

# REFERENCE GUIDE FOR STORMWATER BEST MANAGEMENT PRACTICES



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City of Los Angeles



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## EXECUTIVE SUMMARY

Over the past two decades, local, regional, and national research programs have identified the principal causes of water pollution in most urban areas. Urban runoff, discharged from municipal and separate storm drain systems, has been one of the principal causes identified. Urban runoff discharged through storm drain system is further described as “non-point source pollution”, that is, a diffuse pollution that cannot be traced to a specific source. Because the pollution is discharged from the storm drain system, it is also referred to as “stormwater pollution.” Over time, stormwater pollution can deposit hundreds of tons of trash and debris at beaches and can also lead to public health and safety concerns. Urban runoff and stormwater pollution are not only a concern during the rainy season, but also year-round. This is due to the various ways in which urban water is used and discharged to the storm drain system, throughout the year. While the effect of stormwater pollution is not easily observed at the source, the impact upon receiving waters is apparent. One noticeable example is the presence of trash and debris along the beaches after a rainstorm event.

A less observable effect occurs when urban runoff and associated stormwater pollution impact aquatic plant and animal life in receiving waters. An example of this effect is the presence of potentially harmful viruses and bacteria now found in our coastal receiving waters along with soil particles, other solids, and litter. The City of Los Angeles storm drain system does not filter or treat contaminants or debris in the urban runoff, thus making urban runoff one of the most significant sources of surface water pollution in the region.

The City of Los Angeles is committed to implementing corrective measures to mitigate urban runoff and stormwater pollution problems. The City’s Stormwater Program has been directed to identify and implement mitigation and control measures via the application of Best Management Practices (BMPs). This manual has been prepared to assist departments and divisions of the City of Los Angeles in finding related information regarding BMPs for stormwater and urban runoff.

When implemented, BMPs best manage, prevent, control, remove, reduce, or treat urban runoff and stormwater pollution, before the pollution reaches receiving waters. BMPs include programs, operational measures or methods, engineered systems, technologies, processes, or siting criteria. This manual summarizes and details information on applicable BMPs for construction, source control, and treatment control as defined below:

- ☂ Construction BMPs are structural devices, measures, and operational methods or procedures used at construction sites to prevent, control, and treat pollution emanating from the site.
- ☂ Source control BMPs are schedules of activities, prohibitions of practices, maintenance procedures, management and operational procedures, and other methods employed at municipal, industrial, residential, and commercial sites, that help prevent stormwater pollution by reducing the potential for contamination at the source of pollution.
- ☂ Treatment control BMPs are engineered systems, technology, and structural devices that use physical, chemical, or biological processes to treat, control, remove, or reduce pollutants from stormwater and urban runoff.

# TABLE OF CONTENTS

	<u>Page No.</u>
EXECUTIVE SUMMARY .....	iii
LIST OF TABLES .....	v
ACRONYMS AND ABBREVIATIONS .....	vi
INTRODUCTION.....	1
I. Construction Best Management Practices (BMPs) .....	6
A. Background Information.....	6
B. BMP Listing .....	7
C. BMP Selection Matrix and Tables .....	8
II. Source Control Best Management Practices (BMPs) .....	19
A. Background Information.....	19
B. BMP Listing .....	20
C. Selection Matrix and Tables .....	22
III. Treatment Control Best Management Practices (BMPs) .....	37
A. Background Information.....	37
B. BMP Listing .....	37
C. Selection Matrix and Tables .....	39
REFERENCES.....	54

## APPENDICES

Appendix A Assistance Directory.....	A-1
Appendix B Vendor Information.....	B-1
Appendix C How to Use the Guide .....	C-1
Appendix D Acknowledgments .....	D-1

## LIST OF TABLES

	<u>Page No.</u>
Table IA Construction BMP Selection Matrix .....	9
Table IB Construction BMP References.....	12
Table IC Construction BMP Costs .....	14
Table ID Construction BMP Target Pollutants.....	17
Table IIA Source Control BMP Selection Matrix .....	23
Table IIB Source Control BMP References.....	28
Table IIC Source Control BMP Costs .....	31
Table IID Source Control BMP Target Pollutants.....	34
Table IIIA Treatment Control BMP Selection Matrix .....	40
Table IIIB Treatment Control BMP References.....	45
Table IIIC Treatment Control BMP Costs .....	48
Table IIID Treatment Control BMP Target Pollutants.....	51

## ACRONYMS AND ABBREVIATIONS

BMP	best management practice
BOD	biochemical oxygen demand
CDS	continuous deflective separation
cf	cubic feet
cfs	cubic feet per second
City	City of Los Angeles
COD	chemical oxygen demand
CWA	Federal Clean Water Act of 1987
gal	gallon
H	high
k	thousand
L	low
m	million
M	moderate
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
RWQCB	Regional Water Quality Control Board (Los Angeles)
sf	square feet
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board (California)
TSS	total suspended solids
UV	ultra-violet

# INTRODUCTION

## Purpose and Scope

This *Reference Guide for Stormwater Best Management Practices* has been prepared to provide general guidance and information on stormwater and urban runoff best management practices (BMPs). General guidance is provided to help locate related information on BMPs and to further identify, assess, and select appropriate BMPs. To help with the location and selection, the guide provides BMP listings, selection matrices, reference information, BMP cost information, and BMP target pollutant information. Background information is also provided and includes a general overview of associated pollutant and regulatory issues.

Designated manual users include engineers, planners, managers, and field operations personnel in the Stormwater Management Division, as well as other City of Los Angeles departments and divisions. This manual serves as a reference guide and a planning tool for designated users. The use of this manual however, does not supersede requirements of a National Pollutant Discharge Elimination System (NPDES) permit or other regulatory permits. Although this manual is currently not available to other users, it may in the future, be made available to developers, industries, commercial entities, and the general public, as appropriate. The current and primary purpose of this manual is to assist city engineers and managers in planning, developing, and selecting the optimum BMP(s) for various applications.

## Manual Organization and Use

This manual consists of three major sections that correspond to different BMP categories, as listed below:

- I. Construction BMPs**
- II. Source Control BMPs**
- III. Treatment Control BMPs**

Section I describes BMPs for the construction category, Section II describes BMPs for the source control category, and Section III describes BMPs for the treatment control category. BMP definitions are provided for the described categories at the end of the Executive Summary and at the beginning of each section. Each section contains BMP guidance information for the specific category.

The guidance information presented in each section includes relevant background information, a listing of applicable stormwater BMPs, and associated tables to help with the BMP selection process. One of the tables included in each section is a BMP selection matrix. The other tables include a BMP reference table, a BMP cost table,

and a BMP target pollutant table. If needed, directions for manual use, including table use, are provided in Appendix C. Table organization is described below.

## Table Organization

The tables are organized in a series format as described below.

**Series A** includes Tables IA, IIA, and IIIA. All Series A tables are BMP Selection Matrices and are specific to one BMP category as follows:

Table IA	Construction BMP Selection Matrix
Table IIA	Source Control BMP Selection Matrix
Table IIIA	Treatment Control BMP Selection Matrix

Each table listed above identifies BMPs that would be applicable to a certain activity, area of concern, or target pollutant associated with the category. The purpose of this table series is to identify and help select a BMP that would not only be applicable to the category, but also the activity or area of concern within the category.

**Series B** includes Tables IB, IIB, and IIIB. All Series B tables are BMP Reference Tables and are specific to one BMP category as follows:

Table IB	Construction BMP References
Table IIB	Source Control BMP References
Table IIIB	Treatment Control BMP References

Each table listed above identifies BMPs that are applicable to the category along with a corresponding published reference for each BMP. Abbreviated number citations are included in the table. Full citations are in numerical order, in the Reference section at the end of the manual. The purpose of this table series is to provide reference information for BMPs that are being considered for selection within a category. Each BMP was identified from the latest available and applicable references, pilot study materials, and application results published by various federal, state, and local agencies, as well as those published by private companies.

**Series C** includes Tables IC, IIC and IIIC. All Series C tables are BMP Cost Tables and are specific to one BMP category as follows:

Table IC	Construction BMP Costs
Table IIC	Source Control BMP Costs
Table IIIC	Treatment Control BMP Costs

Each table listed above identifies relative or estimated costs for BMPs applicable to that category. The purpose of this table series is to list applicable BMPs and corresponding qualitative and quantitative cost information. Costs vary depending

on a number of factors including site conditions, site location, and size and type of the project. Because of the unavailability of individual costs at this time, cost information on capital, training, and operation and maintenance are expressed in general qualitative costs (high, moderate, and low) only. The relative cost information was primarily obtained from the California Stormwater BMP Handbooks (References 2, 3, and 4). Information on quantitative costs for treatment control BMPs was also obtained from available data summary materials and pilot study technical reports (e.g. References 30, 39, and 42).

**Series D** includes Tables ID, IID, and IIID. All Series D Tables are BMP Target Pollutant Tables and are specific to one BMP category as follows:

- Table ID Construction BMP Target Pollutants
- Table IID Source Control BMP Target Pollutants
- Table IIID Treatment Control BMP Target Pollutants

Each table listed above consists of BMP listings and corresponding pollutants targeted. The purpose of this table series is to identify the pollutants removed, treated, or reduced by the specific BMP. It should be noted that pollutants could be site-specific depending on the type of project or activity. The information included in the Series D tables was obtained primarily from the California Stormwater BMP Handbooks (References 2, 3, and 4) and pilot study reports (e.g. Reference 39). The degree of effectiveness in the pollutant removal process vary for each BMP due to site-specific conditions and other factors such as application, topography, weather conditions, and implementation methodology. Thus, information on pollutant removal efficiency for construction, source control, and treatment control BMP categories are not documented in this manual. Instead, a qualitative table of target pollutants for each BMP category is provided. It should be noted, however, that limited removal efficiency data for treatment control systems can be found in some reference materials cited in this manual (e.g. Reference 24). Also, information included on specific pollutants for treatment control systems are based on currently available data.

