



**NATIONAL POLLUTION DISCHARGE ELIMINATION  
SYSTEM MUNICIPAL SEPARATE STORM  
SEWER SYSTEM PERMIT RENEWAL APPLICATION**

**Permit Number: 101314**

**Port of Portland  
7200 NE Airport Way  
Portland, OR 97218**

**July 31, 2015**

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Appendix A SWMP

## ACRONYMS

ACWA – Association of Clean Water Agencies  
BOD – Biochemical Oxygen Demand  
BMP – Best Management Practice  
DEQ – Department of Environmental Quality  
DDE – Dichloro-Diphenyl-Dichloroethylene  
DDT – Dichloro-Diphenyl-Trichloroethane  
DPb – Dissolved Lead  
EMC – Event Mean Concentration  
EPA – Environmental Protection Agency  
FAA – Federal Aviation Administration  
GIS – Geographic Information System  
IDDE – Illicit Discharge Detection and Elimination  
IER – Interim Evaluation Report  
MEP – Maximum Extent Practicable  
MID – Marine and Industrial Development  
MS4 – Municipal Separate Storm Sewer System  
NSQD – National Stormwater Quality Database  
NPDES – National Pollution Discharge Elimination System  
ODOT – Oregon Department of Transportation  
PCB – Polychlorinated Biphenyls  
PDX – Portland International Airport  
SWMM – Stormwater Management Model  
SWMP – Stormwater Management Plan  
TMDL – Total Maximum Daily Load  
TP – Total Phosphorus  
TSS – Total Suspended Solids  
USB – Urban Services Boundary  
WLA – Waste Load Allocation  
WLAAA – Waste Load Allocation Attainment Assessment  
WQ – Water Quality

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## **SECTION 1                    INTRODUCTION**

### **1.1        PERMIT BACKGROUND**

In the early 1990s, the Federal Clean Water Act required municipalities with populations greater than 100,000 to apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit for their stormwater discharges. In Oregon, this program was delegated to the Oregon Department of Environmental Quality (DEQ). As a result, DEQ directed select Oregon jurisdictions and associated co-permittees to apply for and obtain a NPDES Municipal Separate Storm Sewer System (MS4) permit. The City of Portland (City) was one of the jurisdictions required to obtain a MS4 permit, and the Port of Portland (Port) is a co-permittee on the current Portland permit.

For Part 1 of the original MS4 permit application (1993), the City and its co-permittees performed a review of their stormwater systems including mapping, outfall inventories, monitoring of stormwater quality, etc. The second part of the application (1995) required the development of Stormwater Management Plans (SWMPs), which included the requirement to develop specific categories of Best Management Practices (BMPs) to address specific sources of pollutants. The permit did not specify the number or type of BMPs that should be implemented; rather the permit states that BMPs should be implemented to reduce the discharge of pollutants to the “maximum extent practicable” (MEP). DEQ issued the first MS4 permit to the City and its co-permittees in 1995.

The 1995 MS4 permit period was 5 years during which time jurisdictions were responsible for implementation of their SWMPs. A second permit was issued in March 2004, expiring in 2009. The third and current permit was issued January 31, 2011. During each permit period, the SWMP was updated and improved through adaptive management and it continues to be the central element of the permit. This document represents the MS4 permit renewal application, due 180 days prior to the January 31, 2016 expiration date of the current permit.

### **1.2        ORGANIZATION OF DOCUMENT**

According to the 2011 MS4 permit, co-permittees must submit a permit renewal application package 180 days prior to permit expiration. Table 1-1 summarizes the permit renewal submittal requirements associated with the permit renewal submittal and the corresponding component’s location within this document.

**Table 1-1. Permit Renewal Submittal Components  
Due July 31, 2015**

<b>Submittal Component</b>	<b>Permit Requirement</b>	<b>Related 2015 Application Section</b>
<p><b>Proposed SWMP Modifications</b> Narrative summary of proposed SWMP revisions and measurable goals, including rationale for revisions.</p>	B.6.a	Section 2.0 and Appendix A
<p><b>MEP Evaluation</b> Information and analysis related to:</p> <ul style="list-style-type: none"> <li>• How the Port’s existing program addressed requirements of the existing permit</li> <li>• How the Port’s proposed program will meeting maximum extent practicable (MEP) criteria</li> </ul>	B.6.b	Section 3.0
<p><b>Service Area Expansions</b> Description of any service area expansions anticipated to occur during the next permit term and a finding as to whether or not the expansion is expected to result in a substantial increase in area, intensity, or pollutant loads.</p>	B.6.e	Not applicable to the Port.
<p><b>Fiscal Evaluation</b> Current permit term expenditures summary and projected program allocations for next permit cycle.</p>	B.6.f	Section 4.0
<p><b>Total Annual Pollutant Loading</b> Updated estimate of total stormwater pollutant loads for applicable TMDL pollutants and other identified pollutants.</p>	B.6.c	Section 5.0
<p><b>Wasteload Allocations (WLAs) and Benchmarks</b></p> <ul style="list-style-type: none"> <li>• List of WLAs met</li> <li>• New benchmarks</li> </ul>	B.6.h D.3.c, d	Section 6.0
<p><b>Monitoring</b></p> <ul style="list-style-type: none"> <li>• Updated monitoring program objectives matrix</li> <li>• Updated monitoring plan</li> </ul>	B.6.d D.3.c.vii	Section 7.0
<p><b>Required Maps</b></p>	B.6.g	See Map provided in Appendix A, and maps provided by the City of Portland as applicable.

## **SECTION 2                      SUMMARY OF PROPOSED SWMP REVISIONS**

As part of the permit renewal, the Port reassessed its program with respect to meeting the requirement to reduce pollutants in stormwater discharges to the maximum extent practicable (MEP). The results of the assessment are described in Section 3.0 of this document and show that the current stormwater program has been effective and is meeting permit requirements/MEP. Therefore, the Port's proposed, updated 2015 SWMP does not include any substantive changes compared to the SWMP associated with the 2011 permit. The majority of changes are related to removing tasks that had a scheduled end date and therefore have been completed. A detailed summary of changes is provided in Section 3.2.4. The revised SWMP is provided in Appendix A.

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### **SECTION 3                    MAXIMUM EXTENT PRACTICABLE EVALUATION**

As part of this permit renewal application package, the Port of Portland (Port) is required to provide information to support the Department of Environmental Quality's (DEQ's) assessment that the Port's Stormwater Management Plan (SWMP) reduces pollutants in discharges from the Municipal Separate Storm Sewer System (MS4) to the maximum extent practicable (MEP). Specifically, the relevant permit renewal application requirements from Schedule B6 are as follows:

#### **B.6: MS4 Permit Renewal Application Package**

*...The application package must include an evaluation of the adequacy of the proposed SWMP modifications in reducing pollutants in discharges from the MS4 to the MEP. The application package must contain:*

- b. The information and analysis necessary to support the Department's independent assessment that the co-permittee's stormwater management program addressed the requirements of the existing permit. Co-permittees must also describe how the proposed management practices, control techniques, and other provisions implemented as part of the stormwater program were evaluated using a co-permittee-defined and standardized set of objective criteria relative to the following MEP general evaluation factors:
  - i. Effectiveness – program elements effectively address stormwater pollutants*
  - ii. Local Applicability – program elements are technically feasible considering local soils, geography, and other locale specific factors*
  - iii. Program Resources – program elements are implemented considering availability to resources and the co-permittees stormwater management program priorities.**

To address this requirement, this MEP evaluation includes two parts:

- Section 3.1    How the existing stormwater management program addressed 2011 permit requirements.
- Section 3.2    How the proposed stormwater management program (for the upcoming permit term) meets the MEP requirement.

#### **3.1    HOW THE EXISTING STORMWATER MANAGEMENT PROGRAM ADDRESSED 2011 PERMIT REQUIREMENTS**

The Port's overall stormwater management program comprises activities outlined in its SWMP, environment monitoring, and additional permit-defined regulatory programs and submittals. The following sections summarize how the program met permit requirements and how the SWMP (as a subset of the Port's overall program) was adaptively managed.

