



# **Stormwater Monitoring Report Guidance**

## **Phase I Municipal Stormwater Permit**

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### Reporting Requirements for Special Condition S8



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# **Stormwater Monitoring Report Guidance**

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## **Phase I Municipal Stormwater Permit Reporting Requirements for Special Condition S8**

*by*

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# Executive Summary

The Washington State Phase I Municipal Stormwater Permit (Phase I Permit) regulates stormwater discharges from large and medium municipal separate storm sewer systems (MS4) as established in Title 40 Code of Federal Regulations (CFR), part 122.26. The 2007 Phase I Permit included requirements to conduct stormwater-related monitoring in Special Condition S8 (S8). The following Phase I Permittees (Permittees) were required to comply with S8:

- City of Seattle and the City of Tacoma.
- Pierce County, Clark County, Snohomish County, and King County.
- The Port of Tacoma and the Port of Seattle.

The required monitoring program detailed in S8 includes three components:

- S8.D Stormwater Monitoring.
- S8.E Targeted Stormwater Management Program Effectiveness Monitoring.
- S8.F Stormwater Treatment and Hydrologic Management Best Management Practice (BMP) Evaluation Monitoring.

On August 1, 2012, the Washington State Department of Ecology (Ecology) reissued the Phase I Permit to be effective from September 1, 2012 to July 31, 2013. In the 2012-2013 Phase I Permit, Ecology added permit language in Special Condition S8.C.1 to describe the endpoints for the monitoring program that began under the 2007 Phase I Permit. The new language also included the requirement for Permittees to submit all relevant data collected pursuant to S8.D into Ecology's Environmental Information Management (EIM) database.

At the time the 2012-2013 Phase I Permit was issued, the 2010 version of the Stormwater Monitoring Report Guidance (SMRG) was the best available guidance for Permittees and was referenced directly in the permit. However, the EIM database has undergone substantial revisions since 2010. The 2012 SMRG clarifies the guidance for EIM data submittals to account for the changes to the EIM database. Ecology highly recommends that Permittees use the 2012 SMRG (as opposed to the 2010 version) to meet the 2012-2013 Permit Requirements. Permittees that use the 2012 SMRG will most likely avoid confusion and enter data into EIM more efficiently.

## Future Revisions to EIM

**Ecology plans to make changes to the EIM system on August 1, 2013.** All data submitted after August 1, 2013 must use the new Result Template. Ecology **highly recommends** Phase I Municipal Stormwater Permittees submit all data packages to EIM well before August 1, 2013 in order to ensure that the Data Coordinator successfully loads the data into EIM before August 1, 2013. If data is contained in the old template and not submitted to EIM by August 1, 2013, it will need to be copied into the new template for submittal, which will require a duplication of effort, by the Permittee.

Ecology is revising the Result Template for several reasons including: making the column headers more descriptive, removing unnecessary columns in an effort to streamline the template,

and adding columns to capture necessary information for data quality. These planned changes are completely unrelated to schedules or content of the NPDES permits.

## **Intent of permit components in S8**

The Stormwater Monitoring Report provides Ecology data from permit requirement monitoring components. Ecology evaluates the data to inform decisions for future permits.

Ecology's 2006 Phase I Fact Sheet provides additional information on the intent of required monitoring components<sup>1</sup>. The language below provides a brief description.

### **S8.D Stormwater monitoring**

Permittees are required to obtain information on pollutant loads for specified storm events from various land use types (such as industrial, or commercial) served by the MS4s. This information is used to gauge whether the Stormwater Management Program (SWMP) is making progress toward pollutant reduction. The intent of the program is to provide a feedback loop for adaptive management of the SWMP.

### **S8.E Targeted stormwater management program effectiveness**

This component requires Permittees to evaluate the effectiveness of a specific action and achieving a targeted environmental outcome. Monitoring of stormwater or receiving water characteristics is required.

The permit lists 10 major components to a stormwater management program (Special Condition S5). This monitoring program establishes a feedback loop to a particular S5 component or series of S5 components. In both the "actions" and "outcomes" categories, Permittees select an issue for study of significance to them. The program requires investigation to determine whether a specific action is making an effective contribution to achieving an overall goal.

For example, a Permittee could evaluate the effect of a public education program for receiving water quality, or evaluate an illicit discharge detection program for reducing spills and other illicit discharges into the MS4.

### **S8.F Stormwater treatment and hydrologic management BMP evaluation**

This component requires evaluating the effectiveness treatment and flow reduction strategies for reducing pollutant discharges. State and local stormwater manuals include a variety of treatment BMPs for implementation in new development and re-development projects. Most of these treatment types have been recommended and in common use for many years, while only incomplete information is available regarding BMP pollutant removal capabilities. Information gathered under this component helps confirm which BMPs perform best for certain pollutants and improve design criteria in stormwater manuals.

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<sup>1</sup> Under the 2012-2013 Phase I Permit, Ecology maintained the intent of these monitoring components.

## **S8.F.7 Hydrologic monitoring**

The permit requires six Phase I Permittees to monitor a flow reduction strategy. This program establishes a feedback loop for documenting designs that show long-term functionality for reducing surface water runoff volumes and flow rates. Permittees select monitoring using a paired study approach (one area with a low impact development feature/flow reduction strategy, and one area without), or against a predicted outcome (monitor a previously established hypothesis prior to retrofitting a low impact development feature). Ecology uses monitoring data to improve methods by which low impact development features are represented in predictive runoff models to determine treatment and flow control needs.

### **Phase I Permittee reporting timelines**

Special Condition S8.H of the Phase I Permit requires reporting data results and narrative analyses. A stormwater monitoring report for each monitoring component is required each year beginning with the 2009 Annual Report submittal (March 31, 2010). Each Permittee, depending on collaborative or independent monitoring agreements (Special Condition S8.G), and depending upon the status of the monitoring program components, may have different reporting schedules.