## Target Pollutants

Target pollutants referred to in this manual and specifically listed in Series D tables, as described above, are grouped in eight general categories as follows:

1. Sediments – Sediments are soils or other surficial materials transported or deposited by the action of wind, water, ice, or gravity, as a product of erosion. For example, sediments can erode from land when disturbed by a construction activity or heavy rainfall. Sediments can increase turbidity, clog the gills of fish, reduce spawning, lower the ability of young aquatic organisms to survive, smother bottom dwelling organisms, and suppress the growth of aquatic vegetation.
2. Nutrients – Nutrients are inorganic substances, such as nitrogen and phosphorous. They commonly exist in the form of mineral salts that are either dissolved or

suspended in water. The primary source of nutrients in urban runoff has been identified as fertilizer products. Excessive use of fertilizer can result in the discharge of nutrients to water bodies and streams, resulting in excessive aquatic algae and plant growth. Overgrowth of aquatic algae and plants can lead to a state of eutrophication in the water body. Eutrophication occurs when overgrowth leads to excessive decay of organic matter in the water body, loss of oxygen in the water, and the eventual death of water body organisms. For non-point sources of pollution, phosphorous is the primary nutrient of concern.

3. Heavy Metals – Metals are inorganic substances that sometimes occur naturally in soil at small concentrations. Metals such as lead, copper, chromium, mercury, cadmium, and zinc, characterized by higher molecular weight, are called heavy metals. At small concentrations naturally-occurring in soil, heavy metals are not considered toxic. However, at higher concentrations, certain heavy metals can be toxic. Metals are also commercially available. Commercially available metals can be found in formed or manufactured metals, as well as metal products. Metals are also used as raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. For example, certain heavy metals such as lead and chromium, have been used as corrosion inhibitors in primer coatings or cooling tower systems. A primary source of heavy metal pollution in stormwater however, is the use of commercially available metals and metal products. At certain conditions, these products can react or degrade such that their metal components are released to the environment and transported via leaching or erosion to local water bodies. Environmental concerns, regarding the potential for release to the environment, have restricted selected heavy metal usage in certain applications.
4. Toxic Chemicals – Toxic chemicals are either organic or inorganic substances, which at certain concentrations can indirectly or directly constitute a hazard to life or health. Chemicals exhibiting human and/or aquatic toxicity characteristics are considered toxic. Some commercially available or naturally occurring substances that may exhibit these characteristics include pesticides, cyanides, solvents, organic compounds, and hydrocarbons. For example, the excessive application of pesticides may result in runoff containing toxic levels of the pesticide's active component. Also, when rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to the storm drain. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also be present at levels that are harmful or hazardous to the environment. Other sources of potentially toxic or hazardous substances include the following: automotive fluids that drip and leak from vehicles; illegally discharged motor fluids (such as motor oil and radiator fluid); cleanup wastes (such as concrete mixers, paints, adhesives, etc.); industrial, sanitary, and animal wastes; and certain types of litter.
5. Floatable Materials - Trash (e.g., paper, plastic, polystyrene packing foam, aluminum materials, etc.) and biodegradable organic matter (e.g., leaves, grass cuttings, food waste, etc.) are considered floatable materials. The presence of floatable materials has a significant impact on the recreational value of a water body and can potentially impact aquatic species habitat. Excess organic matter can create a high biochemical oxygen demand in a stream and thereby, lower the water quality of the

stream. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.

6. Oxygen-Demanding Substances – Oxygen-demanding substances are those substances that require oxygen as part of their natural, biological, or chemical processes. The oxygen demand of a substance can lead to depletion of natural oxygen resources in a water body and possibly the development of septic conditions. Proteins, carbohydrates, and fats are examples of oxygen-demanding substances. They can also be referred to as “biodegradable organics.” The presence of oxygen-demanding substances in water is measured as biochemical oxygen demand (BOD) and chemical oxygen demand (COD).
7. Oil and Grease – Oil and grease are characterized as high-molecular weight organic compounds. Primary sources of oil and grease are petroleum hydrocarbon products, motor products, esters, oils, fats, waxes, and high molecular-weight fatty acids. Migration of these pollutants to the water bodies are very possible due to the wide uses and applications of some of these products in either municipal, residential, commercial, industrial, or construction areas. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality.
8. Bacteria and Viruses – Bacteria and viruses are micro-organisms that thrive under certain environmental conditions. Water, containing excessive bacterial and viral levels, can alter the aquatic habitat and create a harmful environment for humans and aquatic life. This type of water pollution is characterized by high coliform bacterial counts. It is typically caused by excess animal or human fecal wastes in the water. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

## I. Construction Best Management Practices (BMPs)

This section lists and describes those BMPs most commonly used for construction activities. Construction BMPs include structural devices, measures, and operational methods or procedures used at construction sites to prevent, control, and treat stormwater pollution emanating from the site. This section presents the following information: background information, providing an overview of related pollutant and regulatory issues; a BMP listing, summarizing the applicable practices; and BMP guidance information, to assist in the BMP selection process. Guidance information is presented in a tabular format and includes: a BMP selection matrix, a BMP reference table, a BMP cost table, and a BMP target pollutant table.

### A. Background Information

1. Pollutant Issues - Most construction activities disturb large areas and amount of earth and therefore result in significant erosion and transportation of related particulates such as sediments and dust to nearby waterways. In excess amounts, these particulates can increase water turbidity and consequently impair aquatic life and beneficial uses of the water.

Pollutants such as hydrocarbons, metals, nutrients, toxic substances, trash, and other debris can be generated from a variety of construction activities and can travel with eroded sediments. Potential pollutants traveling with the sediments may include the organic components in the top soil, plant residues, nutrient elements, organic material, deposited atmospheric pollutants, and other liquid and solid wastes.

Toxic substances have been found to adsorb or concentrate in sediments. When excessive loading occurs in an aquatic system, the toxic substances can interfere with the reproductive cycle of many plants and animals and cause tumors and lesions in fish. Toxic pollutants in sediments can also be re-mobilized under certain environmental conditions. When a pollutant is re-mobilized, it has the potential to further interfere with the natural cycle of aquatic life.

Miscellaneous wastes that can be generated at a construction site include wash water from concrete mixers, paints and associated equipment cleaning wastes, solid wastes resulting from trees and shrubs removed during land clearing, wood and paper materials derived from building product packaging, food containers (such as paper, aluminum, and metal cans), and sanitary wastes. Discharge of these wastes into the drain system can lead to unsightly and polluted waterways.

2. Regulatory Issues - Based on the aforementioned pollutant issues, the amended federal Clean Water Act of 1987 (CWA) added a requirement to address construction site stormwater pollution. In California, construction activities

consisting of five acres or more are subject to the Construction National Pollutant Discharge Elimination System (NPDES) Permit requirements of the State Water Resources Control Board (SWRCB). These requirements include the preparation and implementation of a formal Storm Water Pollution Prevention Plan (SWPPP).

The CWA also requires that each municipality throughout the nation be issued an NPDES Permit (Permit). The goal of the Permit is to stop polluted discharges from entering the storm drain system and local coastal waters. The associated municipal stormwater NPDES Permit was granted by the Los Angeles Regional Water Quality Control Board (RWQCB) on July 15, 1996. It was issued to Los Angeles County and 85 co-permittee cities including the City of Los Angeles. The Permit contains a requirement for Los Angeles County and co-permittees to develop and implement a "Development Construction Model Program."

In 1999, the local "Development Construction Model Program" was adopted. This program requires construction sites of less than 5 acres of disturbed soil size, to incorporate stormwater pollution control measures. As described previously, the SWRCB's Construction NPDES Permit requires that construction sites of 5 acres or more prepare and implement an official SWPPP and also follow specific NPDES Permit requirements.

## **B. BMP Listing**

Listed below are the specific BMPs for construction activities. The list includes erosion and sedimentation control measures, site management practices, materials and waste management, and general preventive maintenance and inspection.