### **3.1.1 Overall Program Permit Requirements**

Per Schedule A.2 of the permit:

*“Compliance with this permit and implementation of a stormwater management program, including the Department-approved Stormwater Management Plan, establishes this MEP requirement...” (to reduce pollutants to the MEP).*

The Port of Portland met all of its 2011 permit requirements, as shown in Table 3-1. In addition, the Port supplied information in each annual report related to meeting SWMP measurable goals. The Port’s existing program has therefore met the MEP requirement.

### **3.1.2 Annual Adaptive Management Permit Requirements**

Schedule D.4 of the permit requires that *“Each co-permittee must follow an adaptive management approach to assess annually and modify, as necessary, any or all existing SWMP components and adopt new or revised SWMP components to achieve reductions in stormwater pollutants to the MEP.”* A description of the Port’s adaptive management approach was submitted to DEQ as required on November 1, 2011. Each annual report included a section to summarize implementation of the adaptive management process and the resulting proposed SWMP changes.

Implementation of the Port’s adaptive management process requires an annual review of SWMP best management practices (BMPs) to assess whether any adjustments were needed. Since Year 1 of permit issuance, the Port has continued to modify how its BMPs are carried out in order to find the most efficient approaches and maximize pollutant load reduction. While several refinements to BMP implementation were made during the permit term (as reported in annual reports), the refinements were not at a level of detail to require formal SWMP adjustments. Refinements made during the permit term included the following:

- Modified the catch basin and stormwater treatment facility maintenance documentation systems for Aviation and Marine operating areas to allow for increased efficiency and facilitate the identification of areas where changes in cleaning frequencies may be warranted.
- Marine Facilities Maintenance added an extra roll-off box to the vector truck to ensure adequate capacity for the collection of catch basin and sweeping materials.
- PDX Maintenance purchased a new regenerative air sweeper for use at the airport, parking lots, Airport Way, and Alderwood Street.

**Table 3-1. 2011 Permit Requirements**

Permit requirement	Permit section	Due date	Status <i>(Shaded areas = permit requirement has been met)</i>
<p><b>Illicit Discharge Detection and Elimination:</b></p> <ul style="list-style-type: none"> <li>Document an enforcement response plan for responding to illicit discharges.</li> <li>Document pollutant parameter action levels and report them to the Department in an enforcement response plan.</li> <li>Annual dry-weather field screening activities must include identified priority locations which are identified on a map</li> </ul>	A.4.a	November 1, 2011	<ul style="list-style-type: none"> <li>Stormwater enforcement is authorized by Port Ordinance 361. Enforcement rules were adapted and procedures for implementation were developed in 2011.</li> </ul>
	A.4.a	November 1, 2011	<ul style="list-style-type: none"> <li>A protocol for pollutant parameter action levels was developed and an enforcement plan was submitted to DEQ in November 1, 2011.</li> </ul>
	A.4.a	July 1, 2012	<ul style="list-style-type: none"> <li>Dry weather field screening locations, PDX and high priority Marine outfalls are mapped in the Port's GIS system.</li> </ul>
<p><b>Industrial and Commercial Facilities:</b></p> <p>Implement an updated strategy to reduce pollutants to the MS4 from industrial and commercial facilities identified as sources that contribute significant pollutant loads to the MS4.</p>	A.4.b	January 1, 2013	Strategy completed. Critical elements include: screening new facilities, industrial facility inspections, stormwater treatment facility inspection, education and outreach and training.
<p><b>Education and Outreach:</b></p> <p>Conduct or participate in an effectiveness evaluation to measure the success of public education activities.</p>	A.4.d	November 1, 2014	Participated in a regional public education effectiveness evaluation submitted to the Department on November 1, 2014.
<p><b>Public Involvement and Participation:</b></p> <p>Provide opportunities for public comments on the monitoring plan.</p>	A.4.e	June 1, 2011	The monitoring plan developed by the City of Portland covers all permit requirements, per MS4 IGA dated March 2013.
<p><b>Post Construction Site Runoff:</b></p> <ul style="list-style-type: none"> <li>Implement a post-construction site runoff program that meets designated permit conditions.</li> <li>Identify, minimize, or eliminate barriers in ordinances, code, and development standards that inhibit LID/green infrastructure.</li> <li>Develop or reference an enforceable post-construction stormwater management manual or equivalent document.</li> </ul>	A.4.f	January 1, 2014	<ul style="list-style-type: none"> <li>The Port a Stormwater Design Standards Manual to regulate areas inside the airfield fence. Areas outside are regulated under the City's SWMM.</li> </ul>
	A.4.f	January 1, 2014	<ul style="list-style-type: none"> <li>The Port's Stormwater Design Standards Manual fully considers LID opportunities. The Port did not previously regulate stormwater design; the developed before no other conflicting Port code existed.</li> </ul>
	A.4.f	January 1, 2014	<ul style="list-style-type: none"> <li>See bullet one above.</li> </ul>

**Table 3-1. 2011 Permit Requirements**

Permit requirement	Permit section	Due date	Status <i>(Shaded areas = permit requirement has been met)</i>
<b>Pollution Prevention for Municipal Operations:</b> Inventory, assess, and implement a strategy to reduce the impact of stormwater runoff from municipal facilities that treat, store or transport municipal waste.	A.4.g	January 1, 2013	No facilities of this type exist within the Port's MS4.
<b>Stormwater Management Facilities O&amp;M Activities:</b> Inventory and map stormwater management facilities and controls and implement a program to verify that stormwater management facilities and controls are inspected, operated and maintained.	A.4.h	January 1, 2013	City of Portland's Maintenance Inspection Program (MIP) manages this permit requirement for the Port, per the MS4 IGA.
<b>Hydromodification Assessment:</b> Conduct assessment and submit report.	A.5	November 1, 2014	Submitted November 1, 2014.
<b>Retrofit Strategy:</b> <ul style="list-style-type: none"> <li>• Identify one stormwater quality improvement project.</li> <li>• Initiate, construct, or implement the project.</li> <li>• Develop a retrofit strategy and submit plan to DEQ.</li> </ul>	A.6.c A.6.c A.6.b	November 1, 2013 Permit expiration November 1, 2014	<ul style="list-style-type: none"> <li>• The retrofit project was initiated in May 2012 and completed in September, 2013. A report was submitted to DEQ in October, 2013.</li> <li>• The retrofit strategy was submitted to DEQ November 1, 2014.</li> </ul>
<b>Monitoring and Reporting Requirements:</b> <ul style="list-style-type: none"> <li>• Submit plan to DEQ.</li> <li>• Implement approved plan.</li> </ul>	B.2 B.2	June 1, 2011 July 1, 2011	<ul style="list-style-type: none"> <li>• Submitted QAMP to DEQ June 1, 2011. DEQ conditionally approved the QAMP July 1, 2011; implementation began July 1, 2011. Submitted addendum November 1, 2011, to clarify the role of monitoring in adaptive management of the stormwater program.</li> </ul>
<b>Annual Reporting:</b> Submit annual reports each year from the time period July 1 of the previous year through June 30 of the same year.	B.5	November 1 - yearly	All annual reports for the permit term were submitted to DEQ by November 1.

**Table 3-1. 2011 Permit Requirements**

Permit requirement	Permit section	Due date	Status <i>(Shaded areas = permit requirement has been met)</i>
<b>Permit Renewal:</b> Submit permit renewal application package.	B.6	July 30, 2015 (180 days before permit expiration)	Will be submitted by July 30, 2015.
<b>303(d) Listed Pollutants</b> Submit evaluation report in fourth annual report.	B.5.j D.2	November 1, 2014 (4th annual report)	Submitted with FY13-14 annual report.
<b>TMDLs</b> <ul style="list-style-type: none"> <li>• Submit Wasteload Allocation Attainment Assessment</li> <li>• Submit TMDL Pollutant Load Reduction Evaluation.</li> <li>• Submit TMDL benchmarks.</li> </ul>	B.5.j D.3  B.5.j D.3.c  D.3.d	November 1, 2014 (4th annual report)  November 1, 2014 (4th annual report)  July 30, 2015 (180 days before permit expiration)	<ul style="list-style-type: none"> <li>• Submitted with FY 13-14 annual report.</li> <li>• Submitted with FY13-14 annual report</li> <li>• In progress; will be completed as part of permit renewal package</li> </ul>
<b>Adaptive Management:</b> Submit adaptive management approach.	D.4	November 1, 2011	Submitted to DEQ November 1, 2011
<b>SWMP Measurable Goals:</b> Revise to include new permit requirements.	D.6	April 1, 2011	Revised and submitted to DEQ April 1, 2011.

