WATER QUALITY COMPLIANCE MASTER PLAN FOR URBAN RUNOFF

CLEAN STORMWATER / URBAN RUNOFF MASTER PLAN

Watershed Protection Division
Bureau of Sanitation
Department of Public Works

City of Los Angeles
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Council Districts		
Jill Sourial / *CD1* Claire Bartels, Jennifer Cohen/*CD2* Cliff Ruff / *CD3* Renee Weitzer / *CD4* Paul Backstrom / *CD5* Macaria Flores / *CD6*	Saeed Ali / *CD7* Bernard C. Parks, Jr. / *CD8* Jeff Catalano, Kiran Hashmi / *CD9* Charmette Bonpua / *CD10* Alex Fay / *CD11* Mitch Englander / *CD12*	Sam Siegel / *CD13* Peter Hidalgo / *CD14* Eric Moody / *CD15*
Board of Public Works		
Cynthia Ruiz *(President)* Valerie Lynne Shaw (*Vice President)*	Paula Daniels *(Commissioner)* Ernesto Cardenas *(Commissioner)* Julie Gutman *(Commissioner)*	
Bureau of Sanitation Executives		
Enrique Zaldivar *(Director)* Rita Robinson *(Past Director)* Traci Minamide *(Ch. Exec. Officer)*	Adel Hagekhalil *(Asst. Director)* Varouj Abkian *(Asst. Director)* Alex Helou *(Asst. Director)*	
Project Management Committee		
Michael Mullin / *Mayor's Office* Jill Sourial / *CD1* Alex Fay / *CD11*	Paula Daniels / *BPW* Rafael Prieto / *Office of the CLA* Charles Modica / *Office of the CLA*	Shahram Kharaghani / *BOS* Reza Iranpour / *BOS* Hubertus Cox / *BOS*
Project Team		
Reza Iranpour / *BOS* Hubertus Cox / *BOS* Kenneth Weston / *BOS*	Hampik Dekermenjian / *CDM* Richard Meyerhoff / *CDM* Jennifer Gronberg / *CDM*	Ken Susilo / *Geosyntec*
Contributors		
Joyce Amaro / *BOS* Jon Ball / *BOS* Sheila Brice / *BOS* David Cheng / *FMD* Deborah Deets / *BOS* Vijay Desai / *BOS* Roulene Diego / *BOS* Wendy Dinh / *BOS* Ammar Eltawil / *BOS* Nasir Emami / *BOS* Mo English / *BOS* Oscar Figueroa / *BOS*	Alice Gong / *BOS* Chris Harris / *Harris & Co.* Darren Hartwich / *CDM* Thu-Van Ho / *BOS* Azya Jackson / *BOS* Kosta Kaporis / *BOS* Alfredo Magallanes / *BOS* Shokoufe Marashi / *BOS* Vivian Marquez / *BOS* Ida Meisami-Fard / *BOS* Sofia Mohaghegh / *BOS* Steven Nikaido / *BOS*	Majid Sadeghi / *BOS* Michael Scaduto / *BOS* Morad Sedrak / *BOS* Hamid Tadayon / *BOS* Ryan Thiha / *BOS* Peter Tonthat / *BOS* Donna Toy-Chen / *BOS* Alexander Vasquez / *BOS* Robert Vega / *BOS* Amy Wade / *CDM* Penny Weiand / *BOS*