- A-1. Construction Scheduling
- A-2. Preservation of Existing Vegetation
- A-3. Employee/Subcontractor Training
- A-4. Site Maintenance and Inspection
- A-5. Vehicle and Equipment Cleaning
- A-6. Vehicle and Equipment Fueling
- A-7. Vehicle and Equipment Maintenance
- A-8. Material Delivery and Storage
- A-9. Material Use
- A-10. Material Handling
- A-11. Spill Prevention and Control
- A-12. Solid Waste Management
- A-13. Hazardous Waste Management
- A-14. Contaminated Soil Management
- A-15. Concrete Waste Management
- A-16. Sanitary/Septic Waste Management

- A-17. Dust Controls
- A-18. Dewatering Operations
- A-19. Paving Operations
- A-20. Structure Construction and Painting
- A-21. Seeding and Planting
- A-22. Mulching
- A-23. Geotextiles and Mats
- A-24. Temporary Stream Crossing
- A-25. Reinforced Soil Retaining System
- A-26. Stabilized Construction Entrance
- A-27. Construction Road Stabilization
- A-28. Earthen Dike
- A-29. Temporary Drains and Swales
- A-30. Temporary Slope Drain
- A-31. Storm Drain Outlet Protection
- A-32. Check Dams
- A-33. Slope Roughening/Terracing
- A-34. Silt Fence
- A-35. Straw Bale Barriers
- A-36. Sandbag Barrier
- A-37. Brush or Rock Filter
- A-38. Storm Drain Inlet Protection
- A-39. Temporary Sediment Trap
- A-40. Temporary Sediment Basin

### **C. BMP Selection Matrix and Tables**

The BMP selection matrix and tables are provided to help select construction BMPs that best meet the NPDES Permit requirements or other stormwater mitigation plan and most suitable for a subject construction site. The construction BMP selection matrix and tables can be found in the subsequent pages and are listed as follows:

- Table IA - Construction BMP Selection Matrix
- Table IB - Construction BMP References
- Table IC - Construction BMP Costs
- Table ID - Construction BMP Target Pollutants



Stormwater Best Management Practices (BMPs)		Category of Construction Activities																					
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways				Planting/ Landscaping				
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting
<i>Vehicle &amp; Equipment Management</i>																							
Vehicle & Equipment Cleaning	A-6	X	X	X	X	X	X					X	X	X					X				

**Table IA (Cont.)  
CONSTRUCTION BMP SELECTION MATRIX**

Stormwater Best Management Practices (BMPs)		Category of Construction Activities																						
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways				Planting/ Landscaping					
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting	
Vehicle & Equipment Fueling	A-7	X	X	X	X	X	X					X	X	X					X					
Vehicle & Equipment Maintenance	A-8	X	X	X	X	X	X					X	X	X					X					
<i>Tracking Control</i>																								
Stabilized Construction Entrance	A-26	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Contractor Training</b>																								
Employee/Subcontractor Training	A-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
<b>Construction Materials &amp; Waste Management</b>																								
<i>Materials Management</i>																								
Material Delivery & Storage	A-9			X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Material Use	A-10			X	X			X	X	X	X	X	X	X	X	X	X	X	X	X	X			
Spill Prevention & Control	A-12									X	X	X	X									X	X	X





**Table IB  
CONSTRUCTION BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
Construction Scheduling	A-1	2, 9, 17, 19, 29
Preservation of Existing Vegetation	A-2	2, 6, 9, 15, 19, 29, 32
Employee/Subcontractor Training	A-3	2, 9, 24
Site Maintenance and Inspection	A-4	24
Vehicle and Equipment Cleaning	A-5	2, 9, 15, 19, 23, 41
Vehicle and Equipment Fueling	A-6	2, 9, 19, 23, 41
Vehicle and Equipment Maintenance	A-7	2, 9, 15, 19, 23, 41
Material Delivery and Storage	A-8	2, 9, 15, 19, 23, 27
Material Use	A-9	2, 9, 19, 24
Material Handling	A-10	25, 27
Spill Prevention and Control	A-11	2, 9, 17, 19, 23, 24, 41
Solid Waste Management	A-12	2, 9, 15, 16, 17, 19, 24, 27, 28, 41
Hazardous Waste Management	A-13	2, 9, 19, 24, 27, 28, 41
Contaminated Soil Management	A-14	2, 9, 15, 19, 24, 27, 28
Concrete Waste Management	A-15	2, 9, 15, 19, 24, 27, 28, 41
Sanitary/Septic Waste Management	A-16	2, 9, 19, 24, 41
Dust Controls	A-17	2, 9, 23, 24, 32
Dewatering Operations	A-18	2, 9, 19, 24, 35
Paving Operations	A-19	2, 6, 9, 19, 32
Structure Construction & Painting	A-20	2, 6, 9, 19
Seeding and Planting	A-21	2, 6, 9, 13, 15, 18, 19, 23, 24, 27, 29, 32
Mulching	A-22	2, 9, 13, 15, 18, 19, 23, 27, 29, 32
Geo-textiles and Mats	A-23	2, 9, 15, 19, 23, 24, 27, 29, 32
Temporary Stream Crossing	A-24	2, 9, 15, 19, 24, 29
Reinforced Soil Retaining System	A-25	15, 24, 29
Stabilized Construction Entrance	A-26	2, 6, 9, 15, 19, 24, 27, 29, 32
Construction Road Stabilization	A-27	2, 6, 9, 15, 19, 24, 32
Earth Dike	A-28	2, 9, 15, 19, 23, 24, 32
Temporary Drains and Swales	A-29	2, 6, 9, 18, 19, 23, 24, 32
Temporary Slope Drain	A-30	2, 9, 15, 19, 23, 24, 27, 29, 32
Storm Drain Outlet Protection	A-31	2, 9, 19, 23, 24, 32

**Table IB (Cont.)  
CONSTRUCTION BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
Check Dams	A-32	2, 9, 15, 19, 23, 24, 29, 32, 35
Slope Roughening/Terracing	A-33	2, 9, 19, 23, 24, 27, 29, 32
Silt Fence	A-34	2, 9, 15, 18, 19, 23, 24, 27, 29, 32
Straw Bale Barriers	A-35	2, 9, 15, 18, 19, 23, 27, 29, 32
Sandbag Barrier	A-36	2, 9, 19
Brush or Rock Filter	A-37	2, 9, 19, 23, 24, 32
Storm Drain Inlet Protection	A-38	2, 9, 15, 18, 19, 23, 24, 29, 32
Temporary Sediment Trap	A-39	2, 9, 15, 18, 19, 20, 23, 24, 27, 29, 32
Temporary Sediment Basin	A-40	2, 9, 15, 18, 19, 23, 24, 27, 29, 32

**Table IC  
CONSTRUCTION BMP COSTS**

*(<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)*

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments
Construction Scheduling	A-1	L	L	L	May increase other const. costs
Preservation of Existing Vegetation	A-2	L	L	L	May yield aesthetic benefits
Employee/Subcontractor Training	A-3	L	L	M	
Site Maintenance and Inspection	A-4	L	L	L	
Vehicle and Equipment Cleaning	A-5	L	L	L	
Vehicle and Equipment Fueling	A-6	M	L	M	
Vehicle and Equipment Maintenance	A-7	L	L	M	
Material Delivery and Storage	A-8	L	L	M	
Material Use	A-9	L	L	M	
Material Handling	A-10	L	L	L	
Spill Prevention and Control	A-11	L	M	M	
Solid Waste Management	A-12	L	L	M	
Hazardous Waste Management	A-13	L	L	M	Treatment/disposal of contaminated soil can be costly
Contaminated Soil Management	A-14	L	M	M	
Concrete Waste Management	A-15	L	L	M	
Sanitary/Septic Waste Management	A-16	L	L	L	
Dust Controls	A-17	L	M	L	

**Table IC (Cont.)  
CONSTRUCTION BMP COSTS**

*(<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)*

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments
Dewatering Operations	A-18	M	M	M	High disposal costs for contaminated groundwater
Paving Operations	A-19	L	L	M	
Structure Construction & Painting	A-20	L to M	L	M	
Seeding and Planting	A-21	M	M	M	
Mulching	A-22	M	M	L	
Geotextiles and Mats	A-23	H	M	L	
Temporary Stream Crossing	A-24	M	L	L	Bridge: \$45-\$95 per sq. ft.
Reinforced Soil Retaining System	A-25	M	L	L	
Stabilized Construction Entrance	A-26	M	L	L	
Construction Road Stabilization	A-27	M	M	L	
Earth Dike	A-28	M	L	L	\$15-\$55 per linear ft.
Temporary Drains and Swales	A-29	M	L	L	
Temporary Slope Drain	A-30	M	L	L	
Outlet Protection	A-31	M	L	L	
Check Dams	A-32	M	L	L	
Slope Roughening/Terracing	A-33	L	L	L	Terracing: \$4 per linear ft.

**Table IC (Cont.)  
CONSTRUCTION BMP COSTS**

*(<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)*

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments
Silt Fence	A-34	M	M	L	\$7 per linear ft.
Straw Bale Barriers	A-35	H	H	L	Annual cost: \$17 per linear ft.
Sandbag Barrier	A-36	H	L	L	Costly, longer life
Brush or Rock Filter	A-37	M	M	L	Rock filter can be more expensive
Storm Drain Inlet Protection	A-38	M	L	L	Annual cost: \$150 per inlet
Temporary Sediment Trap	A-39	L	M	L	\$1.3k per drainage acre
Temporary Sediment Basin	A-40	L	M	L	\$350 - \$700 per drainage acre