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## **3.2 HOW THE PROPOSED STORMWATER MANAGEMENT PROGRAM MEETS THE MEP REQUIREMENT**

The Port's adaptive management process (submitted to DEQ on November 1, 2011, in accordance with Schedule D.4 of the current permit) requires the Port to conduct a comprehensive assessment of the stormwater management program at the end of the permit term, with the results used to identify proposed program modifications to be submitted as part of this permit renewal package.

This section provides background information related to the Port's ongoing compliance with the MEP standard and provides the results of the comprehensive assessment of the current program along with proposed program modifications.

### ***3.2.1 MEP Background***

MS4 permittees initially developed and established their SWMPs that met MEP as part of their original 1993 permit applications. Those SWMPs have become the foundation for each permittee's program—a foundation that has been continuously evaluated and improved through adaptive management since 1995. As a result, the BMPs described in the permittee's proposed SWMP is the result of the cumulative effect of implementing, continuously evaluating, and making corresponding changes (i.e., adaptive management) to a variety of technically and economically feasible BMPs that ensure that the most appropriate controls are implemented in the most effective manner based on site-specific conditions. Up until the submittal of this permit renewal application, the Port has followed the following process to ensure its SWMP meets the MEP standard:

- Original development of the SWMP submitted with the 1993 permit application: All Phase I National Pollutant Discharge Elimination System (NPDES) MS4 permit applicants were encouraged by the U.S. Environmental Protection Agency to design programs tailored for local problems, priorities, resources, and objectives. The co-applicants for the permit (at the time, this included the City of Portland, Port of Portland, Multnomah County, and the Oregon Department of Transportation) employed a coordinated and comprehensive structured approach to planning and decision-making over a 2-year period. Participants met in a series of technical workshops to discuss objectives and results and to conduct detailed evaluations and ratings of 115 candidate BMPs. The BMPs were evaluated with respect to meeting permit requirements, addressing pollutants of concern, implementation costs, maintenance costs, and public acceptance. A SWMP was developed for the Port to include the selected BMPs.

Issuance of the first NPDES MS4 permit by DEQ, which included implementation of the SWMP, was regarded as acceptance of a program that met the MEP standard.

- Overall SWMP review conducted for the Interim Evaluation Report (IER) due in 2006: The 2004 permit required an Interim Evaluation Report to be submitted to DEQ in 2006. For this report, the permit required each SWMP element (i.e., BMP) to be revisited and reviewed, and for each element, a determination was to be made as to whether implementation of the components in the SWMP was sufficient to reduce the discharge of pollutants to the MEP.

Numerous workshops were held with Port staff representing various implementation groups. The team evaluated and revised the SWMP according to the following criteria: MS4 permit compliance, resource availability, ability to build on existing BMPs, ability to track BMP implementation, and applicability to Port operations. A revised SWMP was prepared and a public involvement process was conducted to solicit feedback. This revised SWMP was approved by DEQ on July 31, 2006.

- Overall SWMP review conducted for the 2008 permit renewal application: As part of the adaptive management process, the Port prepared a revised SWMP for the 2008 permit renewal application. This process included a comprehensive review and evaluation of the revised SWMP with respect to three evaluation criteria as required by DEQ. The evaluation criteria included program effectiveness, local applicability, and program resources.
- Continual adaptive management reported in annual reports (1993–present): The effectiveness of the Port’s SWMP programs, activities, and BMPs has been revisited annually to ensure that the Port’s SWMP continues to meet the MEP standards. As a part of this process, the Port annually reviews, and if necessary, modifies how its BMPs are carried out to ensure the most efficient approaches to reducing pollutant loading.

### ***3.2.2 Current Assessment Components and Results***

As described in the Port’s adaptive management approach, the permit cycle adaptive management process will include a review of annual assessments, trends, and evaluations/reports produced during the permit term. The results of these assessments are provided in the following sections.

#### Review of Annual Adaptive Management Results During Current Permit Term

A summary of the annual adaptive management results is described in Section 3.1. As described, while several refinements to BMP implementation were made during the permit term (as reported in annual reports), the refinements were not at a level of detail described under the SWMP BMP tasks and measurable goals. Therefore, the annual adaptive management process did not result in any formal adjustments to the SWMP.

#### Review of Monitoring Information (Trends Results)

In 2014, a summary of water quality trends was submitted to DEQ based on the results of environmental monitoring conducted under the permit. The Port discharges to the Columbia Slough, the Willamette River, and the Columbia River. Monitoring is not conducted in the Columbia River given the Port’s contribution to flows is such a small portion relative to all upstream contributions. Instream water quality monitoring is conducted at select outfall sites draining to the Columbia Slough and Willamette River during both the dry and wet weather seasons. Water quality monitoring results and trends analyses for these two water bodies reflect anywhere from 8 to 15 years of data depending on the parameter analyzed. Water quality conditions at Port monitoring locations reflect runoff from other jurisdictions in addition to the Port. Therefore, the trends analyses for the Columbia Slough and Willamette River are summarized below as a general indicator of water quality to support stormwater management decisions and not meant to solely reflect Port stormwater runoff conditions or quality.

- For the Columbia Slough, out of 17 parameters analyzed during the wet season, detectable decreasing (i.e., improving) trends were evident for two parameters at the upstream monitoring location (total lead and total suspended solids [TSS]), and for 10 parameters at the downstream monitoring location (total copper, dissolved copper, total mercury, total lead, total zinc, ammonia, nitrate, total phosphorus, *E. coli*, and TSS). No trend was detected in either direction for the remaining parameters.
- For the Willamette River, out of 17 parameters analyzed during the wet season, detectable decreasing (i.e., improving) trends were evident for eight parameters (total lead, dissolved lead, total zinc, dissolved zinc, ammonia, orthophosphorus, total phosphorus, and dissolved oxygen—for dissolved oxygen, the trend was increasing/improving).

During the wet season, increasing or declining water quality trends were not detected for any of the parameters analyzed. Given the magnitude of development that has occurred during the timeframe reflected in the analyses, seeing these improving trends or even no detectable trends is a positive result. These trends analyses did not result in any adjustments to the Port's SWMP.

#### Evaluations and Reports

As stated in the Port's adaptive management process, specific deliverables required under the current permit were reviewed and considered with respect to stormwater program updates. The permit deliverables that were reviewed and submitted in November 2014 included the following:

- Public Education Effectiveness Evaluation
- Hydromodification Assessment
- Retrofit Strategy
- Evaluation of 303(d) Listed Pollutants
- Pollutant Load Reduction Evaluation
- Wasteload Allocation Attainment Assessment (WLAAA)

As a result of the preparation of these permit-required deliverables, the main change made to the Port's overall stormwater program was related to the development of the retrofit strategy. This strategy included the identification of BMPs that the Port plans to implement to further reduce pollutant discharges of select 303(d) and Total Maximum Daily Load (TMDL) pollutants. These BMPs were also included in the Port's update to pollutant load reduction benchmarks (as part of this permit renewal application package) to show how it will contribute toward making continued progress in reducing pollutant loads on the path to meeting waste load allocations. It should be noted that in some cases, as identified in the WLAAA, meeting WLAs will not be feasible.

With respect to the hydromodification assessment, much of the Port's MS4 stormwater discharges directly to large rivers (the Columbia River and the Willamette River). These rivers have relatively large flows compared to the potential increased stormwater runoff flows from development on Port property. Comparatively, the peak runoff for Port property discharging to these rivers is so small that the discharges are not likely to have contributed to potential hydromodification impacts on the Columbia River or Willamette River.

The remainder of Port MS4 stormwater discharges to the Columbia Slough. The slough is a flow-managed water body, which does not drain by gravity and must be pumped to manage water levels. Multnomah County Drainage District (MCDD) is designated by the U.S. Army Corps of Engineers to operate pump stations to manage the water level and flow in the slough for flood control purposes. Due to the flow regulation by MCDD pumps, the pump station operations control the peak flow and volumes in the Columbia Slough rather than stormwater runoff flows. Volume in the slough is controlled by level-setting controls in the MCDD pump stations. Due to these factors, Port stormwater runoff does not likely contribute to channel impacts in the slough.