Stakeholder Advisory Committee		
Mark Abramson / *SM BayKeeper* Mario Acevedo / *DWP* James Alamillo / *Heal the Bay* Ginachi Amah / *LARWQCB* Rodney Anderson / *Burbank* Carol Armstrong / *BOE* David Attaway / *Dept Rec & Parks* Dede Audet / *Grassroots Venice Neighborhood Council* Soe Aung / *LAUSD* Talal Balaa / *LAUSD* Vik Bapna / *LA County, DPW* Polly Barrowman / *Heal the Bay* Melinda Bartlett / *DEA* Jay Brakensiek / *LAUSD* Edward Belden / *LA & San Gabriel Rivers Watershed Council* Jeff Beller / *BOS* Edith Ben-Horin / *TreePeople* Hector Bordas / *LA County DPW* Carlos Borja / *LA County Dept of Health* Claire Bowin / *Dept of City Planning* Jonathan Brooks / *Friends of LA River* Erika Bustamante / *City of Inglewood* Carlos Carreon / *SM Baykeeper* Luis Castillo / *DWP* Leslie Chan / *MRCA* Vincent Chee / *City of Beverly Hills* Kathryn Curtis / *Harbor Dept* Tim Dafeta / *BOS* Glen Dake / *LA Community Garden Council* Mike D'Annucci / *Malcolm Pirnie* Gus Dembegiotes / *BOS* Josette Descalzo / *City of Beverly Hills* Joyce Dillard Mas Dojiri / *BOS* Susan Early / *California Dept Public Health* Rebecca Drayse / *TreePeople*	Steve Fan / BOS Tracy Egoscue / *LARWQCB* Farsheed Farhang / *BOS* Tom Ford / *SM Baykeeper* Rex Frankel / *Ballona Ecosystem Education Project* Ken Fredrick / *MRCA* Nidia Garcia / *North East Trees* Joe Geever / *Surfrider Foundation* Angela George / *LA County DPW* Mark Gold / *Heal the Bay* Laura Grant / *PCCI, POLA* Neil Guglielmo / *BOS* Jessica Hall / *Ballona Creek Watershed Task Force* Mark Hanna / *DWP* Tim Haug / *BOE* Paul Herzog / *Surfrider Foundation* Ken Hoffman / *LA County Sanitation Districts* Neelakshi Hudda / *LARWQCB* Kirsten James / *Heal the Bay* Liz Jennings / *River Center* Beth Jines / *DEA* Andrew Jirik / *Harbor Dept* Sheila Kennedy / *Pasadena* Jim Lamm / *Ballona Creek Renaissance* Stephanie Landregan / *SMMC, MRCA* Hugh Lee / *BSS* Albert Leung / *LAUSD* Joe Linton / *Livable Places* Andy Lipkis / *TreePeople* Shelley Luce / *SMBRC* Mark Mackowski / *Upper LA River Area, Water Master Support* Jim Marchese / *BOS* Meredith McCarthy / *Heal the Bay* Kathleen McGowan / *City of Hermosa Beach* Gerald McGowen / *BOS* Sommvang Meksavanh / *LAWA* John Moore / *BOS* Hiddo Netto / *BOS*	Jenny Newman / *LARWQCB* L.B. Nye / *LARWQCB* Maurice Oillataguerre / *Glendale* Lance Oishi / *BSS* Kendrick Okuda / *BOE* Mi-Hyun Park / *UCLA* Jason Pereira / *LA County DPW* Craig Perkins / *City of SM* Kevin Powers / *Hidden Hills* Dana Prevost / *Building & Safety* Charlynn Rachell / *LAX* Salvador Ramirez / *City of Irwindale* Barbara Romero / *MRCA* Diego Rosso / *UCI* Katherine Rubin / *DWP* Laura Saltzman / *MRCA* Susie Santilena / *Heal the Bay* Neal Shapiro / *City of SM* Michael Shay / *City of Redondo Beach* Susan Shu / *BOE* Michael Shull / *Dept of Rec. & Park* Youn Sim / *LA County DPW* Nancy Steele / *Los Angeles & San Gabriel Rivers Watershed Council* Eric Stein / *SCCWRP* Nathan Stevenson / *LA County DPW* Michael Stenstrom / *UCLA* Xavier Swamikannu / *LARWQCB* Stephanie Taylor / *Green LA* Mitzi Taggart / *Heal the Bay* Ray Tahir / *City of Irwindale* Tom Tait / *City of Arcadia* Paul Teensma / *DEA* Jeanette Vosburg / *Ballona Network* Dan Wall / *City of San Fernando* Ying Wang / *LAUSD* Deborah Weinstein / *TreePeople* Melanie Winter / *The River Project* Robert Wu / *CALTRANS* Clayton Yoshida / *DWP*

Acronyms

A

AQUA	Aquaculture (beneficial use)
ARG	Agricultural Supply (beneficial use)