*ft - feet*

*k - thousand*

*O&M – operation and maintenance*

**Table ID  
CONSTRUCTION BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
Construction Scheduling	A-1	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Preservation Existing Vegetation	A-2	Sediment, Miscellaneous Wastes
Employee/Subcontractor Training	A-3	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Site Maintenance and Inspection	A-4	Sediments, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Vehicle and Equipment Cleaning	A-5	Oil/Grease/Fuels, Toxic Chemicals
Vehicle and Equipment Fueling	A-6	Oil/Grease/Fuels, Toxic Chemicals
Vehicle and Equipment Maintenance	A-7	Oil/Grease/Fuels, Toxic Chemicals
Material Delivery and Storage	A-8	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals
Material Use	A-9	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals
Material Handling	A-10	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals
Spill Prevention and Control	A-11	Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Solid Waste Management	A-12	Sediment, Metals, Miscellaneous Wastes
Hazardous Waste Management	A-13	Toxic Chemicals
Contaminated Soil Management	A-14	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Concrete Waste Management	A-15	Sediment, Miscellaneous Wastes
Sanitary/Septic Waste Management	A-16	Miscellaneous Wastes
Dust Controls	A-17	Sediment, Metals, Toxic Chemicals
Dewatering Operations	A-18	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Paving Operations	A-19	Sediment, Pesticides, Oil/Grease/Fuels, Miscellaneous Wastes
Structure Construction & Painting	A-20	Metals, Toxic Chemicals, Miscellaneous Wastes
Seeding and Planting	A-21	Sediment, Nutrients, Pesticides, Miscellaneous Wastes
Mulching	A-22	Sediment, Nutrients, Pesticides, Miscellaneous Wastes

**Table ID (Cont.)  
CONSTRUCTION BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
Geo-textiles and Mats	A-23	Sediment, Toxic Chemicals, Miscellaneous Wastes
Temporary Stream Crossing	A-24	Sediment
Reinforced Soil Retaining System	A-25	Sediment
Stabilized Construction Entrance	A-26	Sediment
Construction Road Stabilization	A-27	Sediment
Earth Dike	A-28	Sediment
Temporary Drains and Swales	A-29	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Temporary Slope Drain	A-30	Sediment, Miscellaneous Wastes
Storm Drain Outlet Protection	A-31	Sediment
Check Dams	A-32	Sediment
Slope Roughening/Terracing	A-33	Sediment
Silt Fence	A-34	Sediment
Straw Bale Barriers	A-35	Sediment
Sandbag Barrier	A-36	Sediment
Brush or Rock Filter	A-37	Sediment
Storm Drain Inlet Protection	A-38	Sediment
Temporary Sediment Trap	A-39	Sediment
Temporary Sediment Basin	A-40	Sediment

## II. Source Control Best Management Practices (BMPs)

This section lists and describes those BMPs most commonly used for source control at municipal, residential, industrial, and commercial sites. Source control BMPs help to prevent stormwater pollution by reducing the potential for contamination at the source of the pollution. Source control BMPs include schedules of activities, prohibitions of practices, maintenance procedures, management and operational procedures; and other methods employed at municipal, industrial, residential, and commercial sites to control pollution at the source. This section presents the following information: background information, providing an overview of related pollutant and regulatory issues; a BMP listing, summarizing the applicable source control practices by area or activity, and guidance information to assist in BMP selection. Guidance information is presented in a tabular format and includes a BMP selection matrix, a BMP reference table, a BMP cost table, and BMP target pollutant table.

### A. Background Information

1. Pollutant Issues - Urban stormwater primary pollutant sources include the following areas and operations: industrial and commercial areas; high activity parking lots; material (including wastes) storage and handling areas; vehicle and equipment fueling, washing maintenance, repair areas; erodible soil; street and highways; and handling and application of landscape maintenance products.

Reduction or the elimination of stormwater pollutants can be achieved by implementing operational source control BMPs including good housekeeping, employee training, spill prevention and cleanup, preventative maintenance, regular inspections, and record-keeping. These BMPs can be combined with engineering, structural, and physical controls (such as impervious containments and covers). If operational and structural source control BMPs are not feasible or adequate, then stormwater treatment BMPs may be necessary, as described in Section III. Selecting cost-effective BMPs should be based on an assessment of potential pollutants and their sources.

2. Regulatory Issues - Source controls can be used to assist industrial entities in complying with requirements of their individual NPDES permits and their industrial sector permits issued by the United States Environmental Protection Agency. Source controls may also be used in complying with requirements of the General Industrial NPDES permit issued by SWRCB. In the event that the identified BMPs become infeasible or inadequate to reduce the source of contamination, treatment controls may need to be utilized.

City facilities, operations and departments may also utilize source controls to help meet the requirements of the Municipal Stormwater NPDES permit. This includes city vehicle maintenance yards and field operations.

Those in charge of private or city development can use source controls to help comply with the requirements of the newly adopted stormwater mitigation measures, issued by the RWQCB. Source controls may also be used to assist in reducing stormwater pollution from the entire City of Los Angeles drainage area including areas not covered by the described regulatory requirements.

## **B. BMP Listing**

Listed below are the source control BMPs for municipal, residential, industrial, and commercial activities. The list includes vehicle management; material handling and storage; structure and facility maintenance; vegetation management; illicit discharge control; and general practices, preventive maintenance, and inspection. Specific industrial and commercial BMPs are individually listed in the references identified.

### **General**

- B-1. Public Education/Participation
- B-2. Land Use Planning/Management
- B-3. Employee Training
- B-4. Housekeeping Practices
- B-5. Safer Alternative Products
- B-6. Above-Water Activities

### **Vehicle Fleet Management**

- B-7. Vehicle and Equipment Fueling
- B-8. Vehicle and Equipment Washing and Steam Cleaning
- B-9. Vehicle and Equipment Maintenance and Repair
- B-10. Vehicle and Equipment Parking and Storage
- B-11. Vehicle Leak and Spill Control

### **Raw Material, Products and By-Products**

- B-12. Aboveground Tank Leak and Spill Control
- B-13. Outdoor Loading/Unloading of Material
- B-14. Outdoor Container Storage of Liquids
- B-15. Outdoor Equipment O&M
- B-16. Outdoor Storage & Storage of Materials
- B-17. Outdoor Manufacturing Activities
- B-18. Waste Handling and Disposal
- B-19. Household Hazardous Waste Collection
- B-20. Used Oil Recycling
- B-21. Material Handling
- B-22. Material Use

### **Building Maintenance**

- B-23. Building and Grounds Maintenance
- B-24. Building Repair and Remodeling
- B-25. Roof/Building Drains

### **Illicit Connections/Illicit Discharges**

- B-26. Storm Drain System Signs
- B-27. Illicit Connection-Prevention
- B-28. Illicit Connection-Detection and Removal
- B-29. Leaking Sanitary Sewer Control
- B-30. Illegal Dumping Control
- B-31. Non-Stormwater Discharges
- B-32. Industrial/Commercial Discharger Control Program

### **Street/Storm Drain Maintenance**

- B-33. Street Cleaning
- B-34. Catch Basin Cleaning
- B-35. Storm Drain Flushing
- B-36. Roadway/Bridge Maintenance
- B-37. Detention/Infiltration Device Maintenance
- B-38. Storm Channel/Creek Maintenance

### **Vegetation**

- B-39. Vegetation Controls
- B-40. Pest Management & Lawn/Vegetation Management
- B-41. Landscaping
- B-42. Buffer (Vegetation) System Protection
- B-43. Pesticide/Fertilizer Use

### **Others**

- B-44. Specific Industrial BMPs
- B-45. Specific Commercial BMPs
- B-46. General Preventive Maintenance
- B-47. General Inspection and Maintenance

### **C. Selection Matrix and Tables**

The BMP selection matrix and associated tables are provided to help select source control BMPs that best meet the requirements and suitable for a subject municipal, industrial, and commercial site. The source control BMP selection matrix and tables can be found in the subsequent pages and are listed as follows:

Table IIA - Source Control BMP Selection Matrix

Table IIB - Source Control BMPs References

Table IIC - Source Control BMP Costs

Table IID - Source Control BMP Target Pollutants

**Table IIA  
SOURCE CONTROL BMP SELECTION MATRIX**

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas															
		Municipal							Residential				Industrial		Commercial		
		Structures/Yards/Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development	Existing/Old Development
BMP Name	BMP Code																
<b>General</b>																	
Public Education/Participation	B-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Land Use Planning/Management	B-2		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Employee Training	B-3	X	X	X	X	X	X	X						X	X	X	X
Housekeeping Practices	B-4	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Safer Alternative Products	B-5					X	X	X	X				X	X	X	X	X
Above-Water Activities	B-6												X	X	X	X	X
<b>Vehicle Fleet</b>																	
Vehicle and Equipment Fueling	B-7													X	X	X	X
Vehicle and Equipment Washing and Steam Cleaning	B-8													X	X	X	X



**Table IIA (Cont.)  
SOURCE CONTROL BMP SELECTION MATRIX**

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas														
		Municipal				Residential				Industrial		Commercial				
BMP Name	BMP Code	Structures/Yards/Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development
Waste Handling and Disposal	B-18	X				X	X		X	X		X	X	X	X	X
Household Hazardous Waste Collection	B-19									X				X		
Used Oil Recycling	B-20					X	X		X	X					X	X
Material Handling	B-21	X				X	X	X	X	X				X	X	X
Material Use	B-22	X				X	X	X	X	X				X	X	X
<b>Building/Facility Maintenance</b>																
Building and Grounds Maintenance	B-23	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Building Repair and Remodeling	B-24	X				X	X		X					X	X	
Roof/building Drains	B-25	X				X	X		X					X	X	X
<b>Illicit Connections/Illicit Discharges</b>																
Storm Drain System Signs	B-26	X		X	X	X	X		X					X	X	X

