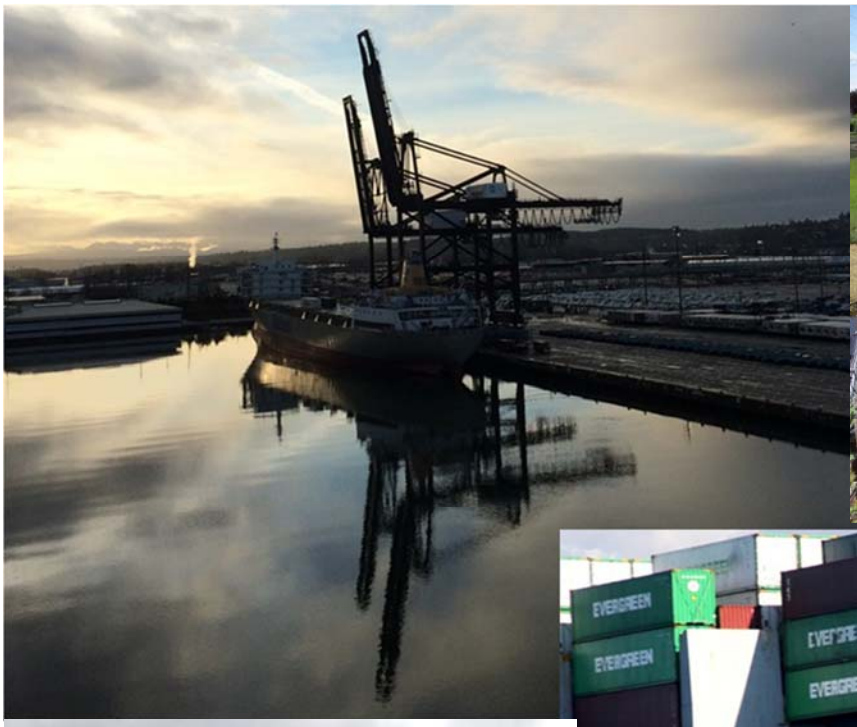
Stormwater Management Guidance Manual: Customizing and optimizing stormwater requirements for *port-specific land uses and customers*.

June 30, 2016



Port of Tacoma Environmental Project Manager: Anita Fichthorn

Port Customers: Husky, AWC, Railroads, Grand Alliance,

Commercial Real Estate, all future industrial customers

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Introduction

The Port of Tacoma (Port) is responsible for managing stormwater runoff on over 2000 acres of property designated as heavy industrial maritime. The majority of the discharges end up in Commencement Bay (Bay) which until early 1980s, industry commonly discharged untreated stormwater and wastewater into the Bay. Pollutants associated with these discharges often build up in the sediments and had the potential to impact human health and the environment. The Port has spent over $175 million dollars over the last 30 years to remove these historically contaminated sediments from the waterways that feed the Bay. Those investments have created a vibrant working waterfront, creating jobs and driving the local economy. The need to protect this investment and continue improve water quality for future generations has compelled the Port take steps to prevent potential pollutants from discharging to the waterways.

Figure 1 Port of Tacoma

Goals and Objectives: A Strategic Approach to Preventing Stormwater Contamination

A key component of the Port of Tacoma Strategic Plan is to advance Environmental Stewardship by helping its customers solve challenging environmental problems. The goal of the Stormwater Management Guidance Manual (Manual) is to help guide internal and external customers in selecting appropriate stormwater treatment for their specific facilities based on operations and other activities.

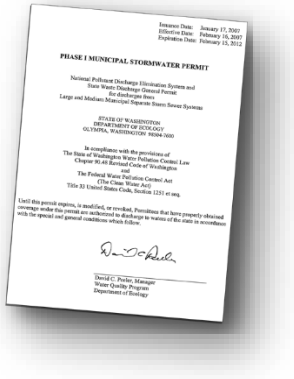
The objective of implementing such a Manual is to provide guidance during development and redevelopment actions (specific to port industrial operations where no other guidance specific to the industry exists) save time and money by creating a process matrix for decision-making and protect water quality by applying the appropriate amount of stormwater treatment for all new facilities.