B

BOD	Biological Oxygen Demand
BC	Ballona Creek
BCR	Ballona Creek Renaissance
BCWTF	Ballona Creek Watershed Task Force
BES	Bureau of Environmental Services, Portland, Oregon
BIOL	Preservation of Biological Habitats (beneficial use)
BMP	Best Management Practice
BOS	Bureau of Sanitation, City of Los Angeles
BOSS	Bureau of Street Services, City of Los Angeles

C

CAD	Computer-Aided Design
CaSIL	California Spatial Information Library
CASQA	California Stormwater Quality Association
cf / ac-yr	cubic-foot per acre-year
CBI	Clean Beaches Initiative
CCI	Community Conservancy International
CCWMP	Compton Creek Watershed Management Plan
CDD	Community Development Department, City of Los Angeles
CDS	Continuous Deflection Separator
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CIP	Capital Improvement Program
CLEAN	Cleanup Loans and Environmental Assistance to Neighbors
CMP	Coordinated Monitoring Plan
COD	Chemical Oxygen Demand
COG	Council of Government
COLD	Cold Freshwater Habitat (beneficial use)
COMM	Commercial and Sport Fishing (beneficial use)
CPI	Catchment Priority Index (Los Angeles County BMP Prioritization Model)
CRA	Community Redevelopment Agency, City of Los Angeles

CREST	Cleaner River through Effective Stakeholder TMDLs
CSMP	Coordinated Shoreline Monitoring Plan
CSO	Combined Sewer Overflow
CWA	Clean Water Act

D

DA	Drainage Area
DDC	Department of Design and Construction, City of New York
DDT	Dichloro-Diphenyls Trichloroethylene
DHS	Department of Health Services
DOT	Department of Transportation
DPD	Department of Planning and Development, City of Seattle
DPH	Department of Public Health, Los Angeles County
DW	Dry Weather
DWAC	Dominguez Watershed Advisory Council
DWMMP	Dominguez Watershed Management Master Plan
DWP	Department of Water and Power, City of Los Angeles

E

EAD	Environmental Affairs Department, City of Los Angeles
EC	*Escherichia coli* (*E. coli*)
ECA	Environmentally Critical Areas, City of Seattle
ED	Effective Date
EDG	Economy Development Group, Los Angeles Department of Water and Power
EDU	Equivalent Dwelling Unit
EPA	Environmental Protection Agency
ES	Executive Summary
ESRI	Environmental Systems Research Institute
EST	Estuarine Habitat (beneficial use)

F

FC	Fecal Coliform
FOG	Fats, Oils and Grease
FUSRAP	Formerly Utilized Sites Remedial Action Program
FRSH	Freshwater Replenishment (beneficial use)
FWY	Freeway

G

GIS	Geographic Information System

GIASP	General Industrial Activity Stormwater Program
g/ha/day	gallons per hectare per day
GWR	Ground Water Recharge (beneficial use)

H

HJTA	Howard Jarvis Taxpayers Association
HLSS	High-Level Storm Sewer, City of New York

I

ID	Identification
ICB	Inner Cabrillo Beach
IND	Industrial Service Supply (beneficial use)
IPWP	Integrated Plan for Wastewater Program
IRWMP	Integrated Regional Water Management Plan
IRP	Integrated Resource Program

J

J2	Jurisdiction 2 of Santa Monica Bay Watershed (north of Santa Monica and south of Marina del Rey)
J3	Jurisdiction 3 of Santa Monica Bay Watershed (near City of Santa Monica)
J7	Jurisdiction 7 of Santa Monica Bay Watershed (near Palos Verdes Peninsula)
JPA	Joint Power Authority

K

kg	kilogram

L

LACDPW	Los Angeles City Department of Public Works
LACGC	Los Angeles Community Garden Council
LANLT	Los Angeles Neighborhood Land Trust
LAR	Los Angeles River
LARRMP	Los Angeles River Revitalization Master Plan
LARWQCB	Los Angeles Regional Water Quality Control Board
LAUSD	Los Angeles Unified School District
LAWA	Los Angeles World Airports
LEED	Leadership in Engineering and Environmental Design
LFD	Low Flow Diversion
LID	Low Impact Development
LREC-1	Limited Water Contact Recreation (beneficial use)