**Table IIA (Cont.)  
SOURCE CONTROL BMP SELECTION MATRIX**

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas														
		Municipal						Residential				Industrial		Commercial		
		Structures/Yards/Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development
BMP Name	BMP Code															
Illicit Connection-Prevention	B-27	X					X							X		X
Illicit Connection-Detection and Removal	B-28	X					X							X		
Leaking Sanitary Sewer Control	B-29	X					X						X	X		X
Illegal Dumping Control	B-30	X					X						X	X		X
Non-Stormwater Discharges	B-31	X					X							X		X
Industrial/Commercial Discharger Control Program	B-32													X		X
<b>Street/Storm Drain Maintenance</b>																
Street Cleaning	B-33			X	X		X						X	X		X
Catch Basin Cleaning	B-34			X	X		X						X	X		
Storm Drain Flushing	B-35			X	X		X						X	X		X
Roadway/Bridge Maintenance	B-36				X									X		
Detention/Infiltration Device Maintenance	B-37	X		X	X		X						X			X



**Table IIB  
SOURCE CONTROL BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
<b><i>General</i></b>		
Public Education/Participation	B-1	3, 8, 10, 16, 17, 25, 27, 30, 36, 41
Land Use Planning/Management	B-2	3, 6, 8, 10, 15, 17, 27, 28, 36
Employee Training	B-3	4, 23, 25, 27
Housekeeping Practices	B-4	3, 10, 15, 23, 24, 26, 27, 30, 36
Safer Alternative Products	B-5	3, 10, 36
Above-Water Activities	B-6	4
<b><i>Vehicle Fleet</i></b>		
Vehicle and Equipment Fueling	B-7	4, 23, 33, 41
Vehicle and Equipment Washing and Steam Cleaning	B-8	4, 15, 23, 33, 41
Vehicle and Equipment Maintenance and Repair	B-9	4, 15, 23, 33, 41
Vehicle and Equipment Parking and Storage	B-10	3, 6, 33, 41
Vehicle Leak and Spill Control	B-11	3, 10, 27, 33, 36
<b><i>Raw Materials, Products, and By-Products</i></b>		
Aboveground Tank Leak and Spill Control	B-12	3, 10, 24, 33, 36
Outdoor Loading/Unloading of Material	B-13	4, 23, 25, 33
Outdoor Container Storage of Liquids	B-14	4, 23, 25, 33
Outdoor Process Equipment O&M	B-15	4, 23, 25, 33
Outdoor Storage of Materials	B-16	3, 4, 10, 15, 23, 25, 27, 33, 36
Outdoor Manufacturing Activities	B-17	23, 33
Waste Handling and Disposal	B-18	4, 17, 19, 25, 28
Household Hazardous Waste Collection	B-19	3, 10, 28, 30, 36, 41
Used Oil Recycling	B-20	3, 10, 36

**Table IIB (Cont.)  
SOURCE CONTROL BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
Material Handling	B-21	25, 27
Material Use	B-22	2, 9, 19, 24
<b><i>Building and Facility Maintenance</i></b>		
Building and Grounds Maintenance	B-23	4, 17
Building Repair and Remodeling	B-24	4, 17, 41
Roof/building Drains	B-25	2, 6, 8, 21, 29, 33
<b><i>Illicit Connections/Illicit Discharges</i></b>		
Storm Drain System Signs	B-26	3, 10, 36
Illicit Connection-Prevention	B-27	3, 10, 17, 33, 36
Illicit Connection-Detection and Removal	B-28	3, 10, 17, 27, 28, 30, 36
Leaking Sanitary Sewer Control	B-29	3, 10, 36
Illegal Dumping Control	B-30	3, 10, 17, 19, 36
Non-Stormwater Discharges	B-31	4, 8, 22, 23, 24, 27
Industrial/Commercial Discharger Control Program	B-32	17, 27
<b><i>Street/Storm Drain Maintenance</i></b>		
Street Cleaning	B-33	3, 10, 17, 18, 28, 30, 32, 33, 36
Catch Basin Cleaning	B-34	3, 10, 15, 18, 20, 27, 28, 30, 36
Storm Drain Flushing	B-35	3, 10, 17, 36
Roadway/Bridge Maintenance	B-36	3, 10, 17, 27, 30, 36
Detention/Infiltration Device Maintenance	B-37	3, 10, 23, 36
Storm Channel/Creek Maintenance	B-38	3, 10, 15, 20, 23, 32, 36
<b><i>Vegetation</i></b>		
Vegetation Controls	B-39	3, 6, 8, 10, 11, 15, 19, 21, 23, 24, 29, 30, 32, 36
Pest Management & Lawn/Vegetation Management	B-40	26, 30, 33, 41

**Table IIB (Cont.)  
SOURCE CONTROL BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
Landscaping	B-41	12, 15, 21, 27, 33, 40, 41
Buffer (Vegetation) System Protection	B-42	6, 8, 11, 15, 19, 21, 23, 24, 27, 29, 32
Pesticide/Fertilizer Use	B-43	10, 15, 16, 24, 26, 28, 29, 30, 41
<b><i>Others</i></b>		
Specific Industrial BMPs	B-44	23, 24, 26, 27, 29, 33, 41
Specific Commercial BMPs	B-45	23, 24, 26, 27, 29, 33, 41
General Preventive Maintenance	B-46	23, 25, 27, 30
General Inspection and Maintenance	B-47	24

**Table IIC**  
**SOURCE CONTROL BMP COSTS**

*(<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)*

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments
<b>General</b>					
Public Education/Participation	B-1	M	M	M	
Land Use Planning/Management	B-2	L	M	H	
Employee Training	B-3	M	M	M	
Housekeeping Practices	B-4	L	M	H	
Safer Alternative Products	B-5	L	M	H	
Above-Water Activities	B-6	L	M	M	
<b>Vehicle Fleet</b>					
Vehicle and Equipment Fueling	B-7	M	L	M	
Vehicle and Equipment Washing and Steam Cleaning	B-8	M	L	M	
Vehicle and Equipment Maintenance and Repair	B-9	L	M	M	
Vehicle and Equipment Parking and Storage	B-10	L	L	M	
Vehicle Leak and Spill Control	B-11	L	M	H	
<b>Raw Material, Products and By-Products</b>					
Aboveground Tank Leak and Spill Control	B-12	L	M	H	
Outdoor Loading/Unloading of Material	B-13	M	L	M	
Outdoor Container Storage of Liquids	B-14	M	M	H	
Outdoor Equipment O&M	B-15	L	L	M	
Outdoor Storage of Materials	B-16	M	L	H	
Outdoor Manufacturing Activities	B-17	L	L	M	
Waste Handling and Disposal	B-18	L	M	M	
Household Hazardous Waste Collection	B-19	M	M	M	

**Table IIC (Cont.)  
SOURCE CONTROL BMP COSTS**

*(<sup>1</sup>Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)*

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments
Used Oil Recycling	B-20	L	M	M	
Material Handling	B-21	M	L	M	
Material Use	B-22	L	L	M	
<b>Building Maintenance</b>					
Building and Grounds Maintenance	B-23	L	M	M	
Building Repair and Remodeling	B-24	L	M	M	
Roof/Building Drains	B-25	M	L	L	
<b>Illicit Connection/Illicit Discharges</b>					
Storm Drain System Signs	B-26	L	M	M	
Illicit Connection-Prevention	B-27	L	M	M	
Illicit Connection-Detection and Removal	B-28	L	H	L	
Leaking Sanitary Sewer Control	B-29	L	H	H	
Illegal Dumping Control	B-30	L	M	H	
Non-Stormwater Discharges	B-31	M	L	M	
Industrial/Commercial Discharger Control Program	B-32	L	M	H	
<b>Street/Storm Drain Maintenance</b>					
Street Cleaning	B-33	H	H	H	
Catch Basin Cleaning	B-34	H	H	M	
Storm Drain Flushing	B-35	M	H	M	
Roadway/Bridge Maintenance	B-36	L	L	M	
Detention/Infiltration Device Maintenance	B-37	M	M	L	
Storm Channel/Creek Maintenance	B-38	L	M	H	

**Table IIC (Cont.)  
SOURCE CONTROL BMP COSTS**

*(<sup>1</sup>Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)*

Stormwater Best Management Practices	BMP Code	Implementation Requirements			Comments
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	
<b>Vegetation</b>					
Vegetation Control	B-39	L	L	M	
Pest Management & Lawn/ Vegetation Management	B-40	M	M	L	
Landscaping	B-41	M	L	L	
Buffer (Vegetation) System Protection	B-42	H	L	M	
Pesticide/Fertilizer Use	B-43	L	M	H	
<b>Other</b>					
Specific Industrial BMPs	B-44	L	M	L	
Specific Commercial BMPs	B-45	L	M	L	
General Preventive Maintenance	B-46	L	M	M	
General Inspection and Maintenance	B-47	L	M	M	