Background: Why do we need a Stormwater Management Guidance Manual for Ports?

Stormwater is the main pollutant contributor to Commencement Bay and is Department of Ecology's top priority. Polluted stormwater runoff threatens our waterway clean-up efforts. There are many risks associated with untreated runoff such as significant impacts to operations, expensive retrofits and the potential for citizen lawsuits.

The Department of Ecology develops and administers National Pollutant Discharge Elimination System (NPDES) stormwater permits in Washington State. The Port of Tacoma is subject to several types of stormwater permits governed by specific activities on Port-owned properties.

Phase I Municipal Stormwater Permit (MS4):


Issuance Date: January 17, 2007
Effective Date: February 16, 2007
Expiration Date: February 15, 2012

PHASE I MUNICIPAL STORMWATER PERMIT

National Pollutant Discharge Elimination System and
State Waste Discharge General Permit
for discharges from
Large and Medium Municipal Separate Storm Sewer Systems

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
OLYMPIA, WASHINGTON 98504-7600

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 et seq.

Until this permit expires, is modified, or revoked, Permittees that have properly obtained coverage under this permit are authorized to discharge to waters of the state in accordance with the special and general conditions which follow.

David C. Parker, Manager
Water Quality Program
Department of Ecology

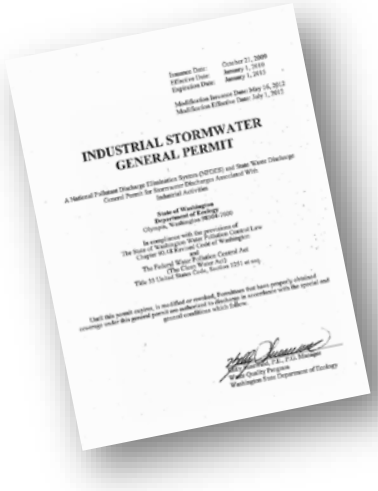
The MS4 permit requires the Port to develop a Stormwater Management Plan and Program that includes the following elements:

- Education program for Port staff and tenants
- Public involvement and participation:

- Illicit Discharge Detection and Elimination
- Construction Stormwater Source Control.
- Post-construction Stormwater Management
- ***Minimum technical requirements for development and redevelopment: if the size of a development project exceeds specific parameters, long-term stormwater treatment must be implemented.***
- Operations and Maintenance Program
- Source Control in existing developed areas

The focus of this discussion is on how the Port has developed industry specific guidance that is above and beyond compliance with the Minimum Technical Requirements.

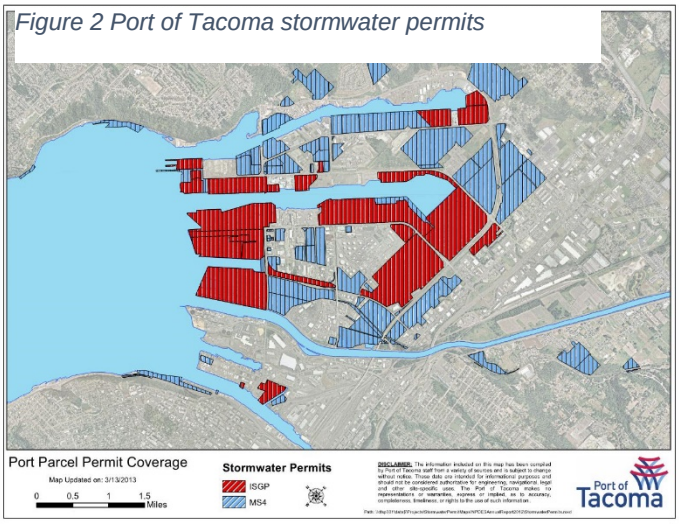
Industrial Stormwater General Permit


INDUSTRIAL STORMWATER
GENERAL PERMIT

The majority of the Port's customers are in the heavy industrial maritime and transportation-related business. Facilities that engage in industrial activities and discharge stormwater to surface waters of the state are subject to the Industrial Stormwater General Permit (ISGP). The ISGP has water quality monitoring requirements that our customers need to meet in order to avoid expensive multi-million dollar retrofits of their stormwater infrastructure and operational interruptions due to construction that cost businesses valuable time and money.