M

MAR	Marine Habitat (beneficial use)
mgd	million gallons per day
MIRG	Migration of Aquatic Organisms (beneficial use)
MOU	Memorandum of Understanding
mg/kg	milligram per kilogram
mg/l	milligram per liter
MPN/100ml	Most Probable Number per 100 milliliter
MRCA	Mountain Recreation and Conservancy Authority
MS4	Municipal Separate Storm Sewer System
MSC	Main Ship Channel

N

NAV	Navigation (beneficial use)
NELA/OS	North East Los Angeles Open Space Coalition
NPDES	National Pollutant Discharge Elimination System
NRDC	National Resources Defense Council
NURP	National Urban Runoff Pollution
NTU	Nephelometric Turbidity Unit

O

OAL	Office of Administration Law
O&G	Oil and Grease
OCP	Overflow Control Program, Kansas City
OSD	Office of Sustainable Design, City of New York or Office of Sustainable Development, City of Portland

P

PAHs	Polycyclic Aromatic Hydrocarbons
PCA	Porter-Cologne Act
PCBs	Polychlorinated Biphenyls
PDC	Portland Development Council
POTW	Public Owned Treatment Works
PIE	Public Involvement Education, City of Santa Monica
PIPP	Public Information and Participation Programs
POW	Hydropower Generation (beneficial use)
PROC	Industrial Process Supply (beneficial use)

R

RARE	Rare, Threatened, or Endangered Species (beneficial use)

REC-1	Water Contact Recreation (beneficial use)
REC-2	Non-Contact Water Recreation (beneficial use)
RMC	River Mountain Conservancy
RIO	River Improvement Overlay
ROW	Right-of-Way

S

SAL	Inland Saline Water Habitat (beneficial use)
SCA	State Constitution Amendment
SCP	Sustainable City Plan
SCCWRP	Southern California Costal Water Research Project
SMB	Santa Monica Bay
SCAG	Southern California Agencies of Government
SCAQMD	South Coast Air Quality Management District
SHELL	Shellfish Harvesting (beneficial use)
SIC	Standard Industrial Classification Code
SMBRP	Santa Monica Bay Restoration Project
SMURRF	Santa Monica Urban Runoff Recycling Facility
SPAC	Stormwater Pollution Abatement Charge
SPAF	Stormwater Pollution Abatement Fund
SPI	Subwatershed Prioritization Index
SPWN	Spawning, Reproduction, and/or Early Development (beneficial use)
SRF	State Revolving Fund
SRPC	Strafford Regional Planning Commission
SSMC	Santa Monica Mountain Conservancy
SSO	Sanitary Sewer Overflow
SUSMP	Standard Urban Stormwater Mitigation Plan
SWRCB	State Water Resources Control Board

T

TC	Total Coliforms
TIE	Toxicity Identification Evaluation
TMDL	Total Maximum Daily Load
TNT	Teens for Neighborhood Trees, City of New York
TSS	Total Suspended Solids

U

µg/l	microgram per liter
UCLA	University of California at Los Angeles

UCCE	University of California Cooperative Extension

W

WARM	Warm Freshwater Habitat (beneficial use)
WDR	Waste Discharge Requirements
WERF	Water Environment Research Foundation
WET	Wetland Habitat (beneficial use)
WILD	Wildlife Habitat (beneficial use)
WLA	Wasteload Allocation
WPD	Watershed Protection Division, City of Los Angeles
WRP	Wastewater Reclamation Plant
WQ	Water Quality
WQCMPUR	Water Quality Compliance Master Plan for Urban Runoff
WW	Wet Weather

Definitions

303(d) list	List of “water quality limited segments” (water bodies) that require TMDLs to satisfy section 303(d) of the Clean Water Act.

A

Aldrin	Compound belonging to the group of organochlorine insecticides.
Anthropogenic	Caused by human activity (as opposed to caused by nature).