Ecology expects Permittees to submit annual monitoring reports with the annual report for calendar year 2012 for monitoring that was conducted during the 2011-2012 water year. For program (S8.E) and BMP (S8.F) effectiveness studies that were completed during the 2011-2012 water year, Ecology expects those final reports to be submitted by March 31, 2013. For any monitoring program component that remains underway in the 2012-2013 water year, final monitoring reports should be submitted by July 31, 2013. For additional information regarding an applicable reporting timeline, contact your assigned Ecology regional stormwater specialist.

## **Overview of this guidance document**

This guidance document is provided to assist Permittees with data reporting requirements providing a verified and validated data package and narrative report for each monitoring component. Under the 2012-2013 Phase I Permit, Ecology requires Permittees to submit data collected under the S8.D monitoring component to EIM. Ecology does *not* require the use of EIM for S8.E or S8.F data.

Further information on EIM can be found on Ecology's website at [www.ecy.wa.gov/eim/](http://www.ecy.wa.gov/eim/). Ecology also offers EIM training opportunities for external users. Contact your regional Ecology municipal stormwater permit manager for more information. The first part of this guidance document lists the permit monitoring component and provides expectations for narrative reports. The second part includes detailed instructions for entering S8.D data into EIM. Permittees may choose to submit one narrative report which covers all monitoring components (S8.D, S8.E, and S8.F) or submit individual narrative reports.

## **Submitting data to Ecology**

The Phase I Permit requires annual submittal of a stormwater monitoring report as an attachment to the annual report. Permittees are required to submit annual reports in both hard copy and

electronic format; therefore, the annual stormwater monitoring reports must be submitted in both hard copy and electronic formats.

The overall reporting package should include:

- For S8.D, a written narrative report, including a narrative report of toxicity data, and a data submittal into EIM including results from flow-weighted composite sampling, sediment sampling and grab sampling.
- For S8.E, a written narrative report.
- For S8.F, a written narrative report and a data submittal using the Excel spreadsheets provided by the International Stormwater BMP Database.
- For S8.F.7 (flow reduction strategy), a written narrative report (not applicable to Phase I Ports).

This document provides guidance for the narrative report submittal for S8.D, S8.E and S8.F, and data submittal for S8.D data into EIM. The narrative reporting requirements are consistent with permit requirements found in S8.H.

Part of S8.H requires each Permittee to submit a comprehensive data report for each component of S8. The EIM data submittal for S8.D will constitute part of that requirement. The EIM data package should include:

- S8.D flow-weighted composite water quality data.
- S8.D grab sampling water quality data.
- S8.D sediment quality data.
- S8.D flow volume data.
- S8.D precipitation data.
- S8.D sampling location information.

The EIM data submittal process has been updated in 2012 to accommodate changes in the EIM program. The EIM data submittal process includes:

1. Permittee submits S8.D data to EIM Data Loader<sup>2</sup>. See pages 15-21 for more detailed data submittal instructions.
2. Ecology's data coordinator performs a data entry QA check.
3. As invalid entries are discovered, Ecology's data coordinator contacts the Permittee to correct and re-submit the data (data credibility laws prevent Ecology from editing Permittee data).
4. Data coordinator uploads re-submitted batches into EIM.
5. Permittee receives an email confirmation indicating data are successfully loaded to EIM.

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<sup>2</sup> Submittal of data to the EIM Data Loader is the S8.D reporting action that corresponds with the deadline in the 2012-2013 Phase I Permit, Special Condition S8.C.1.a. Ecology acknowledges that resolution of invalid data entries for EIM may occur after the permit deadline. However, planned changes to the EIM Result Template expected to take effect August 1, 2013, will not allow invalid data to be corrected after August 1, 2013 without fully re-entering the data using the new template.

# Guidance for Narrative Reports

The permit requires narrative stormwater monitoring reports for each monitoring component (S8.D, S8.E, S8.F and S8.F.7<sup>3</sup>). Ecology does not require a specific format for this report. For the report, clearly label each monitoring section with the pertinent monitoring component (S8.D, S8.E, S8.F and S8.F.7). Reports may be submitted as stand-alone documents or as individual reports.

For S8.D monitoring reporting, Permittees should submit all data collected regardless of whether specified storm event criteria were met. The Result Quality field in EIM addresses storm event criteria.

## S8.D Stormwater monitoring narrative report

If the Quality Assurance Project Plan (QAPP) for the S8.D monitoring program component has been revised, include a copy with the annual report or mail it directly to your assigned regional permit specialist.

*\*The narrative report for S8.D should indicate whether the S8.D data was submitted, or is being submitted, to EIM.*

The following sections provide guidance for certain Phase I Permit phrases used in S8.H.

### **Guidance for: A summary including the location, land use, drainage area size, and hydrology for each site**

This information should already exist in the QAPP. Briefly re-state this information in the stormwater monitoring report for *each* of the monitoring stations. Include any changes to the land use within the contributing drainage area or the monitoring station that could affect hydrology and/or pollutant loading. Significant changes should be reviewed by Ecology and reflected in a revised QAPP. Significant changes can include, but are not limited to:

- Land disturbing activities over 10 acres in size within the sampled drainage area.
- Monitoring site relocation.
- Use of new/different sampling equipment.

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<sup>3</sup> The Port of Seattle and Port of Tacoma are not required to complete a project for S8.F.7.

**Guidance for: A comprehensive data and QA/QC report for each component of the monitoring program, with an explanation and discussion of the results of each monitoring project.**

**A portion of the Comprehensive Data Report submittal will be included in the EIM data submittal. Guidance for submitting EIM data results can be found in the *EIM Data Submittal* section of this document.**

Include in the narrative report the following information for each *sampled* storm event (where data were collected and analyzed) from each monitored site. Ecology recommends clearly identifying storm event information (i.e., forecasts and actual storm characteristics) and sample information (i.e., percent of hydrograph collected, volume collected) in a table format.

