	31	31
50%	3	2	5	6	7	7	6	7	5	4	4	2
75%	4	4	6	8	9	9	7	8	7	6	6	4
25%	2	1	4	4	5	5	4	5	4	2.3	2	1.3

Data from the past 31 years was compiled and summarized in the table above. Quartiles with drier periods are indicated by the 25th percentile, wetter conditions by the 75th percentile and average conditions by the 50th percentile.

Minnesota thaw events

The probability of January thaws is very high in southern Minnesota (~90% likelihood) and parts of central Minnesota (~80% likelihood), and somewhat lower in northern Minnesota (~50% likelihood).

Table 2. Historical likelihood of January thaws* since 1948

(*Defined as 2 or more days with daytime temperatures greater than 32º F)

Twin Cities 92%	Rochester 95%	Pipestone 92%
Fairmont 93%	St. Cloud 87%	Morris 80 %
Crookston 62 %	Duluth 60%	International Falls 50%

Source: Mark Seeley, Minnesota WeatherTalk Friday, January 4, 2008

Appendix E: Impaired waters

All Permittees are required to check annually to determine whether a facility has stormwater discharges that flow to, and are within a mile of, a U.S. Environmental Protection Agency (EPA)-approved listed impaired water. The following Impaired Waters Search Link can be used to make this determination: https://pca-gis02.pca.state.mn.us/ISW

Prior to the first full calendar quarter following the EPA-approved listing of the impaired water, the Permittee shall submit a permit modification application to indicate the waterbody and its impairment(s).After completing the permit modification, the Permittee shall restart monitoring for the pollutant(s) causing the impairment or its appropriate surrogate(s) listed in the Surrogates: Pollutant of Impairment section of the permit.

Facilities which exceed benchmark monitoring values after averaging sample results from four separate quarters must continue quarterly monitoring until average sample results fall below the benchmark monitoring values.

Appendix F: Resources and references

United States Environmental Protection Agency, 1992
NPDES Storm Water Sampling Guidance
EPA 833-B-92-001

Washington Department of Ecology Water Quality Program, December 2002
How To Do Stormwater Sampling A guide for industrial facilities
Publication #02-10-071

Washington Department of Ecology Water Quality Program, December 2002 (rev. March 2010)
How To Do Stormwater Sampling: A guide for industrial facilities
Publication #02-10-071

Wisconsin Department of Natural Resources Bureau of Water Management Municipal Wastewater Section—Storm Water Unit, 1994
Wisconsin's Guidance for Industrial Storm Water Monitoring.

Vermont Agency of Natural Resources, Department of Environmental Conservation Water Quality Division—Stormwater Section
Stormwater Sampling for the Vermont Multi-Sector General Permit: A Guide for Industrial Facilities