In the case of future development or redevelopment on Port MS4 property, stormwater runoff controls will be guided by a stormwater management manual (either the Port's individual manual or the City of Portland's manual), which contains low impact development practices and encourages infiltration BMPs where practicable to reduce flow volumes. No additional strategies or tools need to be implemented in the foreseeable future to address potential hydromodification impacts from new or redevelopment.

#### End of Permit Term SWMP Review Process

For this permit renewal application, the SWMP was reviewed to evaluate the need for revisions. Given the annual review process to identify changes, the SWMP was considered to be relatively current. Therefore, each BMP was reviewed to eliminate tasks that had a specified end date and have now been completed and to determine any potential beneficial revisions to measurable goals to improve clarity and/or efficiencies. Results of this review and proposed SWMP revisions are provided in Section 3.2.3.

#### Public Comment

After the public comment period, this section will be updated to summarize any public comments received and how they were addressed.

#### ***3.2.3 Summary of Proposed SWMP Revisions***

The results of the assessment process described previously show that the program in place has been effective and has been meeting permit requirements/MEP. Therefore, in general, the Port's updated 2015 SWMP does not include any substantive changes compared to the previous SWMP. The majority of changes are related to removing tasks that had a scheduled end date and have therefore been completed. A summary of changes is as follows:

- 1) Removed sections of the SWMP that are not specifically required in the permit under "Schedule A.4. Stormwater Management Plan Requirements." For example, the sections regarding benchmarks and monitoring were removed. These sections and other text were moved to the permit renewal submittal package but were not BMPs that should be elements of the SWMP.
- 2) In the previous SWMP, for each BMP, the "BMP Responsibility" was listed at the top of the BMP description to identify the Port department responsible for implementing the BMP. This was removed from the top of each BMP and, instead, the responsible

department is now listed for each individual BMP implementation task. This was a formatting change to provide additional clarity on implementation responsibilities.

- 3) In the previous SWMP, there were several BMP implementation tasks required for completion within the last permit term. These tasks have been completed and hence removed from this SWMP. These tasks included the following:
- Describe in “Illicit Discharge Detection and Elimination Procedures” (by November 1, 2011) the enforcement response procedures the permittee will implement when an illicit discharge investigation identifies a responsible party. This was completed.
  - For the BMP to Implement the Illicit Discharge Detection and Elimination (IDDE) Program, the task to update the IDDE procedures has been completed. Therefore, the measurable goal has been changed from “Update the IDDE procedures by November 1, 2011” to “Eliminate illicit discharges that have been identified.”
  - Develop or identify dry-weather field screening pollutant parameter action levels that will be used as part of the field analysis to identify the source of an illicit discharge or other type of discharge, etc., by November 1, 2011, and update procedures for dry weather field screening by July 1, 2012. This was completed.
  - For the BMP to “Screen Existing and New Industrial Facilities”, the task to coordinate with the City of Portland on a process to screen industrial facilities has been completed. Therefore, the task has been changed to coordinate with the city to screen industrial facilities. The measurable goal for this BMP has also been changed accordingly.
  - Document a procedure and rationale for selection of priority facilities (for industrial/commercial inspections) by November 1, 2011. This was a task under the BMP to “Implement an Inspection Program for Significant Pollutant Source Areas.” This task was completed.
  - Conduct a public education effectiveness evaluation by November 1, 2014. This was addressed under the BMP to “Participate in a Public Education Effectiveness Evaluation.” This BMP was completed and has been removed from the SWMP.
  - Document the procedure to determine which employees will receive spill training, by November 1, 2011. This was a task under the BMP to “Implement a Spill Response Training Program.” This task was completed.
  - Under the BMP to implement a public participation approach that provides opportunities for the public to effectively participate in the implementation of the stormwater management program, the task to determine what projects are appropriate for public involvement has been removed as this was reviewed during the permit term.
  - Develop and adopt Port specific design standards by January 1, 2014. This was a task under the BMP to “Develop, Adopt, and Implement New Port Specific Post Construction Runoff Control Standards.” This BMP was completed and has been renamed “Implement Port Specific Post Construction Runoff Control Standards.” The associated measurable goal has also been revised to reflect implementation of the new

- standards instead of adoption of the new standards. Also, a commitment has been added to develop an intergovernmental agreement to coordinate and resolve related jurisdictional issues by December 30, 2017.
- Design and initiate construction of a stormwater capital improvement retrofit (by January 30, 2016) to address at least one applicable TMDL pollutant of concern. This was a task under the BMP to “Develop, Adopt, and Implement New Port Specific Post Construction Runoff Control Standards.” This was completed.
  - Review the existing inspection and maintenance procedures for the Port’s storm system (by June 30, 2012) in accordance with requirements outlined in the Port’s MS4 NPDES permit. This was a task under the BMP to “Implement a Stormwater System Cleaning and Maintenance Program.” This was completed.
  - Provide information to tenants related to proper inspection and maintenance activities for such private structural control facilities by June 30, 2012. This was a task under the BMP to “Implement a Program for the Tracking and Maintenance of Private Structural Controls.” This task was completed. The measurable goal for this BMP has been revised to reflect maintenance of the updated inventory of private controls on tenant property instead of development of the inventory. And a new measurable goal was added to coordinate with the city to track inspections and maintenance of private structural controls.
- 4) Under the BMP to provide for public participating in SWMP updates and benchmark submittals, the commitment to provide for a 30-day timeframe for public review of the SWMP and benchmarks was removed. The Port will still provide time for these reviews; however, 30 days is not required by the permit and did not match the City of Portland’s timeframe for public review. Given the coordination and agreements related to implementation of the permit between the Port and the city, aligning with public review timeframes is most efficient.
- 5) Under the BMP to “Implement a Program to Limit Infiltration from Port-Owned Sanitary Sewer System to the MS4 BMP,” the previous SWMP had a task to monitor pump stations through weekly inspections and audible/visual alarms to ensure proper function of MID pump stations. This task was changed to monthly inspections.

### **3.2.4 Demonstration of MEP**

The purpose of this section is to address the permit requirement in Schedule B.6 to *describe how the proposed management practices, control techniques, and other provisions implemented as part of the stormwater program were evaluated using a co-permittee-defined and standardized set of objective criteria relative to the following MEP general evaluation factors:*

- i. *Effectiveness – program elements effectively address stormwater pollutants*
- ii. *Local Applicability – program elements are technically feasible considering local soils, geography, and other locale specific factors*

- iii. *Program Resources – program elements are implemented considering availability to resources and the co-permittees stormwater management program priorities.*

As described above, the SWMP was initially developed in the early 1990s and has continuously evolved through an adaptive management process over the years.

As part of this MEP evaluation and demonstration, Phase I jurisdictions coordinated an approach to defining and standardizing objective criteria related to the three MEP evaluation factors listed above. The coordinated approach included identification of example criteria for consideration. Each jurisdiction scored and ranked the example criteria depending on deemed importance and applicability. Highest ranking criteria were deemed universally acceptable by all participating jurisdictions and were used to facilitate the proposed SWMP revision process.

In general, the SWMP has been developed and adaptively managed with the goal of meeting/addressing the following criteria (listed by evaluation factor).

### **Program Effectiveness**

- The program includes a range of BMPs that encompass pollution prevention, source control, and treatment approaches.
- The program includes BMPs that are technically feasible, effective, and implementable.
- The program includes BMPs that target applicable 303(d) parameters, help achieve TMDL pollutant load reduction benchmarks, and make progress toward TMDL WLAs.
- The program targets pollutant discharges from existing development, redevelopment, and new development activities.

### **Local Applicability**

- The program is consistent with local ordinances and current legal authority.
- Stormwater design standards implemented as part of the program reflect local conditions specific to soils, rainfall, infiltration rates, and stream conditions.
- The program encourages and solicits feedback and involvement from stakeholders to ensure consistency with community-wide goals and objectives.

### **Program Resources**

- The program is included in the current budget allocations.
- The program considers implementation costs and practicability within the overall context of permittee priorities and resources.