- A general summary about storm event criteria, including:
  - Total number of qualifying and non-qualifying storm events captured and analyzed at each monitoring location (specify which criteria were not met for each sampled non-qualifying event).
  - Whether or not 67% of forecasted qualifying storms were captured (only required after one full water year of data collected).
  - Whether or not three storm events were captured which did not reach the 0.20" rainfall depth criterion (how many and date of storm events).
  - Distribution of storms collected between wet and dry seasons (permit goals include 60-80% of storms during the wet season and 20-40% of storms during the dry season).
  - Logistical problems associated with any storm event criterion.
- A hyetograph and a hydrograph for each sampled storm event. Include properly labeled graphs that display the following:
  - Date of the storm event.
  - Time of day versus precipitation information.
  - Time versus flow rate.
  - Time versus aliquot collection.
  - Total duration of the storm event, not just the duration when samples were collected (remember the pollutant load calculation must include flow for the entire storm event, not just the water quality sampled portion).
- A summary of (or in the graph) the total runoff volume in gallons/other appropriate unit of measure.
- A summary table displaying the rainfall/runoff relationship used to estimate the unsampled storm events (where water quality samples were not collected). Used for future estimations for annual and seasonal loads (See Appendix A for further guidance).
- Whether or not any chemicals were removed from the list of analysis due to two years of non-detect data.
- A brief summary with storm event dates where insufficient volumes were collected. Include the parameters analyzed.

For sediment monitoring, include:

- Whether or not any chemicals were removed from the list of analyses due to two years of non-detect data.
- Include a brief summary with storm event dates where insufficient volumes were collected. Include the parameters analyzed.

For toxicity monitoring, include:

- A narrative description of the toxicity sampling efforts (all attempts) for the reporting year. Include good faith efforts and/or anomalous tests encountered, document problems associated with sample collection, and document whether or not these problems affect the data.
- Bench sheets developed during the 7-day test
- An analytical result table from the toxicity chemical analysis.
- An analytical results table from the GC/MS analysis (if applicable).
- A description of the submittal status for follow up actions:
  - Indicate the date the library of comparison report was sent to Ecology (S8.D.2.d requires 120 days after data validation.
  - Indicate the date of the GC/MS result report submitted to Ecology (S8.D.2.d requires 150 days after data validation.
- An explanation of how the stormwater management actions are expected to reduce stormwater toxicity.

**The QA/QC Report submittal should include the following information for each *sampled storm event* at each site, *sediments* sampled at each site and *toxicity data* at each site:**

- A narrative summary of the field and laboratory verification, validation results, and quality control checks performed.
- A narrative analysis of the field and laboratory quality control sample results and how they compare with the data quality objectives/indicators in the QAPP.
- Corrective actions reported/taken.

**The Explanation and Discussion of Results should include the following information for each *sampled storm event* at each monitoring site and *sediments* collected at each site:**

- A narrative analysis of the parameter concentrations.
- Any conclusions based on trend data that may result from this study or from previously collected data from these sites.
- A description of Stormwater Management Program activities currently taking place or planned within the monitoring station's drainage area.

For toxicity, include:

- A narrative analysis of the toxicity follow-up actions including any conclusions on known toxicants.
- A discussion of the GC/MS results and analysis (if applicable).

**Guidance for: The annual pollutant load for each site expressed in total pounds and pounds/acre, and the wet and dry season pollutant loads, expressed in total pounds and pounds/acre.**

The annual pollutant load calculation must be based on a water year and include wet and dry season loads and total annual load (wet+dry season load). Guidance for calculating pollutant loads can be found at [www.ecy.wa.gov/programs/eap/quality.html](http://www.ecy.wa.gov/programs/eap/quality.html) (ECY 004, Standard Operating Procedure for Calculating Pollutant Loads for Stormwater Discharges).

Submit pollutant loading information only for completed seasons (wet/dry). Indicate the timeframe for which the loading result applies. For example, the loading calculation information of 250 lbs/acre of total suspended solids (TSS) is applicable for the dry season of 2009.

\*Pollutant loading information is required for water quality only.

In the written narrative report, submit the following information in pounds and pounds per acre:

*For storm events where water quality samples were collected, track and submit the following for each site:*

- The load for each parameter for each sampled storm event; include date of storm events. This is optional, but Ecology requests this information.

*For ALL storm events (where water quality samples were collected and were not collected) submit the following for each site:*

- An estimated seasonal pollutant load for each parameter.
- A total annual pollutant load (wet season load + dry season load) for each parameter (include estimated events).
- Submit the rainfall/runoff relationship including the pollutant load estimates for unsampled events.
- See Appendix A for further guidance.

*Note: For the 3<sup>rd</sup> and 4<sup>th</sup> bullets above, if this data is unavailable to effectively estimate the rainfall to runoff relationship due to an incomplete water year, submit this information in the next year's stormwater monitoring report.*

**S8.E Targeted stormwater management program effectiveness monitoring narrative report**

If the QAPP for the S8.D monitoring program component has been revised, include a copy with the annual report or mail it directly to your assigned regional permit specialist.

The following sections provide guidance for certain Phase I Permit phrases used in S8.H.



## **Guidance for: A summary of the purpose, design, and methods of the monitoring program**

This information should already exist in the QAPP. Briefly re-state this information in the stormwater monitoring report. Include separate descriptions of the targeted action and the environmental outcome you are testing. In addition, include any changes to land use, the drainage area, or the monitoring station that could affect hydrology and/or pollutant loading. Significant changes should be reviewed by Ecology and updated in the QAPP.

Examples of significant changes can be found on page 7 in the “S8.D Stormwater Monitoring Narrative Report” section in this document.

## **Guidance for: The status of implementing the monitoring program**

Provide a narrative description of the status of the program as of the end of the water year (September 30). Ecology expects monitoring conducted under this monitoring component to occur over the course of this permit cycle. Include in the description how much of the planned program is complete, what is left to do, and any adjustments needed to the sampling approach or hypotheses.

## **Guidance for: A comprehensive data and QA/QC report for each part of the monitoring program, with an explanation and discussion of the results of each monitoring project**

**The Comprehensive Data Report submittal should include the following information for each monitoring location:**

- Total number of sampling events during the water year reported at each monitoring location.
- An analytical results table including water quality parameter results and hydrologic data (flow data), if applicable.

**The QA/QC Report submittal should include the following information for each sampled event:**

- A narrative analysis of field and laboratory verification results, validation results, and quality control checks performed.
- A narrative analysis of field and laboratory quality control results with a comparison to the QAPP data quality objectives and data quality indicators.
- Corrective actions reported and taken.