The Stormwater Management Guidance Manual was designed to meet the needs of the Port and its customers and create a simple process that will be cost effective and improve water quality.

Figure 2 Port of Tacoma stormwater permits



Objectives and Methodology

The Port of Tacoma Stormwater Management Guidance Manual (Manual) was developed as a tool to help our customers and stakeholders navigate the stormwater requirements associated with development actions and as part of the Port's Interlocal Agreement with the City of Tacoma.

Stormwater Management Guidance Manual Contents

The Manual contains Supplemental Guidelines that are specific to Port operations that are not contained in the City of Tacoma's Stormwater Manual. The Manual can assist any municipality in selecting the most appropriate stormwater treatment Best Management Practices (BMPs) based on:

- Performance – using site specific water quality data and the treatment system type to determine pollutant removal rates;
- Cost-effectiveness of implementation to include life-cycle costs and operations & maintenance costs;
- Criteria to determine whether the BMP will be able to perform when associated with pollutant generating activities and specific land uses.

The Manual contains the tools for BMP selection to include:

- Permit requirements decision-making flow charts. The Manual includes checklists for permittees, design engineers, facility occupants, and enforcement personnel. This section is meant to provide user-friendly tools for all levels during the development of a project.
- Site-specific treatment BMP selection process. Step-by-step process of selecting treatment BMPs for projects that trigger treatment requirements. As mentioned above, the BMP Selection process considers performance and cost of implementation. Selection process will also eliminate treatment systems that will not meet performance goals and in the future, will provide a cost-benefit curve for all BMPs that are proposed for use. This process is not specific to Port facilities and can be used by any municipality;

- Low Impact Development (LID) Guidance document- LID is not required at Port facilities; however, the Port is committed to implementing LID where feasible. This document includes an LID selection process using site characteristics to determine the viability of LID BMPs in areas where LID is difficult to implement due to environmental constraints.
- Retrofit guidelines that will provide guidance on how to deal with those small projects where treatment BMPs do not provide any water quality benefit and how to provide treatment where is it needed.

Stormwater Management Guidance Manual Chapters

The layout of the Manual is such that is follows the requirement of the MS4 permit and includes the following chapters:

Chapter 1 – Explains the purpose, regulatory framework, and definitions used in the manual.

Chapter 2 – Stormwater Requirement for Port properties - Water Quality Treatment

- Land use/activity trigger (Port-specific requirement)
- Preferred/Approved stormwater treatment systems for Port projects
- Conditionally allowed stormwater treatment system
- Pilot data will be required and proposed treatment will have performance standard of 80% (Port-specific requirement)
- Process Flow Chart –
    - Project request – initial Stormwater Project checklist one pager –
        - External: to be initiated by the tenant during the TI process
        - Internal: to be initiated during pre-project planning, BOD and/or preliminary design
    - Pre-application meeting with Port to go over Stormwater Site Plan Checklist
    - Final submittal for review – prior to submittal to City of Tacoma for permits
    - Plan review – to be completed by Engineer (internal or consultant)
- Exemptions

Chapter 3 – LID Feasibility Guidance and Flow chart for BMP selection based on typical land uses within Port

Chapter 4 – BMP Selection (treatment) for development/redevelopment

- Selection based on
    - Pollutant removal efficiency and performance
    - Construction cost
    - Operations & Maintenance cost
- Approved BMP – if select from this menu no further action needed
- Conditionally approved – BMPs on this list will require pilot data, stormwater characterization and supply expected results – must meet current ISGP benchmarks 80% of the time
- Not allowed - stormwater treatment system that will not be constructed at Port facilities unless absolutely required.
- If the stormwater treatment system is not listed on the menu (new technology), the proponent would need to run the data through the pilot study process and submit results for review.