*O&M – operation and maintenance*

**Table IID  
SOURCE CONTROL BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
<b><i>General</i></b>		
Public Education/Participation	B-1	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Land Use Planning/Management	B-2	Sediment, Nutrients, Metals, Toxic Chemicals
Employee Training	B-3	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Housekeeping Practices	B-4	Sediment, Nutrients, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances
Safer Alternative Products	B-5	Sediment, Nutrients, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances
Above-Water Activities	B-6	Metals, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances, Floatable Materials, Bacteria/Viruses
<b><i>Vehicle Fleet</i></b>		
Vehicle and Equipment Fueling	B-7	Metals, Oil/Grease, Toxic Chemicals
Vehicle and Equipment Washing and Steam Cleaning	B-8	Sediment, Nutrients, Metals, Oil/Grease, Toxic Chemicals, Oxygen-Demanding Substances
Vehicle and Equipment Maintenance and Repair	B-9	Metals, Oil/Grease, Toxic Chemicals
Vehicle and Equipment Parking and Storage	B-10	Metals, Oil/Grease, Toxic Chemicals
Vehicle Leak and Spill Control	B-11	Metals, Oil/Grease, Toxic Chemicals
<b><i>Raw Material, Products, and By-Products</i></b>		
Aboveground Tank Leak and Spill Control	B-12	Toxic Chemicals, Oil/Grease
Outdoor Loading/Unloading of Material	B-13	Nutrients, Metals, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances, Floatable Materials
Outdoor Container Storage of Liquids	B-14	Metals, Toxic Chemicals, Oxygen-Demanding Substances
Outdoor Process Equipment O&M	B-15	Sediment, Metals, Toxic Chemicals, Oil/Grease
Outdoor Storage of Materials	B-16	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oil/Grease
Outdoor Manufacturing Activities	B-17	Sediments, Nutrients, Metals, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances, Floatable Materials
Waste Handling and Disposal	B-18	Metals, Toxic Chemicals, Oil/Grease
Household Hazardous Waste Collection	B-19	Metals, Toxic Chemicals, Oil/Grease

Used Oil Recycling	B-20	Metals, Oil/Grease
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**Table IID (Cont.)  
SOURCE CONTROL BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
Material Handling	B-21	Sediment, Nutrients, Metals, Oil/Grease, Toxic Chemicals
Material Use	B-22	Sediment, Nutrients, Metals, Oil/Grease, Toxic Chemicals
<b><i>Building and Facility Maintenance</i></b>		
Building and Grounds Maintenance	B-23	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Building Repair and Remodeling	B-24	Sediment, Metals, Toxic Chemicals, Floatable Materials, Oil/Grease
Roof/Building Drains	B-25	Sediment, Metals, Floatable Materials
<b><i>Illicit Connection/Illicit Discharges</i></b>		
Storm Drain System Signs	B-26	Sediment, Nutrients, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Illicit Connection-Prevention	B-27	Nutrients, Oxygen-Demanding Substances, Bacteria/Viruses
Illicit Connection-Detection and Removal	B-28	Nutrients, Oxygen-Demanding Substances, Bacteria/Viruses
Leaking Sanitary Sewer Control	B-29	Nutrients, Oxygen-Demanding Substances, Bacteria/Viruses
Illegal Dumping Control	B-30	Sediment, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Non-Stormwater Discharges	B-31	Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Industrial/Commercial Discharger Control Program	B-32	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
<b><i>Street/Storm Drain Maintenance</i></b>		
Street Cleaning	B-33	Sediment, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances
Catch Basin Cleaning	B-34	Sediment, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Storm Drain Flushing	B-35	Sediment, Nutrients, Metals, Oxygen-Demanding Substances, Bacteria/Viruses
Roadway/Bridge Maintenance	B-36	Sediment, Nutrients, Metals, Oxygen-Demanding Substances, Bacteria/Viruses
Detention/Infiltration Device Maintenance	B-37	Sediment, Metals, Oxygen-Demanding Substances, Bacteria/Viruses
Storm Channel/Creek Maintenance	B-38	Sediment, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
<b><i>Vegetation</i></b>		
Vegetation Controls	B-39	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances

**Table IID (Cont.)  
SOURCE CONTROL BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
Pest Management & Lawn/Vegetation Management	B-40	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances, Bacteria/Viruses
Landscaping	B-41	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances
Buffer (Vegetation) System Protection	B-42	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances
Pesticide/Fertilizer Use	B-43	Nutrients, Pesticide, Toxic Chemicals, Oxygen-Demanding Materials
<b><i>Other</i></b>		
Specific Industrial BMPs	B-44	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Specific Commercial BMPs	B-45	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
General Preventive Maintenance	B-46	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
General Inspection and Maintenance	B-47	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses

*N/A – not applicable*

### **III. Treatment Control Best Management Practices (BMPs)**

This section lists and describes those BMPs most commonly used for treatment control. Treatment control BMPs include engineered systems, technology, and structural devices that use physical, chemical, or biological processes to treat, control, remove, or reduce pollutants from stormwater and urban runoff. This section presents the following: background information, providing an overview of related pollutant and regulatory issues; a BMP listing, summarizing the applicable practices; and guidance information to assist in the BMP selection process. Guidance information is presented in a tabular format and includes a BMP selection matrix, a BMP reference table, a BMP cost table, and a BMP target pollutant table.

#### **A. Background Information**

1. Pollutant Issues - Treatment control BMPs are designed to treat, reduce, or remove pollutants contained in urban runoff. The pollutants of concern may include suspended solids, sand, silt, heavy metals (e.g. copper, lead, zinc), nutrients (e.g. nitrogen, phosphorus), bacteria and viruses, and organics (e.g. petroleum hydrocarbons, pesticides). Floatable pollutants including oil, debris, and scum can also be removed by certain treatment control devices (e.g. separator structures). Treatment control BMPs include settling basins or vaults, oil/water separators, biofilters, wet ponds, constructed wetlands, infiltration, media filters, and others.
2. Regulatory Issues - Treatment control systems can fulfill the regulatory requirements of either construction or source control BMPs (see Sections I.B and II.B). Treatment control measures should be considered as part of the BMP selection process in the event that construction or source control BMPs are not sufficient to reduce stormwater pollution to meet regulatory requirements. Treatment controls should also be considered if they are economically feasible and a preferable measure. Also, in certain instances, regulatory requirements may require the implementation of treatment control instead of other control alternatives.

#### **B. BMP Listing**

Listed below are the treatment control BMPs. The list includes vegetative, infiltration, pavement, catch basin, hydrodynamic, clarifier, media filtration, and end-of-pipe systems.

##### **Vegetative Systems**

- C-1. Biofiltration Swales (Vegetated Buffer System)
- C-2. Vegetative Filter Strips
- C-3. Bioretention

- C-4. Existing Vegetation
- C-5. Constructed Wetlands
- C-6. Shallow Marsh

**Infiltration/Retention/Detention**

- C-7. Infiltration Trench
- C-8. Infiltration Basin
- C-9. Cisterns
- C-10. Wet (Retention) Pond
- C-11. Dry (Extended Detention) Pond
- C-12. Dry Well

**Pavements**

- C-13. Asphalt Porous Pavements
- C-14. Modular Concrete Block Porous Pavements
- C-15. Poured Concrete Porous Pavements
- C-16. Structural Soil

**Catch Basin Systems**

- C-17. Boarding/Coarse Screens
- C-18. Generic Catch Basin Filters
- C-19. Fossil Filter
- C-20. Aqua-Guard
- C-21. StormFilter
- C-22. Ultra-Urban Filter
- C-23. Enviro-Drain
- C-24. HydroKleen

**Vortex/Hydrodynamic Systems**

- C-25. Generic Hydrodynamic Systems
- C-26. Downstream Defender
- C-27. Vortechincs
- C-28. V2B1
- C-29. Continuous Deflective Separation (CDS )
- C-30. StormTreat
- C-31. Stormceptor
- C-32. Aqua-Filter

**Clarifiers**

- C-33. Generic Clarifiers

- C-34. Clarifiers with Rain Diversion
- C-35. Oil/Water Separator
- C-36. Jensen Interceptor
- C-37. Teichert Interceptor
- C-38. BaySaver
- C-39. Isoilater

**Media Filtration**

- C-40. Sand/Organic Beds
- C-41. Organic Filters
- C-42. StormFilter

**End-of-Pipe Systems**

- C-43. Diversion to Sewer
- C-44. Disinfection
- C-45. Water Reclamation

**C. Selection Matrix and Tables**

The BMP selection matrix and associated tables are provided to help select a treatment control BMP that best meets the requirements and suitable for a subject site. The treatment control BMP selection matrix and tables can be found in the subsequent pages and are listed as follows:

- Table IIIA - Treatment Control BMP Selection Matrix
- Table IIIB - Treatment Control BMP References
- Table IIIC - Treatment Control BMP Costs
- Table IIID - Treatment Control BMP Target Pollutants

**Table IIIA  
TREATMENT CONTROL BMP SELECTION MATRIX**

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																							
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics			Toxic Chemicals		Bacteria/Viruses				
		Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
BMP Name	BMP Code																								
<b>Vegetative Systems</b>																									
Biofiltration Swales/Vegetated Buffer System	C-1	X				X				X		X	X			X			X						
Vegetative Filter Strips	C-2	X				X				X		X	X			X			X						
Bioretention	C-3	X				X				X		X	X			X			X				X	X	
Existing Vegetation	C-4	X				X				X		X	X			X			X						
Constructed Wetlands	C-5	X				X				X		X	X			X			X				X	X	
Shallow Marsh	C-6	X				X				X		X	X			X			X						
<b>Infiltration/Retention</b>																									
Infiltration Trench	C-7	X				X				X		X	X			X			X				X	X	



**Table IIIA (Cont.)  
TREATMENT CONTROL BMP SELECTION MATRIX**

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																							
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics			Toxic Chemicals		Bacteria/Viruses				
		Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
BMP Name	BMP Code																								
<b>Catch Basins Systems</b>																									
Generic Catch Basin Filters	C-18	X										X									X				
Fossil Filter	C-19	X											X								X				
Aqua-Guard	C-20	X																			X				
StormFilter	C-21																				X				
Ultra-Urban Filter	C-22	X																			X				
Enviro-Drain	C-23																				X				
HydroKleen	C-24																				X				
<b>Vortex/Hydrodynamic Systems</b>																									
Generic Hydrodynamic Systems	C-25																				X				
Downstream Defender	C-26																								
Vortechnics	C-27																					X			
V2B1	C-28																					X			