**The Explanation and Discussion of Results should include the following information for the project:**

- A description of the purpose for this study including a desired environmental outcome and proposed action.
- A discussion about whether or not the hypothesis was met.
- Any conclusions based on trend data resulting from the study or from previously collected data (if applicable).

## **Guidance for: An analysis of the results of each part of the monitoring program, including any identified water quality problems or improvements or other trends in stormwater or receiving water quality, and recommended future actions based on the findings**

At the time of reporting, if the study has concluded, indicate any final conclusions in the narrative description, otherwise provide an interim analysis. In the narrative report, include:

- Whether or not the targeted action improved water quality and/or achieved a targeted environmental outcome.
- A description of the stormwater management program activities in progress or planned within the monitoring area.
- Any proposed changes to the stormwater management program activity being tested.
- A description of any water quality problems or trends identified.

## **S8.F Stormwater treatment and hydrologic management BMP evaluation monitoring reporting**

If the QAPP for the S8.D monitoring program component has been revised, include a copy with the annual report or mail it directly to your assigned regional permit specialist.

The Phase I permit requires each Permittee to use appropriate sections of the *Guidance for Evaluating Emerging Stormwater Treatment Technologies, Technology Assessment Protocol – Ecology (TAPE)* for preparing, implementing, and reporting the results of the BMP evaluation monitoring program. In addition, each Permittee is required to collect information pertinent to fulfilling the *National Stormwater BMP Data Base Requirements (BMP Database)*. For reporting flow reduction strategy information, refer to the “S8.F.7 Hydrologic Reduction Strategy Narrative Report” section below.

The studies conducted under S8.F have a discrete end point that may or may not correlate with annual reporting deadlines. For this reason, Ecology is providing guidance for both interim study reporting and final reporting, contained as status reports and final reports, respectively.

- If no data were collected during the applicable reporting period (based on water year), submit only a status report.
- If data were collected during the applicable reporting period but statistical goals have not yet been met, submit a status report.
- If the project was completed and statistical goals were met for all permit required parameters, submit a final report.

## Status reports for S8.F

### Guidance for narrative reporting: A summary of the purpose, design, and methods of the monitoring program

This information should already exist in the QAPP. Briefly re-state this information in the stormwater monitoring report. Include separate descriptions of the treatment BMPs you are evaluating and the flow reduction strategy. In addition, include any changes to the land use, the drainage area, or the monitoring station that could affect hydrology and/or performance. Significant changes should be reviewed by Ecology and updated in the QAPP.

Examples of significant changes can be found in the “S8.D Stormwater Monitoring Narrative Report” section in this document.

The status report should contain the following information:

- The status of implementing the monitoring program.
- Status of data collection activities.
- Changes in key project personnel.
- Projected work for the next reporting period.

## Final BMP reports

Ecology expects final BMP reports to be submitted by July 31, 2013, following completion of the BMP evaluation monitoring. If the status of monitoring program implementation will not allow for a final report by July 31, 2013, contact your assigned Ecology regional stormwater specialist.

*How does the Permittee know when BMP sampling is complete and a final report is due?*

The final BMP treatment report is required once the sampling program is complete. Ecology considers sampling of short detention and long detention BMPs to be complete based on the following conditions:

- You have collected a minimum of 12 samples for each parameter at the influent and effluent sampling station, and,
- Permit-required statistical goals (S8.F.4) have been met for each permit required parameter<sup>4</sup>, or a maximum of 35 influent and effluent samples have been collected for each permit required parameter, and,
- You have met all other permit requirements in S8.F.

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<sup>4</sup> Permit-required statistical goals are not intended to be applied for pH, hardness, oil sheen, or particle size distribution.

## **Guidance for narrative reporting: A summary including the BMP type, location, land use, drainage area size, and hydrology for each site**

Include all required information as indicated under “status reports” above.

## **Guidance for data reporting and narrative reporting: A comprehensive data and QA/QC report for each part of the monitoring program, with an explanation and discussion of the results of each monitoring project**

A portion of the *Comprehensive Data Report* includes submittal of BMP data entry spreadsheets to Ecology. These data entry spreadsheets can be downloaded from the following link: [www.bmpdatabase.org](http://www.bmpdatabase.org). Appendix B provides further guidance on the spreadsheets.

In addition to the data entry spreadsheets, submit the following information for each monitoring location in a narrative report:

- A description of the BMP, detention time of the BMP, and how the BMP works including physical, chemical and/or biological treatment functions.
- Attach design information (preferable full size drawings). Include sizing methodology, flow diagrams and appropriate illustrations.
- Operation and maintenance activities that occurred during the testing duration, including details about how the maintenance was performed. (Ecology suggests you use a graphical representation of pollutant removal over time highlighting the times when maintenance was performed to verify maintenance cycles).
- Capital and project annual costs for monitoring and operation and maintenance of the specific BMP.
- An explanation of any deviations from sampling procedures.
- Number of influent aliquots and the number of effluent aliquots per appropriately labeled sampling event.
- Influent peak flow rate (gpm).
- Effluent peak flow rate (gpm).
- Bypass peak flow rate (gpm).
- Total influent runoff volume (gallons).
- Total effluent runoff volume (gallons).
- A summary table indicating accumulated sediment depth measurements and analytical results.

**The Explanation and Discussion of Results should include the following information for the project:**

- The particle size distribution analysis for each site (this is typically generated by the laboratory but Ecology can provide further guidance if necessary).
- A general assumption of the estimated sediment mass loading based on accumulated sediment test results and TSS data.
- Storm event hydrographs for each sampled event at each site with axes of flow, time, and precipitation (time on x-axis, flow and precipitation on y-axes). Event hydrograph should include a graph of precipitation, influent flow, and effluent flow.
- An explanation of the accumulated sediment results with mass balance estimates (TAPE, page 20).

**The QA/QC Report submittal should include the following information for each sampled event:**

- A narrative analysis of the field and laboratory verification, validation results, and quality control checks performed.
- A narrative analysis of the field and laboratory quality control sample results and how they compare with the data quality objectives/indicators in the QAPP.
- Corrective actions reported and taken.