In order to keep updates to the Manual minimal unless there is a permit update, all appendices, reference materials, checklists, and figures, are located on Port's external website under Tenant Resources in order to have the readily available for use.

For a full review of the Stormwater Management Guidance Manual, please visit Port of Tacoma's website at the following link:

http://portoftacoma.com/real-estate/tenant-resources#stormwater

Stormwater Management Guidance Manual Fulfills the Six Award Criteria

Figure 3 Horizon Consumer

1. Level and nature of benefits to environmental quality, beautification, or community involvement.

As stated above a key component of the Port of Tacoma Strategic Plan is to advance Environmental Stewardship by helping its customers solve challenging environmental problems.

The Stormwater Management Guidance Manual provides the necessary tools to help our customers and stakeholders cut costs for potential future expensive retrofit projects that impact operations and business viability, meet their stormwater permit obligations, and prevent recontamination of waterways associated with Commencement Bay and the Puget Sound.

2. Level of independent involvement and effort by the Port of Tacoma

The Port of Tacoma funded and led all aspects of the project from consultant selection, drafting the framework, and developing Port-specific requirements to meeting with agencies, external customers, design engineers, and internal commercial, operations and capital project managers to provide education and outreach.

3. Creativity of the Solution or programs.

The Stormwater Management Guidance Manual is the first of its kind developed for Port-specific heavy industrial maritime and transportation related facilities. The City of Tacoma and Department of Ecology stormwater manuals are aimed at private developments in an urban setting such as residential and commercial facilities. The Port Manual is designed to be used in conjunction with the other manuals; however, it provides a stormwater treatment selection process specifically for port facilities.

4. Whether the project or program results are apparent.

The Stormwater Management Guidance Manual has been in use for a little over a year. The result of implementation has saved the Port and our customers hundreds of thousands of dollars in design costs for capital projects. Prior to the launch of the Manual, design consultants would take one of two approaches to selecting stormwater treatment for large development projects. They would either reuse a design from another project or select technology that has not been tried or tested in an industrial application. There are measurable risks and benefits to those two approaches:

Table 1 Risk and Benefit of designing <u>without</u> guidance

Approach	Risks	Benefits
Use a system from another project	System not based on site-specific characterization of stormwater discharges	Less time in design
Choose an untested proprietary technology	New technology or proprietary systems are extremely expensive.	Latest technology can be very effective at removing pollutants
	Manufacturers' removal rates are based on controlled pollutant loading which is not based on field loading, storm intensity or geographical location	
	Proprietary system require special operations and maintenance adding to operational costs not anticipated during selection process	

The Port has <u>reduced or eliminated</u> potential risk of non-compliance, the risk of operational interruptions, and the risk of being required to invest in potentially large expensive retrofits of systems that were installed but do not perform as needed.

5. Cost effectiveness of the activity.

Development of the Manual was roughly the same cost of designing a proprietary stormwater treatment system for a one retrofit project. The Port has completed four large retrofit projects over the last three years at a cost of $8.1 million dollars. **The implementation of the Manual for development and redevelopment projects will reduce or eliminate the requirement for retrofit projects.**

6. Transferability of the technology or idea to port industry.

The Stormwater Management Guidance Manual is designed for port-specific land uses including container cargo, break bulk cargo, log sort yards, heavy equipment maintenance facilities, public roads and vehicle movement, outdoor raw materials storage, parking, industrial buildings, and rail operations. It also accounts for potentially