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## **SECTION 4 FISCAL EVALUATION OF STORMWATER EXPENDITURES**

The Port annually undertakes budget and business planning to identify areas of focus and actions needed to address them. The Port derives almost all revenue from business transactions with the users and tenants of Port facilities. A small proportion (approximately three to four percent) of the Port's overall revenue is from property tax. Business transactions generally occur between the Marine Business Line, the Aviation Business Line (Commercial Aviation and General Aviation), the Industrial Development Business Line, and associated users and tenants of those properties. Industrial Development Business Line revenue sources can also include sales of property. The Port also receives revenue from the U.S. Army Corps of Engineers for dredging services.

Commercial Aviation (PDX) resources are derived primarily from charges to airline passengers and air cargo customers, airport parking, rental car revenue, passenger facility charges, Federal grants, and tenant fees. PDX resources cannot be comingled with any other resources of the Port and are restricted for use at Aviation facilities by bond ordinances and Federal Aviation Administration (FAA) regulations.

The Port annually budgets resources to fund projects and programs identified in the Strategic and Business Line Plans. Program expenses are allocated among Business Lines and departments involved in implementation of the program. Specifically, stormwater resources are allocated among the following Port departments, Environmental Affairs, Information Technology (IT), Legal, Engineering and Operations. Stormwater program expenditures include the cost of staff salary (including fringe costs), permit fees, contractor and consultant fees, stormwater infrastructure, City of Portland stormwater fees, disposal of collected material, sample analysis, stormwater training, and outreach materials.

Total estimated stormwater program expenditures for the current permit term are shown below in Table 4-1. The 2010/2011 estimated stormwater expenditures were abnormally high due to the construction of deicing treatment plant. The 2011/2012 stormwater expenditures were also inflated due to the stormwater master planning effort. To estimate the projected expenditure costs for the next permit cycle, first the geometric mean was calculated using the reported and projected totals for each reporting year. Then the geometric mean was multiplied by five, based on 5-year permit duration, to estimate projected allocations for the next permit cycle.

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**Table 4-1. Estimated and Projected Stormwater Expenditures for the Current and Next Permit Cycle**

	<b>Estimated 2010-11 Stormwater Expenditures</b>	<b>Estimated 2011-12 Stormwater Expenditures</b>	<b>Estimated 2013-14 Stormwater Expenditures</b>	<b>Projected 2014-15 Stormwater Expenditures</b>	<b>Projected 2015-16 Stormwater Expenditures</b>	<b>Sum of 2011-2016 Stormwater Expenditures</b>	<b>Projected 2017-2021<sup>(2)</sup></b>
<b>Total Program Allocation</b>	\$40,567,500	\$11,822,966	\$8,250,808	\$6,373,638	\$6,400,000	\$73,388,550	\$54,980,058

Notes

1 The Environmental Affairs group was merged with the Environmental Operations group in the spring of 2015.

2 Geometric mean of the current permit cycle annual totals was used to calculate the projected annual cost for 2017-2021 stormwater expenditures.  
Annual geometric mean of the current permit cycle equals \$10,996,012

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## **SECTION 5 TOTAL ANNUAL POLLUTANT LOAD ESTIMATE<sup>1</sup>**

Per Schedule B.6.c of the current MS4 permit, the permit renewal application package must include an updated estimate of total annual stormwater pollutant loads. This section includes a summary of the Port's pollutant load modeling approach in Section 5.1 and a summary of modeling results/pollutant loads in Section 5.2.

### **5.1 MS4 POLLUTANT LOAD MODELING APPROACH**

Modeling results presented in Section 5.2 reflect existing conditions for the Port-owned areas within the Portland USB outside of industrial stormwater permits, and include structural BMPs known to be in place as of 2014. Structural BMPs refer to stormwater treatment facilities that include grey or green infrastructure components designed to detain, infiltrate, and/or treat stormwater runoff. Examples include detention basins, vegetated swales, and media filters. Pollutant reductions associated with non-structural BMPs, such as sweeping, educational outreach, and sump cleaning, are not explicitly quantified by the WQ model. Additionally, Port MS4 land use areas of open water over receiving waters (i.e., area that represents direct aerial catchment of rainfall and that does not produce overland runoff) and natural areas (e.g., riparian buffers, existing wetlands, Port property within Smith & Bybee Lakes, etc.) have been removed from the model.

Previously in 2008, Port MS4 pollutant load analyses utilized a spreadsheet-based Simple Method model. The current Port MS4 analyses have been conducted using a continuous simulation hydrologic model (based on the U.S. EPA Storm Water Management Model (SWMM)) coupled with a stochastic, data-driven Monte Carlo water quality (WQ) model. Precipitation inputs to the SWMM model include approximately 60 years of hourly rainfall. The Monte Carlo WQ model utilizes the statistical distribution of discrete storm events generated from the SWMM simulation along with statistical distributions of pollutant concentrations by land use, as described in the following sections.

As a result of the change in modeling methodology, differences in the estimated loading conditions are expected. For example, the Simple Method used in 2008 utilizes a single annual precipitation depth for the calculation of annual loads and only accounts for variability in the form of representative land use concentration ranges. This Simple Method does not account for the fact that annual precipitation varies from year to year, runoff varies according to antecedent conditions, or that not all storms actually produce runoff. In contrast, the current modeling methodology incorporates continuous simulation and stochastic approaches to better account for stormwater quantity and quality variability and provides a more accurate reflection of Port conditions.

Table 5-1 summarizes the current pollutant load estimation approach and related components compared to the previous approach (Port of Portland, 2008). As described above and indicated in the table, a more sophisticated modeling approach was used based on continuous hydrologic simulation coupled with a probabilistic (stochastic) water quality model. Due to a more refined analysis of Port property, land use, imperviousness, and permit boundaries, it appears the

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<sup>1</sup> Section prepared by GeoSyntec.

previous modeled land area was significantly overestimated. For example, for current Port MS4 analyses presented here, open water areas that do not produce stormwater runoff have been removed (e.g., marine terminal slips, Smith and Bybee Lakes, natural water features, and parts of the Columbia Slough). Open water areas such as up-gradient detention facilities were not removed. Additionally, areas determined to be “natural,” directly adjacent to receiving waters and not connected to the Port MS4 were also removed. These areas include unmanaged riparian corridors, wetlands, and heavily vegetated areas.

**Table 5-1. Summary of Differences between Previous (2008) and Current Pollutant Load Estimation Approach**

Approach Component <sup>(2)</sup>	Columbia Slough		Willamette River	
	Previous (2008)	Current	Previous (2008)	Current
Model	Simple Method (spreadsheet)	Stochastic Continuous Simulation (SWMM-Monte Carlo)	Simple Method (spreadsheet)	Stochastic Continuous Simulation (SWMM-Monte Carlo)
Annual Precipitation (in)	36.5	33.8	36.5	33.8
Modeled Land Area (ac)	1,226.1	588.8 (1283.4) <sup>(1)</sup>	361.5	342.6 (401.3) <sup>1</sup>
% Imperviousness	26%	15%	44%	39%
BMP % Capture	90% (presumed)	30-100% (individually assessed)	90% (presumed)	30-100% (individually assessed)
Port Monitoring Data Considered	No	Yes	No	Yes

Notes

1 Prior to the exclusion of open water and natural area.

2 The Columbia River is not included in the comparison because no approved TMDL currently exists.

While these area removals result in a reduction of approximately 788 acres (753 acres from drainage area to waters with approved TMDLs) within the modeled area, this refined area assessment more accurately represents the Port property that contributes stormwater to the receiving waters and is more consistent with the intent of the two applicable TMDLs. The Willamette TMDL, for example, only establishes WLAs for urban development and agriculture and states that forestry, while not allocated, is included in the background load. It is assumed that undeveloped natural areas (unmanaged and not connected to stormwater infrastructure) such as those described above would similarly be included in background load under the presumption that the TMDLs and subsequent permit stipulations did not intend to require treatment of these areas. Other differences are primarily due to changes in land use coverage and categories, stormwater infrastructure, BMP drainage areas and BMP design sizes. Finally, the use of Port stormwater monitoring data, where available, was incorporated to better reflect actual pollutant concentrations.