**Guidance for narrative reporting: Performance data or flow reduction performance**

The following information should be submitted in your performance data report for treatment BMPs:

- A general discussion of how well the BMP performed to remove monitored pollutants
- Performance information results of calculations for:
  - Coefficient of variance.
  - Confidence intervals.
  - Probability plots.
  - Description of tests used.
  - Long detention BMPs, include a copy of the inputs used into the DSS Toolkit [www.dssresearch.com/toolkit/sscalc/size\\_a2.asp](http://www.dssresearch.com/toolkit/sscalc/size_a2.asp)
- The method used for calculating removal rates.

Further guidance on determining statistical goals for long detention BMPs is found in Appendix C.

**S8.F.7 Hydrologic reduction strategy narrative report**

If the QAPP for the S8.D monitoring program component has been revised, include a copy with the annual report or mail it directly to your assigned regional permit specialist.

**Guidance for data reporting and narrative reporting: A comprehensive data and QA/QC report for each part of the monitoring program, with an explanation and discussion of the results of each monitoring project**

**The Comprehensive Data Report submittal should include:**

- An estimate of the reduction in runoff volume achieved through this flow reduction strategy.
- A summary table of the continuous rainfall and surface runoff monitoring results (do not submit raw data).
- Detail on maintenance performed during the reporting period.

**The Explanation and Discussion of Results should include the following information for the project:**

- A discussion of how well the BMP performed for reducing flows.
- A discussion of the results compared to the predicted outcome or paired study.
  - If evaluating a paired study, include a description of the paired study site and a comparison of performance.

**The QA/QC Report submittal should include the following information for each sampled event:**

- A narrative analysis of data validation results for the flow rate data and quality control checks performed.
- Corrective actions reported and taken.

# Environmental Information Management (EIM) Data Submittals

The Environmental Information Management (EIM) system is the Washington State Department of Ecology's main database for environmental monitoring data. EIM contains records on physical, chemical, and biological analyses and measurements. EIM centers on three main elements: studies, locations, and results.

This guidance document contains information specific to entering S8.D Phase I Permittee data. Because the EIM program updates its own guidance documents on a regular basis to correspond to changes in the program, this guidance document includes links to other EIM supporting information that Permittees should use to complete the EIM submittal process.

## Account setup

Prior to setting up a new Organization Account, explore whether or not your jurisdiction has an existing EIM Organization Account. Then, follow the directions in the EIM Submittal Guidelines ([EIM\\_Submittal\\_Guidelines\\_V2008.02.pdf](#)) to either set up a new Organization Account and/or create new individual User Profiles under the existing Organization Account. When creating a User Profile, select *Stormwater Phase I Permit Data* for *Submitting To*.

## Submitting Study information

Follow the instructions in the EIM Submittal Guidelines to navigate to the Study form on the EIM Data Loader. Use the EIM Study Help document (**helpStudyV2012.01.xls**) to assist you in filling out the Study fields. Required fields in the online Study form have a red asterisk. For Phase I studies, follow the specific guidance below for certain fields:

**Table 1 Phase I Guidance for Specific EIM Study Fields**

<b>Field Name</b>	<b>Guidance for Phase I Permittees</b>
Study ID	Enter your Permit Number followed by an “underscore” symbol, followed by S8D. For example: “WAR044455_S8D”
Study Name	Enter the name of jurisdiction (“City of ___” or “_____ County”) followed by “Phase I Municipal Stormwater Permit”
Study Type	Municipal Stormwater Permit Monitoring
Study Purpose	Example: “To fulfill requirements in S8.D”
Study Start Date, Study End Date	For Start Date Enter: 02/16/2007 (the effective date of the permit) For End Date Enter: 02/15/2012 (the permit expiration date)
Ecology Contact	Enter in the name of your regional permit manager
Ecology Program or Other Responsible Entity	Enter Ecology Water Quality Program, and applicable region
Study QA Planning Level	Enter Level “4”
Study QAPP Description	Enter “Ecology Approved QAPP for S8.D”
Study QA Assessment Level	Use EIM’s Study help document to determine your Study’s QA Assessment Level.



# Entering Location information

The template for entering Location information can be found at [www.ecy.wa.gov/eim/submitdata.htm](http://www.ecy.wa.gov/eim/submitdata.htm). Under the *Submit Data Using EIM Spreadsheets* heading, select *Download Zip file with EIM Spreadsheets, Help documents, and Submittal Guidelines*. Select the **EIMLocationV2011.02.xls** file. Save the template to your computer.

Enter all information for the locations sampled in the EIM Locations template. If you take two different types of samples in one location, such as flow and water quality, only submit one Location to EIM and label appropriately.

Use the Locations Help Document (**helpLocationV2011.01.doc**) and the Stormwater Help Document ([www.ecy.wa.gov/eim/helpDocs/EIMHelp\\_StormwaterAndCombinedSewerData.pdf](http://www.ecy.wa.gov/eim/helpDocs/EIMHelp_StormwaterAndCombinedSewerData.pdf)) to determine what should be entered into each field in the Locations template.

**Table 2 Phase I Guidance for Specific EIM Location Fields**

Column Name	Guidance for Phase I Permittees
A –Location ID (15 character limit)	<p>It is suggested to use a code for your organization, followed by a number for each sampling location. Be consistent with the QAPP, if applicable.</p> <p>EXAMPLE Coding:            Port of Seattle: POS; Port of Tacoma: POT; Clark County: CLK; Snohomish County: SNO ; King County: KIN; City of Seattle: SEA; City of Tacoma: TAC            Pierce County: PIE; Washington State Department of Transportation: WSDOT</p> <p>Example coding scheme for monitoring stations:            TAC001S8D_OUT            POS021S8D_OUT            SEA002S8D_RAIN</p>
B – Location Name (40 character limit)	<p>For a unique location name, you may enter your permit number followed by the code entered in Row A above. Example:            WAR044003A_TAC001S8D_OUT</p> <p>Or you may follow the suggested naming conventions in the EIM Stormwater and Combined Sewer help document</p>
D - Location Description (254 character limit)	<p>Follow the recommendations in the EIM Stormwater and Combined Sewer Data help document</p>

# Entering Result information

The template for entering Result information can be found at <http://www.ecy.wa.gov/eim/submitdata.htm>. Under the *Submit Data Using EIM Spreadsheets* heading, select *Download Zip file with EIM Spreadsheets, Help documents, and Submittal Guidelines*. Select the ***EIMResultV2011.01.xls*** file. Save the template to your computer. Enter Results into the template, including all non-detects. A reporting or detection limit, and a data qualifier, is required for all non-detects. For specific guidance on non-detects and estimates, see the specific help document posted here [www.ecy.wa.gov/eim/helpdocs.htm](http://www.ecy.wa.gov/eim/helpdocs.htm).