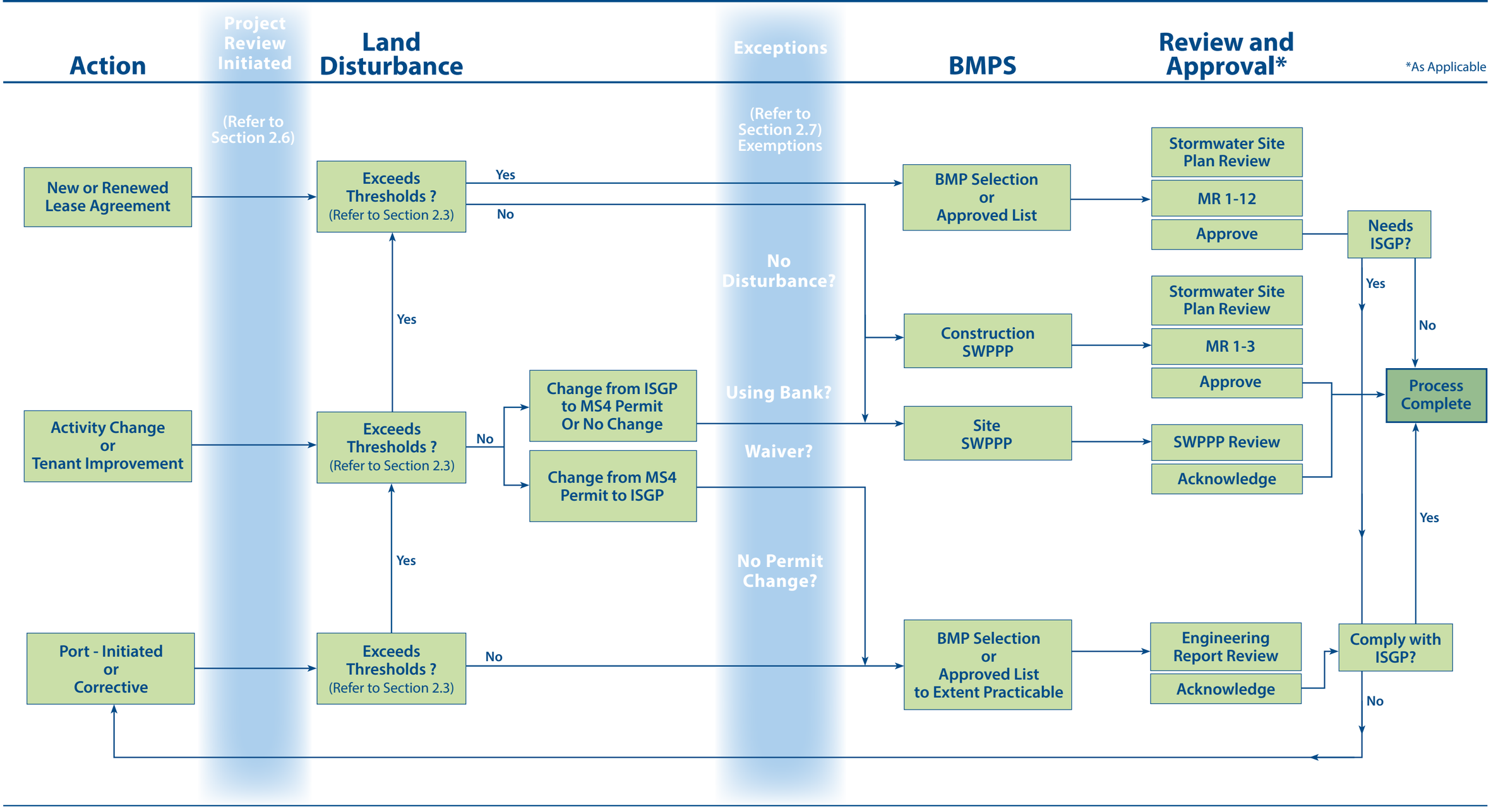
contaminated underground soils, operational constraints, and facilities that are typically built at the waters' edge. Any one of these types of facilities could benefit from using the guidance in the Manual to implement decisions related to stormwater treatment selection for their facility.