**Table IIIB  
TREATMENT CONTROL BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
<b><i>Vegetative Systems</i></b>		
Biofiltration Swales/ Vegetated Buffer System	C-1	1, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 18, 20, 21, 23, 24, 27, 28, 29, 30, 31, 32, 34, 35, 36, 40, 42
Vegetative Filter Strips	C-2	1, 3, 4, 5, 6, 7, 11, 12, 13, 14, 18, 21, 23, 27, 28, 29, 30, 32, 34, 35, 36
Bioretention	C-3	5, 6, 7, 8, 12, 13, 21, 30
Existing Vegetation	C-4	1, 6, 10, 21, 23, 27, 32, 34
Constructed Wetlands	C-5	1, 3, 4, 7, 11, 20, 21, 27, 28, 29, 30, 34, 36
Shallow Marsh	C-6	1, 7, 11, 13, 14, 15, 18, 29, 30
<b><i>Infiltration/Retention</i></b>		
Infiltration Trench	C-7	1, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15, 16, 18, 20, 21, 23, 27, 28, 30, 34, 35, 36
Infiltration Basin	C-8	1, 3, 4, 7, 11, 12, 13, 14, 15, 18, 20, 21, 27, 28, 30, 34, 35, 36
Cisterns	C-9	1, 3, 4, 40
Wet (Retention) Pond	C-10	1, 3, 4, 7, 8, 11, 12, 14, 15, 18, 20, 21, 27, 28, 29, 30, 31, 34, 35, 36
Dry (Extended Detention) Pond	C-11	1, 3, 4, 7, 11, 14, 15, 20, 21, 27, 28, 29, 30, 34, 35, 36
Dry Well	C-12	28, 30, 40
<b><i>Pavements</i></b>		
Asphalt Porous Pavements	C-13	1, 3, 4, 6, 11, 14, 15, 18, 21, 23, 27, 28, 30, 34, 35, 40
Modular Concrete Block Porous Pavements	C-14	1, 3, 4, 6, 14, 15, 18, 21, 23, 27, 28, 30, 34, 35, 40
Poured Concrete Porous Pavements	C-15	1, 3, 4, 6, 14, 15, 18, 21, 23, 27, 28, 30, 34, 35, 40
Structural Soil	C-16	3, 14, 40, 43
<b><i>Catch Basin Systems</i></b>		
Boarding/Coarse Screens	C-17	6, 38, 43
Generic Catch Basin Filters	C-18	34, 38
Fossil Filter	C-19	37, 38, 42
Aqua-Guard	C-20	37

**Table IIIB (Cont.)  
TREATMENT CONTROL BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
StormFilter	C-21	6, 37, 38, 39, 42
Ultra-Urban Filter	C-22	37, 38
Enviro-Drain	C-23	37, 42
HydroKleen	C-24	42
<b><i>Vortex/Hydrodynamic Systems</i></b>		
Generic Hydrodynamic Systems	C-25	34, 42
Downstream Defender	C-26	37, 42
Vortechnics	C-27	37, 39, 42
V2B1	C-28	37, 39, 42
Continuous Deflective Separation	C-29	37, 38, 42
StormTreat	C-30	37, 39, 42
Stormceptor	C-31	1, 37, 38, 39, 42
Aqua-Filter	C-32	42
<b><i>Clarifiers</i></b>		
Generic Clarifiers	C-33	4, 34
Clarifiers with Rain Diversion	C-34	43
Oil/Water Separator	C-35	3, 4, 14, 27, 34, 36
Jensen Interceptor	C-36	37, 42
Teichert Interceptor	C-37	37, 42
BaySaver	C-38	37, 39
Isoilater	C-39	39
<b><i>Media Filtration</i></b>		
Sand/Organic Beds	C-40	1, 3, 4, 5, 6, 7, 12, 13, 14, 15, 20, 21, 27, 28, 30, 34, 36
Organic Filters	C-41	1, 5, 6, 7, 20, 21, 27, 34, 36
StormFilter	C-42	37, 38, 39, 42

**Table IIIB (Cont.)  
TREATMENT CONTROL BMP REFERENCES**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Sources of Information (See References)</b>
<b><i>End-of-Pipe Systems</i></b>		
Diversion to Sewer	C-43	27, 43
Disinfection	C-44	43
Water Reclamation	C-45	11

**Table IIIC**  
**TREATMENT CONTROL BMP COSTS**

(<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)  
(<sup>2</sup> Numerical cost data was obtained from available technical and data summary reports [References 30, 39, 42, and 43])

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments <sup>2</sup>
<b>Vegetative Systems</b>					
Biofiltration Swales (Vegetated Buffer System)	C-1	L	M	L	\$0.5/cf
Vegetative Filter Strips	C-2	L	M	L	\$1.3/cf
Bioretention	C-3	M	M	L	\$5.3/cf
Existing Vegetation	C-4	L	L	L	
Constructed Wetlands	C-5	H	M	L	\$0.6-\$1.25/cf
Shallow Marsh	C-6	M	M	L	
StormTreat™	C-30	M to H	M	L	\$12k/cfs treated
<b>Infiltration/Retention</b>					
Infiltration Trench	C-7	M	M	L	\$4/cf
Infiltration Basin	C-8	M	M	L	\$1.30/cf
Cisterns	C-9	M	L	L	\$7k/ 1,800-gal
Wet (Retention) Pond	C-10	H	M	L	\$0.5-\$1/cf
Dry (Extended Detention) Pond	C-11	H	M	L	\$0.5-\$1/cf
Dry Well	C-12	M	L	L	
<b>Pavements</b>					
Asphalt Porous Pavements	C-13	M	L	L	\$10-\$15/sf
Modular Concrete Block Porous Pavements	C-14	H	L	L	\$10-\$15/sf
Poured Concrete Porous Pavements	C-15	H	L	L	\$10-\$15/sf
Structural Soil	C-16	M	L	L	\$10-\$15/sf
<b>Catch Basin Systems</b>					
Boarding/Coarse Screens	C-17	L	M	L	\$300/opening

**Table IIIC (Cont.)  
TREATMENT CONTROL BMP COSTS**

<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

<sup>2</sup> Numerical cost data was obtained from available technical and data summary reports [References 30, 39, 42, and 43])

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments <sup>2</sup>
Generic Catch Basin Filters	C-18	L	M	L	\$1k- 5k/ catch basin
Fossil Filter™	C-19	L	M	L	\$3.1k/cfs
Aqua-Guard™	C-20	L to M	M	L	\$3k/catch basin
StormFilter™	C-21	M to H	M	M	\$39.6k-\$74k/cfs
Ultra-Urban Filter™	C-22	L	M	L	\$4.5k/cfs \$3k/catch basin
Enviro-Drain®	C-23	L	L	L	\$3k-\$4k/cfs
HydroKleen™	C-24	L to M	L	L	\$3.9k-\$11.4k/cfs
<b>Vortex/Hydrodynamic Systems</b>					
Generic Hydrodynamic Systems	C-25	M to H	M	L	
Downstream Defender	C-26	M to H	M	L	\$5.2k-\$16.1k/cfs
Vortechnics™	C-27	M to H	M	L	\$9k-\$36.8k/cfs
V2B1™	C-28	M to H	M	L	\$7k-\$17k/cfs
Continuous Deflective Separation™	C-29	M to H	M	L	\$7.5k-\$12k/cfs
Stormceptor®	C-31	M to H	M	L	\$16.7k-\$33.1k/cfs \$40k/7,200-gal
Aqua-Filter™	C-32	M to H	M	L	
<b>Clarifiers</b>					
Generic Clarifiers	C-33	M	M	L	\$10k/5,000-gal tank
Clarifiers with Rain Diversion	C-34	M	M	L	\$10k/5,000-gal tank
Oil/Water Separator	C-35	M	M	L	\$10k/5,000-gal tank
Jensen® Interceptor	C-36	L to M	L	L	\$11.8k-\$12.4k/cfs
Teichert Interceptor™	C-37	L	L	L	\$8.7k/cfs

**Table IIIC (Cont.)  
TREATMENT CONTROL BMP COSTS**

<sup>1</sup> Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

<sup>2</sup> Numerical cost data was obtained from available technical and data summary reports [References 30, 39, 42, and 43]

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost <sup>1</sup>	O&M Cost <sup>1</sup>	Training Cost <sup>1</sup>	Comments <sup>2</sup>
BaySaver®	C-38	L to M	L	L	\$2.4k/cfs treated
Isolater™	C-39	M	M	L	\$4.7k/cfs treated
<b>Media Filtration</b>					
Sand/Organic Beds	C-40	H	M	L	\$3-\$6/cf
Organic Filters	C-41	H	M	L	
StormFilter™	C-42	H	M	M	\$18.6k/cfs treated
<b>End-of-Pipe Systems</b>					
Diversion to Sewer	C-43	H	H	L	\$1.5m/ 5 cfs \$0.5m/ 0.5 cfs
Disinfection	C-44	H	H	M	\$2.5m/ 5 cfs for UV
Water Reclamation	C-45	H	H	H	\$5m for 5 cfs