Result information should be entered for:

- S8.D flow weighted composite water quality data.
- S8.D grab sampling water quality data.
- S8.D sediment quality data.
- S8.D flow volume data.
- S8.D precipitation data.

Use the Result Help Document (**helpResultV2009.01.xls**) and the Stormwater Help Document ([http://www.ecy.wa.gov/eim/helpDocs/EIMHelp\\_StormwaterAndCombinedSewerData.pdf](http://www.ecy.wa.gov/eim/helpDocs/EIMHelp_StormwaterAndCombinedSewerData.pdf)) to determine what should be entered into each field in the Results template.

Table 4 below contains guidance specific to Phase I results.

**Table 3 Phase I Guidance for Specific EIM Result Fields**

Column Name	Guidance for Phase I Permittees
F – Field Activity Start Date	<p>Enter in the <i>date</i> of sample collection or field measurement.  <b>REQUIRED format:</b> MM/DD/YYYY</p> <ul style="list-style-type: none"> <li>• For water quality results, enter the <i>start date</i> when the auto sampler began sample collection for this storm event.</li> <li>• For grab samples, enter the <i>date</i> the grab sample was collected.</li> <li>• For precipitation data, enter the <i>start date</i> when the rain gauge began recording for this storm event.</li> <li>• For flow data (storm event flow volume) enter the <i>start date</i> when flow response began for this storm event.</li> <li>• For flow data (sample event flow volume) enter the start date when you started collecting the water quality samples.</li> <li>• For sediment quality data, enter the <i>start date</i> of <u>sediment trap deployment</u>.</li> </ul>
G – Field Activity Start Time	<p>Enter the start <i>time</i> of sample collection or field measurement.  <b>REQUIRED format:</b> Express in military (24-hour) time as HH:MM:SS format.</p> <ul style="list-style-type: none"> <li>• For water quality results, enter the <i>time</i> when the auto sampler began sample collection.</li> <li>• For grab samples, enter the <i>time</i> the grab sample was collected.</li> <li>• For precipitation data, enter the <i>time</i> when the rain gauge began recording for this storm event.</li> <li>• For flow data (storm event flow volume) enter the <i>time</i> when flow response began for this storm event.</li> <li>• For flow data (sample event flow volume) enter the time when you started collecting the water quality samples.</li> <li>• For sediment quality data, enter the <i>time</i> the <u>sediment trap was deployed</u>.</li> </ul>
H – Field Activity End Date	<p>Enter the <i>end date</i> of the sample collection, field measurement, or field observation.  <b>REQUIRED format:</b> MM/DD/YYYY</p> <ul style="list-style-type: none"> <li>• For water quality results, enter the <i>end date</i> when the auto sampler stopped collecting samples.</li> <li>• For grab samples leave blank.</li> <li>• For precipitation data, enter the <i>end date</i> when storm event stopped (include the 6-hour inter-event dry period).</li> <li>• For flow data (storm event flow volume), enter the <i>end date</i> of the storm event (when the 6-hour inter-event dry period was met). If base flow is present in your discharge, enter the date when flow returns</li> </ul>

	<p>to base flow conditions.</p> <ul style="list-style-type: none"> <li>• For flow data (sample event flow volume) enter the end date of sample collection of the auto sampler.</li> <li>• For sediment quality data, enter the <i>end date</i> of sediment trap deployment (or the date when sediments were collected from the trap).</li> </ul>
I – Field Activity End Time	<p>Enter the <i>end time</i> of the sample collection, field measurement, or field observation.  <b>REQUIRED format:</b> Expressed in military (24-hour) time as HH:MM:SS format.</p> <p><u>Notes</u></p> <ul style="list-style-type: none"> <li>• For water quality results, enter the <i>end time</i> when the auto sampler stopped collecting samples.</li> <li>• For grab samples leave blank.</li> <li>• For precipitation data, enter the <i>end time</i> when the storm event stopped (include the 6-hour inter event dry period).</li> <li>• For flow data (storm event flow volume) enter the <i>end time</i> of runoff from the storm event (when the 6-hour inter-event dry period was met). If base flow is present in your discharge, enter the time when flow returns back to base flow conditions.</li> <li>• For flow data (sample event flow volume) enter the end time of sample collection of the auto sampler.</li> <li>• For sediment quality data, enter the <i>end time</i> of sediment trap deployment (or the time when sediments were collected from the trap).</li> </ul>
T – Sample Replicate Flag	<p>Refer to the Stormwater and Combined Sewer data EIM help document for requirements.  Further information on Entering Field Replicates can be found in this help document:  <a href="http://www.ecy.wa.gov/eim/helpDocs/EIMHelp_EnteringFieldReplicates.pdf">www.ecy.wa.gov/eim/helpDocs/EIMHelp_EnteringFieldReplicates.pdf</a></p>
V – Sample Composite Flag	<p>Refer to the Stormwater and Combined Sewer data EIM help document for requirements.  If samples are a composite, the composite flag must be Y and Field Activity Start and End Date and Field Activity Start and End Time are required.</p>
AR – Result Parameter Name	<p>Refer to the Stormwater and Combined Sewer data EIM help document for additional requirements.</p> <ul style="list-style-type: none"> <li>• For flow rate data, enter both <i>Storm Event Flow Volume</i> and <i>Sample Event Flow Volume</i>.</li> <li>• For precipitation data, enter <i>Precipitation</i>.</li> <li>• For other parameters, enter the parameter name.</li> </ul>
BF – Result Quality	<p>Refer to the Stormwater and Combined Sewer data EIM help document for requirements.</p>

## **Submitting Locations and Results Template to EIM Data Loader**

Follow instructions in EIM Data Submittal Guidelines (**EIM\_Submittal\_Guidelines\_V2008.02.pdf**) on validating, exporting and submitting EIM templates to EIM Data Loader.