### **5.1.1 Land Use Based Runoff Quality**

Average land use event mean concentrations (EMCs), were estimated for Port land uses using a combination of marine terminal monitoring data and national and local data sets. EMCs are concentrations that represent the mass load of pollutants divided by the runoff volume discharged from a defined land use area during discrete storm events. Data sets included in the original derivation of the land use EMCs include the Association of Clean Water Agencies (ACWA) (Woodward Clyde, 1997), the National Stormwater Quality Database (NSQD, 2008), technical reports prepared by Kennedy/Jenks (2004, 2005), and the previous land use concentration values used in the modeling to support the Port of Portland MS4 Permit Renewal Application (Port of Portland, 2008). EMCs are developed and used to represent what would be expected in stormwater runoff from corresponding land uses. The Monte Carlo model assumes all land use concentrations are log-normally distributed to better match the positive skew typical of stormwater quality data sets. Land use EMCs used in the WQ modeling of Port MS4 area represent the combined average of final EMCs derived from outfall modeling and data analysis for Port Marine Terminals 2, 4, 5, and 6. Due to the lack of applicable site-specific monitoring data, EMCs derived from the noted regional/national data sets for DPb were modified by the same percentage as TPb, while EMCs for TCd and NO<sub>3</sub>-N were not modified. COD EMCs were determined using a correlation factor to BOD derived from assessment of the noted regional datasets.

Land use distributions, impervious areas and structural BMPs modeled were delineated by the consultant team (Gresham Smith and Partners Team) using Port supplied Geographic Information System (GIS) shapefiles, known infrastructure issues such as abandoned pipes, aerial photography, and site discussions.

Modeling for Port MS4 area has been summarized by annual pollutant loads in Section 5.2. Because Port MS4 modeling is Port property based and does not consider Port and City comingling of stormwater, pollutant loading has been summarized for the entire Port-owned area within the Portland USB, outside of industrial stormwater permits, by receiving waters (i.e., Columbia Slough, Columbia River, and Willamette River).

### **5.1.2 BMP Performance**

Hydrologic modeling coupled with effluent concentrations from the International Stormwater BMP Database were used to estimate structural BMP performance. All of the BMP types are effective at reducing TSS and TP concentrations via sedimentation and filtration along with moderate effectiveness at reducing *E. coli* and BOD<sub>5</sub>, particularly for the portions of these constituents that are associated with particulate matter. Reductions of dissolved fractions of these constituents and DPb are primarily addressed through the Port's BMPs that provide infiltration and cartridge filters that contain media specifically designed to remove metals, TSS, and bacteria.

Described further in Section 6.0, current MS4 modeling does not explicitly account for non-structural BMPs such as those outlined in the Port's Stormwater Management Plan (2011). Although pollutant reductions were not explicitly modeled for non-structural BMPs, Port monitoring data was considered in the development of land use-based EMCs to be more

representative of the quality of runoff observed from Port MS4 areas. The EMC selection also partially accounts for the effects of non-structural practices, such as street sweeping, catch basin cleaning, and various other pollutant reduction programs implemented by the Port.

Table 5-2 shows modeled BMP areas by watershed while Table 5-3 presents unit processes and targeted pollutants by BMP type.

**Table 5-2. Modeled BMPs by Watershed**

Receiving Waters	BMPs	Total Area Treated (ac)
Columbia River	Infiltration Porous Pavement StormFilters	2
Columbia Slough	Infiltration Detention Basins Vegetated Swales StormFilters	142
Willamette River	Wet ponds Vegetated Swales Infiltration StormFilters	106

**Table 5-3. Targeted Pollutants by BMP Type**

BMP Type	Unit Processes	Targeted Pollutants
Infiltration	Volume reduction	All
Detention Basin	Settling	TSS, Nutrients
Wet Pond	Flocculation <sup>(1)</sup> Settling Biological Uptake Microbial Transformation <sup>(2)</sup>	TSS, Metals, Nutrients, Bacteria, Organics
Media Filters (StormFilters)	Filtration Chemical Sorption	TSS, Metals, Bacteria, Organics
Vegetated Swales	Settling Filtration/ Biofiltration Volume reduction	TSS, Metals, Organics

Notes

- 1 Flocculation naturally occurs in stormwater wet ponds as a result of suspended particle interactions and, depending on parameters such as mixing, pH, ionic strength, and particle properties, natural flocculation can begin within several hours to 12 hours of initial runoff (Strecker et al., 2005).
- 2 Microbes within water bodies, soils, and sediments promote biochemical transformations of metals, nutrients, and organic pollutants as a result of metabolic processes (Strecker et al., 2005).

## **5.2 EXISTING CONDITIONS ANNUAL POLLUTANT LOAD ESTIMATES**

The following sections present average annual loading estimates for Port MS4 areas per receiving waters for those pollutants required per Schedule B.6 of the current MS4 permit.

### ***5.2.1 Port MS4 Runoff to the Columbia River***

Runoff from Port MS4 area discharging to the Columbia River is generated from approximately 190.1 acres and characterized by unvegetated open space (36 percent), vegetated open space (24 percent), buildings/rooftops (1 percent), and parking lots/roads (39 percent). Overall the modeled area is 40 percent impervious, primarily due to the combination of large open space areas and parking lots/roads around the perimeters covered by industrial permits. Stormwater discharges from Port MS4 to the Columbia River are treated by infiltration facilities, porous pavement, and StormFilter cartridge vaults. Structural BMPs treat approximately 2 acres (1 percent) of Port MS4 property discharging to the Columbia River.

### ***5.2.2 Port MS4 Runoff to Columbia Slough***

Runoff from Port MS4 area discharging to the Columbia Slough is generated from approximately 588.8 acres and characterized by unvegetated open space (34 percent), vegetated open space (30 percent), buildings/rooftops (14 percent), parking lots/roads (13 percent), impervious industrial land use (8 percent), and open water (1 percent). Overall the modeled area is 15 percent impervious, primarily due to large open space areas at Rivergate Industrial Park. Stormwater discharges from Port MS4 to the Columbia Slough are treated by infiltration facilities, detention basins, vegetated swales, and StormFilter cartridge vaults. Structural BMPs treat approximately 142 acres (24 percent) of Port MS4 property discharging to the Columbia Slough.

### ***5.2.3 Port MS4 Runoff to Willamette River***

Runoff from Port MS4 area discharging to the Willamette River is generated from approximately 342.6 acres and characterized by unvegetated open space (41 percent), buildings/rooftops (8 percent), impervious industrial land use (14 percent), open water (2 percent), vegetated open space (15 percent), and parking lots/roads (20 percent). Overall the modeled area is 39 percent impervious. Stormwater discharges from Port MS4 to the Willamette River are treated by wet ponds, vegetated swales, infiltration facilities, and StormFilter vaults. Structural BMPs treat approximately 105 acres (31 percent) of Port MS4 property tributary to the Willamette River.

### ***5.2.4 Loading Summary***

Table 5-4 summarizes the modeling results for the average annual pollutant loading for Port MS4 area outside of industrial stormwater permits, while Table 5-5 summarizes average annual loading on a unit area basis.

**Table 5-4. Average Annual Port MS4 Total Loading Estimates**

Pollutant	Units	Annual Load Estimate			
		Columbia River	Columbia Slough	Willamette River	Total
BOD <sub>5</sub>	lbs/yr	3,950	11,600	9,570	25,100
DPb	lbs/yr	0.66	1.43	1.16	3.25
<i>E. coli</i>	10 <sup>12</sup> #/yr	1.71	2.99	2.47	7.17
TP	lbs/yr	103	259	207	569
TSS	lbs/yr	23,200	36,100	31,800	91,000
COD	lbs/yr	19,800	58,000	47,900	125,650
NO <sub>3</sub> -N	lbs/yr	210	734	521	1,470
DP	lbs/yr	29	105	82.1	216
TCd	lbs/yr	1.02	1.89	1.59	4.5
TCu	lbs/yr	9.88	17.2	14.9	42
TPb	lbs/yr	14.7	17.1	17.1	49
TZn	lbs/yr	66.6	158	137	362

**Table 5-5. Average Annual Port MS4 Loading per Acre Estimates**

Pollutant	Units	Annual Load Estimate			
		Columbia River	Columbia Slough	Willamette River	Total
BOD <sub>5</sub>	lbs/yr/ac	20.8	19.7	27.9	22.4
DPb	lbs/yr/ac	0.003	0.002	0.003	0.003
<i>E. coli</i>	10 <sup>12</sup> #/yr/ac	0.009	0.005	0.007	0.006
TP	lbs/yr/ac	0.542	0.440	0.604	0.507
TSS	lbs/yr/ac	122	61.3	92.8	81.1
COD	lbs/yr/ac	104	98.5	139.7	112
NO <sub>3</sub> -N	lbs/yr/ac	1.105	1.25	1.52	1.31
DP	lbs/yr/ac	0.153	0.178	0.240	0.193
TCd	lbs/yr/ac	0.005	0.003	0.005	0.004
TCu	lbs/yr/ac	0.052	0.029	0.043	0.037
TPb	lbs/yr/ac	0.077	0.029	0.050	0.044
TZn	lbs/yr/ac	0.350	0.268	0.400	0.323

### 5.3 REFERENCES

Kennedy/Jenks Consultants. 2004. Final Annual Pollutant Base Load Model Report - Portland International Airport.