Appendix A Decision Matrix

Appendix B Low Impact Development Matrix

Appendix C Pilot Data Decision Matrix and Performance Evaluation

ACTION AND REVIEW DECISIONS



MS4: Municipal Separate Storm Sewer System
ISGP: Industrial Stormwater General Permit

FIGURE 3. Action and Review Decisions
Refer to Section 2.6

	Prohibited	Conditional	Port Required	Port Allowed
Container, Break Bulk, And Dry Bulk Terminals	• Permeable Pavement • Flow Dispersion	• Planters And Tree Boxes • Rainwater Collection And Use		Bioretention
Log Yards	• Bioretention • Permeable Pavement • Planter Boxes • Flow Dispersion	Rainwater Collection And Use		
Maintenance	• Permeable Pavement • Rainwater Collection And Use • Flow Dispersion	Bioretention		Planters And Tree Boxes
Public Roads and Vehicle Movement	Permeable Pavement			• Flow Dispersion • Bioretention • Planters And Tree Boxes
Outdoor Raw Materials Storage	• Bioretention • Permeable Pavement • Planter Boxes • Flow Dispersion	Rainwater Collection And Use		
Parking			Bioretention	• Permeable Pavement • Planters And Tree Boxes • Rainwater Collection And Use • Flow Dispersion
Buildings/ Roofs		• Bioretention • Planters And Tree Boxes • Flow Dispersion	• Vegetated Roofs • Downspout Treatment	Rainwater Collection And Use
Rail	LID Not Used			
Landscape	LID Not Used			
Other				