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# Appendix A

## Estimating Annual Pollutant Loads

The Phase I permit requires collection of continuous precipitation and flow monitoring data from each S8.D sampling site along with water quality samples collected from a limited number of storm events throughout the year. It is required that flow is monitored from each site for at least 1-year, but the Permittee will have a limited number of storm events data where water quality samples were collected. Therefore, it becomes necessary to estimate the pollutant loading (from unsampled events). This appendix provides guidance for developing a rainfall/runoff relationship, for estimating pollutant loads from unsampled events, and for calculating the estimated annual pollutant load.

Individual storm event loads can be estimated using Ecology SOP ECY 004 Calculating Pollutant Loads from Stormwater Discharges found at

[www.ecy.wa.gov/programs/wq/stormwater/municipal/SOPPOLLUTANTLOADINGCALCULATIONS.PDF](http://www.ecy.wa.gov/programs/wq/stormwater/municipal/SOPPOLLUTANTLOADINGCALCULATIONS.PDF)

\*This SOP includes a method for taking into account base flow for individual storm events.

### Creating a rainfall/runoff relationship table

For each monitoring site:

- Evaluate precipitation data from all storm events that occur throughout the year.
- Evaluate the continuous flow record and rainfall records.
- Avoid using data from closely spaced rain events as it may be difficult to define separate corresponding runoff events. It is recommended to use the permit required inter-event period to distinguish between storm events.
- Use a number of discrete storm events of varying magnitude for determining the runoff volumes associated with incident rain depths.
- Using the above information, create a regression model to fit the relationship to predict runoff volumes from rainfall records when gaps in the flow monitoring records exist. In the first year, gaps may exist where a flow monitor failed during a storm event. In subsequent years, runoff volumes must be estimated for all unsampled events unless the municipality continues to monitor every event.
- Different relationships may need to be modeled for the wet and dry seasons if the hydrologic response is significantly different.

**Table 4 Example Rainfall/Runoff Relationship Table for the 08/09 Wet Season**

<b>Storm Event #</b>	<b>Time and Date of Storm Event</b>	<b>Total Runoff Volume of Drainage Area (gallons)</b>	<b>Total Precipitation of Storm Event(inches)</b>	<b>Water Quality Sample Collected/Analyzed?</b>
<i>Wet Season 2008/ 2009</i>				
1	10/5/08 8am - 10/5/08 3:13pm	281,250	0.5	
2	10/15/08 6am- 10/15/08 6pm	62,500	0.15	Yes
3	11/7/08 10pm – 11/8/08 6am	156,250	0.3	Yes
4	11/22/08 9pm - 11/23/08 8pm	218,750	0.4	
5	12/10/08 7am – 12/10/08 5pm	187,500	0.35	
6	12/24/08 5pm - 12/26/08 3pm	93,750	0.2	
7	1/7/09 6pm – 1/8/09 9pm	125,000	0.25	Yes
8	1/15/09 7am – 1/16/09 8am	500,000	1.25	Yes
9	2/2/09 7am – 2/4/09 9pm	406,250	0.7	
10	2/18/09 10pm – 2/19/09 11pm	468,750	0.8	Yes
11	3/7/09 7am – 3/10/09 8am	250,000	0.45	Yes
12	3/25/09 9pm – 3/26/09 11pm	312,500	0.55	Yes
13	4/10/09 11am – 4/10/09 5pm	31,250	0.1	
14	4/28/09 6am – 4/29/09 7am	375,000	0.65	



## Guidance for estimating pollutant loads

For each site:

- Step 1: Create a rainfall/runoff relationship table for the wet season, as demonstrated above, based on collected precipitation and total runoff volume data for each site.
- Step 2: Use SOP ECY 004 (see link above) or the approved QAPP method to calculate a pollutant load for each sampled event.
- Step 3: For each parameter, calculate an arithmetic mean event mean concentration (EMC) for all the sampled events during the wet season.
- Step 4: Sum the total runoff volumes for all unsampled storm events that occurred during the wet season.
- Step 5: Multiply the mean EMC calculated in Step 3 by the total runoff volume for all unsampled wet season events (summed in Step 4). This is the estimated wet seasonal pollutant load from unsampled events.
- Step 6: Add the estimated wet season load for unsampled events to the calculated loads for sampled events (from Step 2). This is the total wet season pollutant load.
- Step 7: Repeat Steps 1-7 above for the dry season for each parameter.
- Step 8: Sum the total dry season pollutant load and the total wet season pollutant load to get the total annual load for each parameter

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# Appendix B

## International BMP Database Data Entry Spreadsheet Guidance

Information regarding data entry for the International BMP Database can be found at <http://www.bmpdatabase.org/DataEntry.htm#SubmittalREQs>. Refer to the Final Stormwater BMP Data Entry User's Guide, August 2010, available on the website above, for detailed guidance. Permittees should submit an electronic copy of this completed data entry spreadsheet to Ecology for compliance with the reporting requirement at S8.H.1.c.iv, second bullet.

The information presented below was compiled in 2010 to assist Permittees in meeting the relevant requirements of the 2007-2012 Phase I permit.

To provide information to Ecology pertinent to fulfilling the International BMP Database ([bmpdatabase.org](http://bmpdatabase.org)), and to comply with TAPE reporting guidance, fill out the appropriate tabs listed below (WATER QUALITY RESULTS ONLY) in the data entry spreadsheets.

### Instructions for spreadsheets

Complete one spreadsheet for each BMP, also separated by the BMP influent/effluent station. For example, save one spreadsheet for one of the influent BMP sampling stations, save a second for that same BMPs effluent station. Label properly for easy identification.