Kennedy/Jenks Consultants. 2005. Final Strategic Environmental Stormwater Pollutant Load Model Report - Portland International Airport.

National Stormwater Quality Database (NSQD) Version 3.1 (2008). [Online: <http://rpitt.eng.ua.edu/Research/ms4/mainms4.shtml>, Accessed October 2012]

Port of Portland (2008). National Pollution Discharge Elimination System Municipal Separate Storm Sewer System Permit Renewal Application. Permit Number: 101314.

Port of Portland (2011). National Pollution Discharge Elimination System Municipal Separate Storm Sewer System Permit, Stormwater Management Plan.

Strecker, E., Quigley, M., and Leisenring, M. (2005). Critical Assessment of Stormwater Treatment and Control Selection Issues. Water Environment Research Foundation. WERF 02-SW-1.

Woodward Clyde (1997). Analysis of Oregon Urban Runoff Water Quality Monitoring Data Collected from 1990 to 1996. Prepared for the Oregon Association of Clean Water Agencies.

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## SECTION 6                    BENCHMARKS<sup>2</sup>

Per Schedule D.3.d of the current MS4 permit, “A TMDL pollutant reduction benchmark must be developed for each applicable TMDL parameter where existing BMP implementation is not achieving the WLA”. Updated benchmarks are to be submitted with the MS4 permit renewal application at least 180 days prior to January 30, 2016 (current MS4 permit expiration date) as follows:

- i. *The TMDL pollutant load reduction benchmark must reflect:*
  1. *Additional pollutant load reduction necessary to achieve the benchmark estimated for the current permit term, if not achieved per Schedule D.3.c.iv.; and*
  2. *The pollutant load reduction proposed to achieve additional progress towards the TMDL WLA during the next permit term.*
- ii. *The TMDL pollutant load reduction benchmark submittal must include:*
  1. *An explanation of the relationship between the TMDL WLAs and the TMDL benchmark for each applicable TMDL parameter;*
  2. *A description of how Stormwater Management Plan (SWMP) implementation contributes to the overall reduction of the TMDL pollutants during the next permit term;*
  3. *Identification of additional or modified BMPs that will result in further reductions in the discharge of the applicable TMDL pollutants, including the rationale for proposing the BMPs; and*
  4. *An estimate of current pollutant loadings that reflect the implementation of the current BMPs and the BMPs proposed to be implemented during the next permit term.*

Applicable TMDL pollutants include Total Suspended Solids (TSS) (surrogate for Toxics), Escherichia coli (*E. coli*), Dissolved Lead (DPb), 5-day Biochemical Oxygen Demand (BOD<sub>5</sub>) and Total Phosphorus (TP) for the Columbia Slough and *E. coli* for the Willamette River. Based on Port MS4 Permit Required Water Quality Assessment (GS&P and Geosyntec, 2014a) and modeling representing 2014/2015 conditions, the TSS WLA for the Slough was estimated to be met. The WLAs for the other applicable TMDL pollutants were estimated to not be met. Therefore the pollutants subject to updated benchmarks include *E. coli*, DPb, BOD<sub>5</sub>, and TP for the Columbia Slough and *E. coli* for the Willamette River.

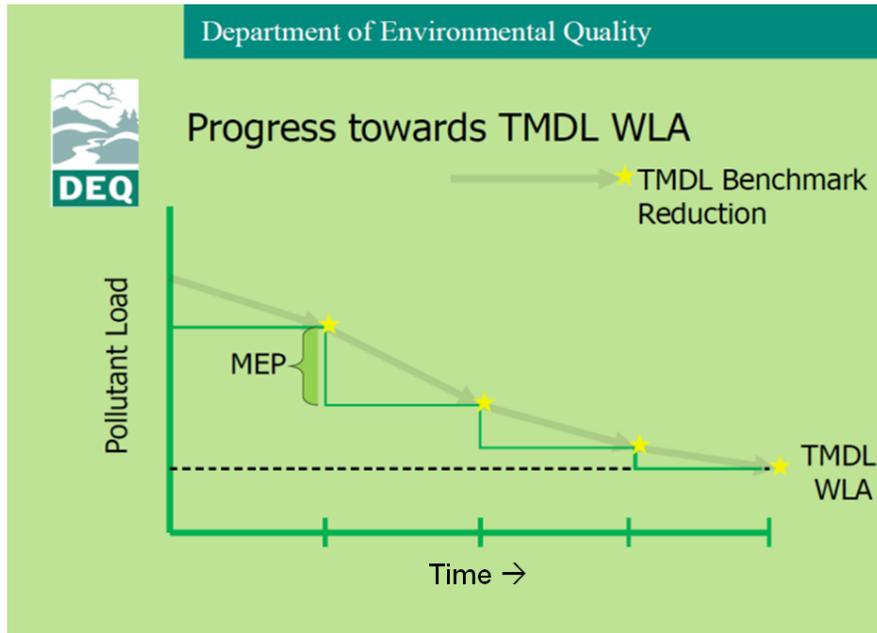
### 6.1      RELATIONSHIP BETWEEN TMDL WLAS AND BENCHMARKS

Figure 6-1 presents a visual description of the relationship between TMDL WLAs and pollutant load reduction benchmarks. This figure illustrates how incremental achievement of pollutant load reduction benchmarks will eventually achieve WLAs. However, due to refinements to modeling methodologies and changes to land uses, industrial permit boundaries, and parcel ownership between permit cycles, permittee-specific WLAs and benchmarks are not directly comparable from one permit to the next. Therefore, these must be recomputed as described in Section 6.3. Figure 6-2 illustrates the computations made to estimate progress towards meeting WLAs and

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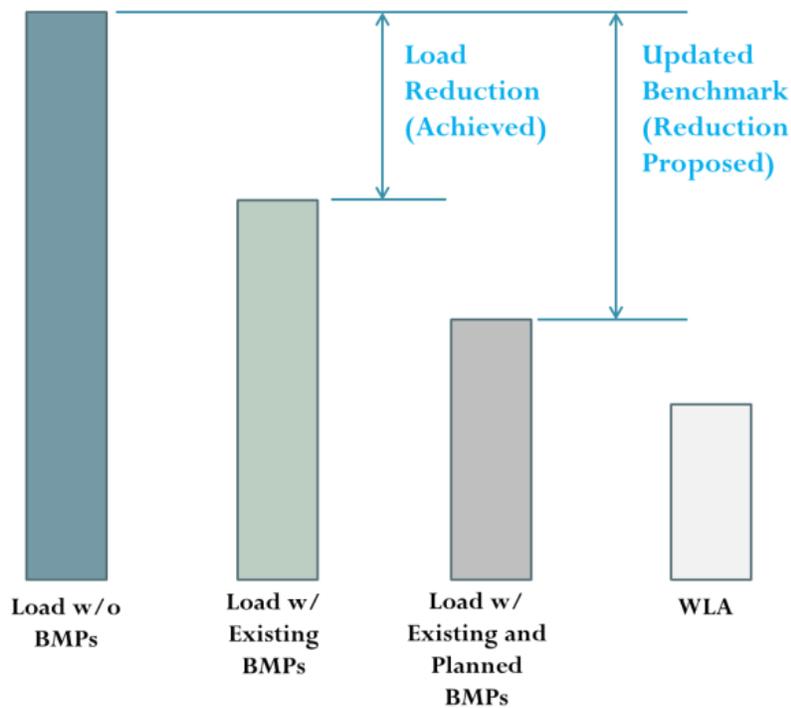
<sup>2</sup> Section prepared by GeoSyntec.

how load reductions benchmarks are reestablished for the current permit term. For consistency, current WLA calculation methods have been maintained from previous MS4 required submittals.