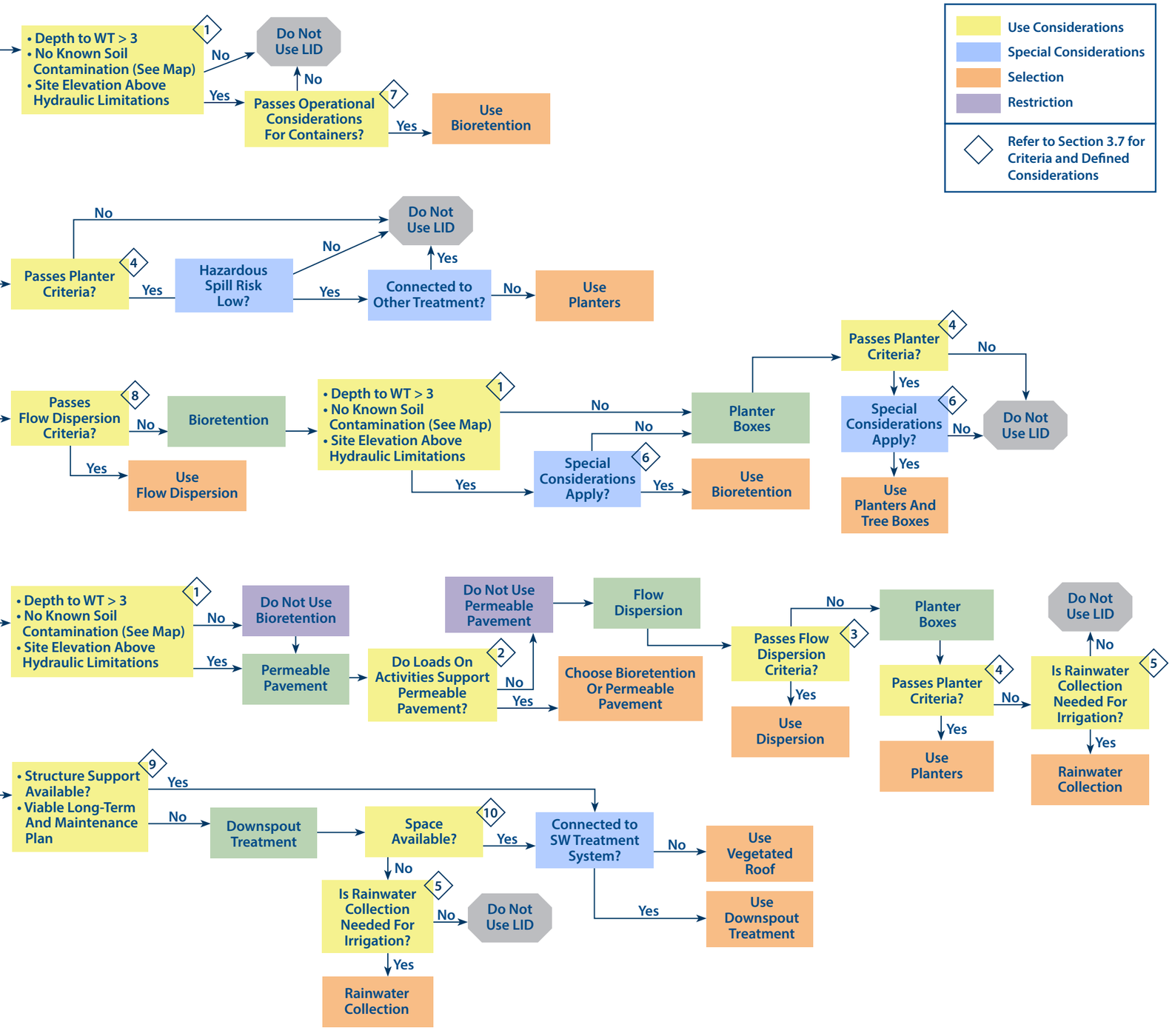


FIGURE 5. Decision Assessment for Evaluating LID Feasibility

Port of Tacoma - Data for Percent-Exceedance Curves

Type in Data Set name here

Constituent (Type in constituent here): Copper

Units (Type in units for all data sets here): ug/L

Add Benchmark value here

Benchmark: 14 ug/L

14.0	0%
14.0	50%
14.0	100%

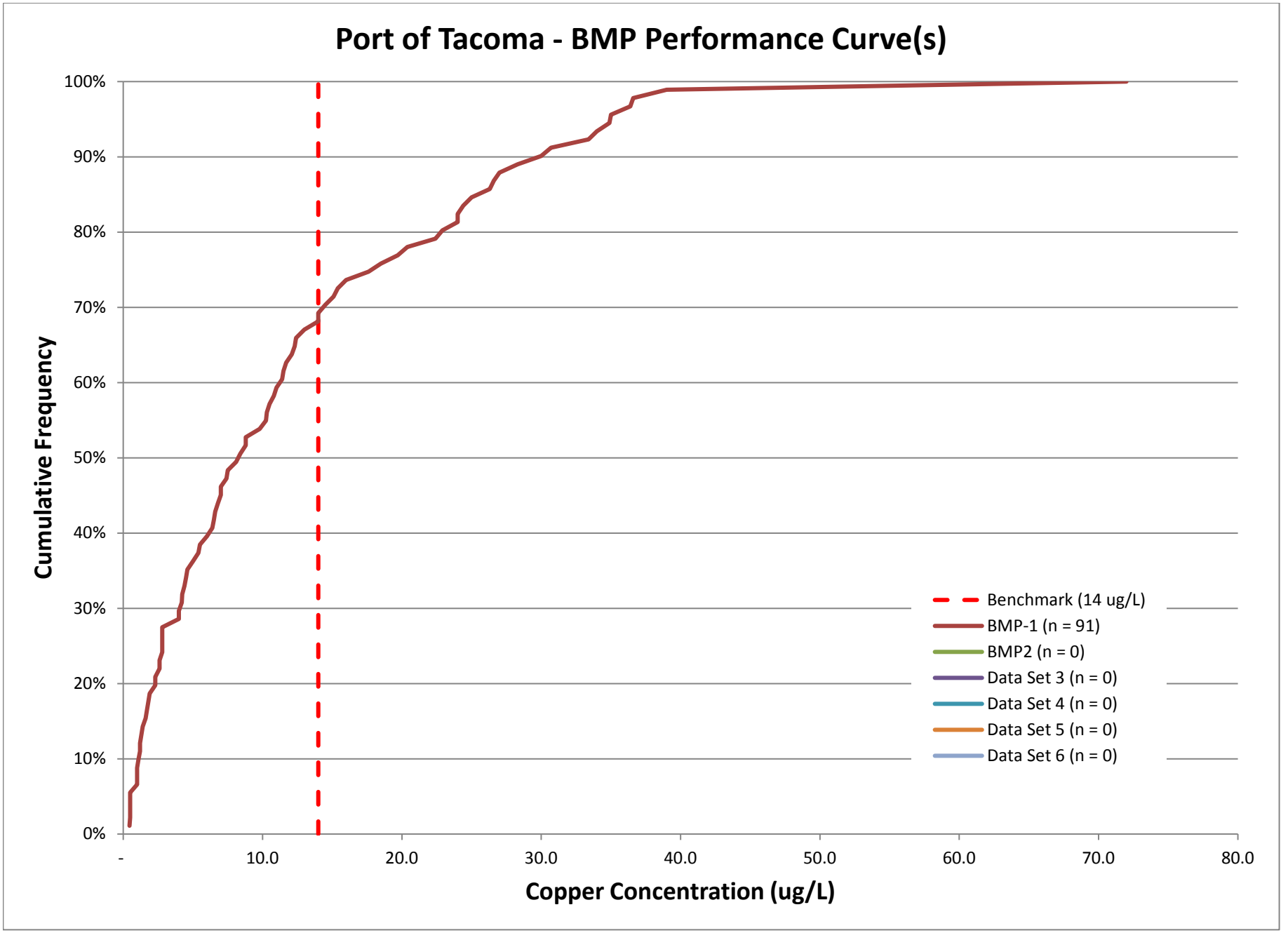
Automatically Calculated:

X-axis Label: Copper Concentration (ug/L)

Benchmark Label: Benchmark (14 ug/L)

Paste values here & sort manually, smallest to largest

Data Name:	BMP-1			Data Name:	BMP2			Data Name:				Data Name:		
Label:	BMP-1 (n = 91)			Label:	BMP2 (n = 0)			Label:	Data Set 3 (n = 0)			Label:	Data Set 4	
mean =	12.4			mean =	#DIV/0!			mean =	#DIV/0!			mean =	#DIV/0!	
sd =	12.37332			sd =	#DIV/0!			sd =	#DIV/0!			sd =	#DIV/0!	
n =	91			n =	0			n =	0			n =	0	
Sorted Data	*Index*	*Cum%*		*Sorted Data*	*Index*	*Cum%*		*Sorted Data*	*Index*	*Cum%*		*Sorted Data*	*Index*	
0.45	1	1.1%			1				1				1	
0.5	2	2.2%			2				2				2	
0.5	3	3.3%			3				3				3	
0.5	4	4.4%			4				4				4	
0.5	5	5.5%			5				5				5	
1	6	6.6%			6				6				6	
1	7	7.7%			7				7				7	
1	8	8.8%			8				8				8	
1.1	9	9.9%			9				9				9	
1.2	10	11.0%			10				10				10	
1.2	11	12.1%			11				11				11	
1.3	12	13.2%			12				12				12	
1.4	13	14.3%			13				13				13	
1.6	14	15.4%			14				14				14	
1.7	15	16.5%			15				15				15	
1.8	16	17.6%			16				16				16	
1.9	17	18.7%			17				17				17	
2.3	18	19.8%			18				18				18	
2.3	19	20.9%			19				19				19	
2.6	20	22.0%			20				20				20	
2.6	21	23.1%			21				21				21	
2.8	22	24.2%			22				22				22	
2.8	23	25.3%			23				23				23	
2.8	24	26.4%			24				24				24	
2.8	25	27.5%			25				25				25	
4	26	28.6%			26				26				26	
4	27	29.7%			27				27				27	
4.2	28	30.8%			28				28				28	


Port of Tacoma - BMP Performance Curve(s)
Cumulative Frequency
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
-
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
Copper Concentration (ug/L)
Benchmark (14 ug/L)
BMP-1 (n = 91)
BMP2 (n = 0)
Data Set 3 (n = 0)
Data Set 4 (n = 0)
Data Set 5 (n = 0)
Data Set 6 (n = 0)