*cf – cubic feet*

*cfs – cubic feet per second*

*k - thousand*

*m – million*

*O&M – operation and maintenance*

**Table IIID  
TREATMENT CONTROL BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
<b><i>Vegetative Systems</i></b>		
Biofiltration Swales (Vegetated Buffer System)	C-1	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Vegetative Filter Strips	C-2	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Bioretention	C-3	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Existing Vegetation	C-4	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Constructed Wetlands	C-5	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Shallow Marsh	C-6	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
<b><i>Infiltration/Retention</i></b>		
Infiltration Trench	C-7	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Infiltration Basin	C-8	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Cisterns	C-9	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Wet (Retention) Pond	C-10	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Dry (Extended Detention) Pond	C-11	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Dry Well	C-12	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease

**Table IIID (Cont.)  
TREATMENT CONTROL BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
<b><i>Pavements</i></b>		
Asphalt Porous Pavements	C-13	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Modular Concrete Block Porous Pavements	C-14	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Poured Concrete Porous Pavements	C-15	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Structural Soil	C-16	Sediment, Nutrients, Metals, Floatable Materials, Oil/Grease
<b><i>Catch Basin Systems</i></b>		
Boarding/Coarse Screens	C-17	Floatable Materials
Generic Catch Basin Filters	C-18	Floatable Materials, Trash & Debris, Oil/Grease, Metals
Fossil Filter	C-19	Trash & Debris, Sediments, Oil & Grease, Fuels
Aqua-Guard	C-20	Sediments, Floatable Materials, Trash & Debris, Oil/Grease, Metals, Fuels
StormFilter	C-21	TSS, COD, Nutrients, Oil/Grease, Metals, Sediments
Ultra-Urban Filter	C-22	Sediment, Floatable Materials, Trash & Debris, TSS, Oil & Grease
Enviro-Drain	C-23	Sediments, Fuels, Oil & Grease
HydroKleen	C-24	Fuels, Other Organics, Metals
<b><i>Vortex/Hydrodynamic Systems</i></b>		
Generic Hydrodynamic Systems	C-25	Floatable Materials, Sediments, Oil/Grease, TSS
Downstream Defender	C-26	Sediments, Floatable Materials, TSS
Vortechnics	C-27	TSS, Sediments, Floatable Materials, Metals, Oil & Grease
V2B1	C-28	Sediments, Floatable Materials, TSS, Oil & Grease
Continuous Deflective Separation	C-29	Sediments, Floatable Materials, Trash & Debris, TSS, Nutrients, COD, BOD
StormTreat	C-30	TSS, COD, Nutrients, Oil/Grease, Metals, Bacteria/Viruses
Stormceptor	C-31	TSS, Nutrients, Oil/Grease, Metals, Sediments, Floatable Materials
Aqua-Filter	C-32	Trash & Debris, Sediments, TSS, COD, Nutrients, Oil/Grease, Metals, Fuels

**Table IIID (Cont.)  
TREATMENT CONTROL BMP TARGET POLLUTANTS**

<b>Stormwater Best Management Practices</b>	<b>BMP Code</b>	<b>Target Pollutants</b>
<b><i>Clarifiers</i></b>		
Generic Clarifiers	C-33	Sediments, Floatable Materials, Oil/Grease, TSS,
Clarifiers with Rain Diversion	C-34	Sediment, Floatable Materials, Oil & Grease, Fuels
Oil/Water Separator	C-35	Sediments, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, TSS
Jensen Interceptor	C-36	Sediments, Floatable Materials, TSS, Oil & Grease
Teichert Interceptor	C-37	Sediments, Floatable Materials
BaySaver	C-38	TSS, Sediments, Floatable Materials, Oil & Grease
Isoilater	C-39	TSS, COD, Nutrients, Oil/Grease, Floatable Materials, COD/BOD
<b><i>Media Filtration</i></b>		
Sand/Organic Beds	C-40	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Organic Filters	C-41	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
StormFilter	C-42	TSS, COD, Nutrients, Oil/Grease, Metals, Sediments
<b><i>End-of-Pipe Systems</i></b>		
Diversion to Sewer	C-43	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Disinfection	C-44	Bacteria/Viruses
Water Reclamation	C-45	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses

*COD – chemical oxygen demand*

*TSS – total suspended solids*

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**APPENDIX A**  
**ASSISTANCE DIRECTORY**

***Spill Response Agencies***

City of Los Angeles, Stormwater Management Division ..... (800) 974-9794  
City of Los Angeles Police Department, Hazardous Materials Program ..... (213) 485-4011  
City of Los Angeles Fire Department, Hazardous Materials Program..... (213) 485-6185  
County of Los Angeles Fire Department, Hazardous Materials Program ..... (323) 890-4045

***Recycling & Hazardous Waste Disposal***

City of Los Angeles, Household & Small Business Hazardous Waste Hotline..... (800) 988-6942  
City of Los Angeles, Hazardous & Toxic Materials Program ..... (213) 580-1023  
City of Los Angeles, Solid Resources Citywide Recycling Division..... (213) 473-8228  
County of Los Angeles, Recycling & Household Hazardous Waste Hotline ..... (800) 522-5218

***To Report Illegal Dumping***

City of Los Angeles, Stormwater Program Hotline..... (800) 974-9794  
County of Los Angeles, Illegal Dumping Hotline..... (800) 303-0003  
Calif. Environmental Protection Agency, Dept. of Toxic Substances Control ..... (818) 551-2800

***To Report Clogged Catch Basins***

City of Los Angeles, Stormwater Program Hotline..... (800) 974-9794  
County of Los Angeles, Department of Public Works ..... (888) 253-2652

***For Assistance on BMP Requirements***

City of Los Angeles, Stormwater Management Division..... (213) 847-6350

***To Request a Copy of the Reference Guide***

City of Los Angeles, Stormwater Management Division..... (800) 974-9794

## APPENDIX B VENDOR INFORMATION

The following is the list of vendors, proprietary treatment control systems, and web site addresses or phone numbers, as available:

1. Aqua-Guard , Remedial Solutions, Inc./AquaShield . Web Page: <http://www.aquashieldinc.com>
2. Aqua-Filter , Remedial Solutions, Inc./AquaShield . Web Page: <http://www.aquashieldinc.com>
3. BaySaver , BaySaver, Inc. Web Page: <http://www.BaySaver.com>
4. CDS , Continuous Deflective Separation Technologies, Inc. Web Page: <http://www.cdstech.com.au/usa/index.html>
5. DrainPac Storm Drain Filter Insert, United Storm Water, Inc. Telephone: (877) 71-STORM • Web site: <http://www.unitedstormwater.com>
6. Enviro-Drain , Enviro-Drain, Inc. Web Page: <http://www.members.aa.net/~filters>
7. Ero-Con Filter, Ero-Con. Telephone: (800)891-0473
8. Fossil Filter , KriStar Enterprises, Inc.. Web Page: <http://www.fossilfilter.com>
9. HydroKleen , ALTECH Technology Systems, Inc. Web Page: <http://www.altech-group.com>
10. Isoilator , Americast, Inc. Telephone: (800)999-2278
11. Jensen Interceptors, Jensen Precast. Telephone: (909)355-1819
12. V2B1 , Environment 21 , Kistner Concrete Products, Inc., <http://www.kistner.com/env21-2.html>
13. RDI Drain Inceptor , Roberts Design, Inc. Web Page: <http://www.auto-wise.com/related.htm>
14. Stormceptor , Stormceptor Corporation. Web Page: <http://www.stormceptor.com>
15. StormFilter , Stormwater Management, Inc. Web Page: <http://www.stormwatermgt.com>

16. StormTreat , StormTreat Systems, Inc. Telephone: (508)362-4449
17. Ultra-Urban Filter , Abtech Industries, Inc. Web Page: <http://www.abtechindustries.com>
18. Vortechincs , Vortechincs, Inc.. Web Page: <http://www.vortechincs.com>

**APPENDIX C**  
**HOW TO USE THE GUIDE**

A. Input Data:

BMP Category: Source Control

Site/Area: Industrial

B. Find Applicable BMP(s):

- 1) Look under Section II – Source Control Best Management Practices.
- 2) Note BMP codes and listing in Subsection B - BMP Listing.
- 3) Locate Table IIA – Source Control BMP Selection Matrix (Please note that the BMPs are numbered sequentially from the top of the table).
- 4) Read columns under “Industrial” category (under “Category of Pollution Source Areas”) and list corresponding BMP(s) marked with an “X”. The “X” marks indicate suggested BMPs for that category.

Example:

<u>BMP Code</u>	<u>BMP Name</u>
B-16	Outdoor Storage of Materials

- 5) Using the specific example in number 4) above, locate Table IIB – Source Control BMP References. List the specified reference numbers listed under “Sources of Information” column.
- 6) Find the reference names corresponding to the numbers in Table IIB from “References” section at the end of the manual. These references discuss partially or in detail the subject BMP (Outdoor Storage of Materials) and related topics.
- 7) From Table IIC – Source Control BMP Costs, locate BMP code B-16 and note the relative costs based on capital, O&M, and training as M (moderate), L (low), and H (high), respectively. These costs are site-specific and exact figures vary. Some references also indicate cost information.
- 8) From Table IID – Source Control BMP Target Pollutants, locate BMP code B-16 and note the target pollutants. Target pollutants are sometimes site-specific and also vary depending on the type of industrial activity.

## APPENDIX D ACKNOWLEDGMENTS

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