**Figure 6-1. TMDL/WLA Relationship to Benchmarks and Conceptual Illustration of Progress over a Generic Timescale\***

*\*Note: Not intended to imply expected compliance within a specific timeframe*



**Figure 6-2. Computation of Progress towards Achieving WLAs and Updated Benchmarks**

## 6.2 STORMWATER MANAGEMENT PLAN IMPLEMENTATION

The implementation of the Port’s SWMP has continued to demonstrate proactive environmental management for a distributed network of industrial, marine and transport facilities covering over 5,000 acres within the Portland USB. Specific to the permit requirement per Schedule D.3.d.ii.2, the implementation of the Port’s SWMP contributes to the reduction of TMDL pollutants during the next permit term through the following mechanisms:

- The implementation of an overall retrofit plan that was developed in the context of specific TMDL pollutants, unit treatment processes and BMPs that most effectively treat respective pollutants.
- Ongoing collaboration and environmental oversight of Port tenants.
- Development of Port specific design standards for PDX which allow additional and more efficient management of retrofits and development under conditions unique to the area.
- Continued efforts to reduce TSS loadings to all receiving waters although the Port is currently assessed to be meeting the TMDL WLA for the Columbia Slough.
- Through adaptive management, the Port expects to integrate potential future regulatory changes into its BMPs and environmental planning. If regulations become more stringent, the Port’s adaptive responses will likely contribute to further reductions of TMDL pollutants.

## 6.3 BMPS ANTICIPATED TO BE IMPLEMENTED NEXT PERMIT TERM

Updated load reduction benchmarks provided in Section 6.4 reflect existing structural BMPs as described in GS&P/Geosyntec (2014b), as well as retrofit BMPs identified in the Port of Portland Stormwater BMP Retrofit Plan (2014c). The treated areas for the retrofit BMPs identified in the Retrofit Plan are summarized in Table 6-1. As indicated in the table, several stormwater retrofit projects are planned for the next permit cycle (January 31, 2016 to January 30, 2021) and have been considered in the updated load reduction benchmarks.

**Table 6-1. Treated Areas Identified in Port of Portland Stormwater BMP Retrofit Plan**

<b>Watershed</b>	<b>Anticipated Implementation Timeline</b>	<b>Impervious Drainage Area Treated (acres)</b>
Willamette River	2014-2018	15.4
Columbia Slough	2018-2020	23

To quantify the retrofit projects treating the areas identified in Table 6-1, unit area drainage basins of impervious industrial land type were modeled and then scaled by the project size and load reduction assumptions noted. As they applied to the development of new benchmarks, retrofit project load reductions were then combined with existing BMP load estimates.

## 6.4 UPDATED POLLUTANT LOAD REDUCTION BENCHMARKS

Updated pollutant reduction benchmarks for the end of the next permit term are provided below in Table 6-2. Both the upper and lower limits of the 90 percent prediction intervals<sup>3</sup> for the existing conditions load reductions presented in GS&P and Geosyntec (2014b) were increased to account for the additional load reductions associated with the retrofit BMPs.

An updated benchmark for TSS for the Columbia Slough was not developed because it has been determined that the Port is currently meeting the WLA.

**Table 6-2. Previously Predicted and Updated TMDL WLA Pollutant Benchmarks for the Port**

Parameter	Units	Updated Benchmarks <sup>(1)</sup>
BOD <sub>5</sub>	lbs/yr	2,739 to 5,932
DPb	lbs/yr	0.17 to 0.34
<i>E. coli</i>	10 <sup>(1)</sup> #/yr	0.58 to 1.25
TP	lbs/yr	65.9 to 140
TSS	lbs/yr	NA
<b>Lower Willamette River</b>		
<i>E. coli</i>	10 <sup>(1)</sup> #/yr	0.36 to 0.86

Notes:

<sup>1</sup> Calculated in 2014 representing 2020 conditions.

A demonstration that currently estimated benchmarks are proposed to achieve progress towards the Port's respective WLAs is shown in Table 6-3.

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<sup>3</sup> The 90 percent prediction interval is the 5th and 95th percentiles of the annual load reduction estimates; there is a 90 percent chance that the annual load reduction from any given year will fall within this interval.

**Table 6-3. Demonstration of Progress towards Achieving WLAs**

Parameter	Units	Percent Reduction Needed to Achieve WLA	Percent Load Reduction Estimated from Current BMPs	Percent Load Reduction Estimated from Achieving Proposed Benchmarks <sup>(3)</sup>
<b>Columbia Slough</b>				
BOD <sub>5</sub>	lbs/yr	73%	22%	27%
DPb	lbs/yr	36%	12%	16%
<i>E. coli</i>	10 <sup>(1,2)</sup> #/yr	78%	19%	23%
TP	lbs/yr	73%	24%	30%
TSS	lbs/yr	0% <sup>(1)</sup>	20% <sup>(2)</sup>	20% <sup>(2)</sup>
<b>Lower Willamette River</b>				
<i>E. coli</i>	10 <sup>(1,2)</sup> #/yr	78%	15%	19%

Notes:

- 1 TSS WLA estimated to have been achieved (GS&P and Geosyntec, 2014b).
- 2 Although no updated benchmark has been established for TSS, the noted percent reduction was calculated from the difference between baseline conditions and conditions with BMPs, including retrofits.
- 3 Accounting for the retrofits to be implemented during the next permit term represents additional progress towards meeting the respective WLAs beyond that assessed for current conditions.

The percent load reductions shown in Table 6-3 do not explicitly reflect the reductions achieved by non-structural BMPs. As described in the Port of Portland Stormwater Management Plan (Appendix A), the Port conducts various pollution prevention activities including the following programs that are expected to contribute directly to the reduction of the TMDL pollutants:

- Street and Vehicle Maneuvering Area Cleaning and Maintenance Program
- Program to Limit Landscape Maintenance Activities Impact on Stormwater
- Program to Limit Infiltration from Port-Owned Sanitary Sewer System to the MS4
- Staff Training Program for Stormwater Pollution Prevention
- Tenant Stormwater BMP Program
- Stormwater System Cleaning and Maintenance Program
- Program for the Tracking and Maintenance of Private Structural Controls

Through the analysis of Port stormwater monitoring data, Port MS4 area appears to discharge fewer pollutants compared to similar land uses in the MS4 data documented in the ACWA database (1997). The lower concentrations found in Port stormwater are, at least partially, attributed to the Port's implementation of non-structural BMPs. The water quality model partially incorporates the effects of non-structural BMPs through the use of land use-based EMCs that have been adjusted to better match available outfall monitoring data from Port-owned property. Adjustments to EMCs originally derived from local/regional datasets, and where site-specific data was available, were made to better account for Port land use conditions (e.g., flat topography, limited erosion, partially disconnected impervious areas, limited roadway ownership, etc.) and the non-structural management strategies and practices implemented by the Port as described above. Additionally, since adjusted EMCs reflect actual Port conditions (for those pollutants where site-specific data was available as described in Section 5.1), the likelihood

of over-estimating the pollutant removal performance of both existing and planned structural BMPs is reduced.

## **6.5 REFERENCES**

Gresham, Smith and Partners, Geosyntec Consultants, Inc., and HDR (GS&P et al.). (2014a). Port of Portland Stormwater Design Standards Manual. May.

Gresham, Smith and Partners and Geosyntec Consultants, Inc. (GS&P/Geosyntec). (2014b). Port of Portland Stormwater MS4 TMDL Water Quality Assessment. December.

Gresham, Smith and Partners and Geosyntec Consultants, Inc. (GS&P/Geosyntec). (2014b). Port of Portland Stormwater MS4 Retrofit Plan. October.

Port of Portland (2008). National Pollution Discharge Elimination System Municipal Separate Storm Sewer System Permit Renewal Application. Permit Number: 101314.

## **SECTION 7            MONITORING**

Pursuant to an intergovernmental agreement (IGA), the Port of Portland and the City of Portland have a joint monitoring program conducted by the City to meet the requirements specified under Schedule B. The proposed monitoring program objectives matrix and proposed monitoring plan are provided in the City of Portland's portion of the permit renewal application.

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**Appendix A**  
**Stormwater Management Plan**