### Individual spreadsheet tab guidance

#### Tab #1 Test Site

- Fill in all required fields/all other fields are optional.

#### Tab #2 Study Info

- For Year Submitted to Database enter Annual Report, Reporting Year.
- Fill in your jurisdictions name as the Data Provider.
- Fill in (Y/N) and attach BMP Layout (if updated).
- All other fields are optional.

#### Tab #3 Agencies

- Fill in all required fields/all other fields are optional.

#### Tab #4 Location Info

- Fill in Climate and GIS information.

#### Tab #5 Monitoring Events

- Fill in event information for the individual (influent OR effluent) site.
- Fill in all required fields, other fields are optional.

#### Tab #6 Monitoring Costs

- This tab is optional.

#### Tab #7 Watershed

- Fill in required fields, other fields are optional.

#### Tab #8 Roads and Parking Lots

- This tab is optional.

#### Tab #9 Land Use

- This tab is optional.

#### Tab #10 BMP (General)

- Fill in required fields.

#### Tab #11 BMP Costs

- This tab is optional.

#### Tab # 12a Monitoring Station Id

- Fill in required field.

#### Tab # 12b Monitoring Station Relation

- Fill in required fields.

#### Tab # 13 Instrumentation

- This tab is optional.

#### Tab # 14 Precipitation

- Fill in all fields.

#### Tab # 15 Flow

- Fill in all fields.
- For flow information: this is for entire storm flow, not just flow recorded for the sampling event only.

#### Tab # 16 Water Quality

- Fill in all *required fields*. For metals, include a sample fraction. For TPH or other parameters not on the list, indicate the parameter name in the “Result Comment” cell.

#### Tab # 17 Settling Velocity

- This tab is optional: the particle size distribution graphs should be submitted as part of the narrative report.

#### Tab # 18 – Tab #33 Detention Basin - Other BMP

- Fill in required fields if design information submitted to Ecology does not include this information/or if this information has been updated.

## **Submitting spreadsheets to Ecology**

Submit spreadsheets in both hard copy and electronic form to Ecology as part of the S8.F Section of the Stormwater Monitoring Report. Be sure to properly label for easy identification.

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# Appendix C

## Long Detention Best Management Practice (BMP) Monitoring Questions and Answers

### History of the long detention guidance

The Phase I Municipal Stormwater Permit requires Permittees to use Ecology's *Evaluating Emerging Stormwater Treatment Technologies – Technology Assessment Protocol-Ecology (TAPE)* for preparing, implementing, and reporting results for the S8.F Stormwater Treatment and Hydrologic Management Best Management Practices (BMPs) monitoring program. The TAPE was originally designed for testing protocols with shorter detention times (*i.e.*, the amount of time it takes for water to flow from the influent to the effluent BMP station).

Some Phase I Permittees selected BMPs with longer detention times (where detention times were in hours rather than minutes, and possibly up to a few days). For guidance for monitoring long detention BMPs, Ecology drafted an addition to the current TAPE guidance (updated January 2008), titled *Evaluating Stormwater Treatment Technologies with Long Detention Times (November 2008)*.

### Questions and answers

This Q&A is designed to answer questions related to this guidance associated with long detention BMP monitoring programs.

*Question:* For testing BMPs with long detention times, how many sample sets are required?

*Answer:* A minimum of 12 and a maximum of 35 at each influent and effluent station at each site for each parameter. The Permittee must use local precipitation data to assist with planning to estimate the first year of samples.

*Question:* What is the purpose of the efficiency calculator?

*Answer:* The efficiency calculator is to be used for guidance only and does not demonstrate whether permit-required statistical goals are met. The calculator is designed to help display log-normal distributions of actual concentration data of both the influent and effluent monitoring stations. The idea is to display more pairs of data based on actual collected data.

*Question:* How do I use the DSS Toolkit to determine if I have met my permit-required statistical goals?

*Answer:* Once you have collected a minimum of 12 influent and a minimum of 12 effluent samples, use the DSS Toolkit (see detailed steps below) to determine the total number of sample sets needed to meet permit-required statistical goals, for each parameter.

[www.dssresearch.com/toolkit/sscalc/size\\_a2.asp](http://www.dssresearch.com/toolkit/sscalc/size_a2.asp)

*Question:* When is my S8.F BMP monitoring program complete?

*Answer:* Once you reach a Calculated Sample Size “0” indicating you have met the permit-required statistical goals or when you have collected a maximum of 35 influent and 35 effluent samples.

*Question:* Do I have to meet permit-required statistical goals or reach a maximum of 35 influent and 35 effluent samples for all permit required parameters indicated in (S8.F.5)?

*Answer:* Yes. You must meet permit-required statistical goals or collect a maximum of 35 influent and 35 effluent samples in order to comply with the permit for each required parameter listed in the permit.

## Steps for using the DSS toolkit

### *Step 1*

Enter the Average Value for Sample 1: This should be the arithmetic mean of the 12 *influent* sample results.

Enter the Average Value for Sample 2: This should be the arithmetic mean of the 12 *effluent* sample results.

Enter the Standard Deviation for Sample 1: This should be the standard deviation of the 12 influent sample results.

Enter the Standard Deviation for Sample 2: This should be the standard deviation of the 12 effluent sample results.

### *Step 2*

Enter 10% or 5% in Alpha Error Level or Confidence Level. (The 10% or 5% corresponds to the permit-required statistical goal of 90-95% confidence).

Enter 25% or 20% in Beta Error Level or Statistical Power. (The 25% or 20% corresponds to the permit-required statistical goal of 75-80% power).

### *Step 3*

Click “Calculate Sample Size”. The result will indicate how many **total** sample sets you need in order to reach permit-required statistical goals. The total sample sets includes sampled already collected. For example, if the total sample sets needed indicates 22 and you have already collected 12, you only need to collect 10 more influent and effluent samples.

\*As you collect more samples (one by one after collecting 12), run the data through Steps 1-3 above and follow the number indicated in Calculate Sample Size.