B

BMP	Activity or measure for reducing the amount of pollutants entering a receiving water body from urban runoff, or a method that has been determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources.
BOD	Laboratory measurement of the amount of oxygen required by bacteria to consume organic chemicals in water (Biological Oxygen Demand). A high BOD usually results in a water body deficient in oxygen and not being able to support higher life forms.
Biofiltration	Simultaneous process of filtration, infiltration, adsorption and biological uptake of pollutants that takes place when stormwater flows over and through vegetated areas.
Bioremediation	Use of living organisms (typically bacteria) to clean up oil spills or remove other pollutants from soil, water, or wastewater.
Bioretention	Stormwater management practice that utilizes shallow storage, landscaping and soils to control and treat stormwater by collecting it in shallow depressions before filtering it through a fabricated planting soil media.
Biosolids	Term used by the water treatment industry which refers to treated sludge.

C

Catch basins	Storm drain inlet or curb inlet to the storm drain system that typically includes a grate or curb inlet where stormwater enters the catch basin and a sump to capture sediment and debris.
Chaparral	Shrubland or heathland plant community found primarily in California.

ChemA	Term referring to the group of the following chemicals: Aldrin, Dieldrin, Chlordane, Endrin, Heptachlor, Heptachlor Epoxide, HCH, Endosulfan, and Toxaphene.
Cistern	Reservoir, tank, or container used for storing stormwater in order to enable its use for irrigation.
Coliform bacteria	Class of bacteria that are commonly used as indicator of likely presence of pathogenic organisms.
Composting	Controlled biological decomposition of organic material in the presence of air to form humus-like material.
Constructed wetlands	Wetland that is created on a site that previously was not a wetland, specifically to remove pollutants from stormwater.

D

Debt financing	Raising money for working capital or capital expenditures by selling bonds, bills, or notes to individual and/or institutional investors. In return for lending the money, the individuals or institutions become creditors and receive a promise to repay principal with interest on the debt.
Detention	Temporary storage of stormwater runoff with the goals of controlling peak discharge rates and providing gravity settling of pollutants.
Disinfection	Process in which objectionable microorganisms are killed.

E

Effluent	Discharge of water from a natural body of water, or from a man-made structure.
Enteric	Of intestinal origin, especially applied to wastes or bacteria.
Estuary	Semi-enclosed coastal body of water with one or more rivers or streams flowing into it, and with a free connection to the open sea.
Eutrophication	Increase in chemical nutrients—typically compounds containing nitrogen and phosphorus—in an ecosystem resulting in high primary productivity.
Enterococcus	Group of bacteria used as indicators of water quality for the safety of public beaches.

G

GIS	Tool that links spatial features commonly seen on maps with information from various sources ranging from demographics to pollutant sources.

Greenway	Policy or land use designation in land-use planning to retain areas of largely undeveloped, wild, or agricultural land surrounding or neighboring urban areas.
Groundwater	Water located beneath the ground surface in soil pore spaces and in the fractures of lithologic formations.

H

Habitat	Particular kind of environment inhabited by certain species.
Heavy metals	Metallic elements with relatively high atomic weights (e.g. mercury, chromium, cadmium, arsenic, and lead); can damage living organisms at low concentrations and tend to accumulate in the food chain.
Hydrocarbons	Organic compound consisting entirely of hydrogen and carbon.
Hydrodynamic separator	Engineered structure which separates sediments and oils from stormwater by gravitational separation and / or hydraulic flow.
Hydrograph	Plot of the discharge of a river as a function of time. In surface water hydrology, a hydrograph is a time record of the discharge of a stream, river or watershed outlet.

I

Impaired water body	Water body that does not meet the criteria that supports its designated use.
Impervious structures	Structures, such as pavement and building roofs, which replace natural landscape and prevent stormwater infiltration.
Infiltration	Penetration of water through the ground surface into sub-surface soil.
Institutional BMP	Any urban runoff management activity that reduces the generation of pollutants at the source and that does not require engineering and / or construction. Sometimes also referred to as nonstructural or source-control BMPs.

L

Lagoons	Body of comparatively shallow salt or brackish water separated from the deeper sea by a shallow or exposed sandbank, coral reef, or similar feature.
Legacy toxics	Toxic or hazardous chemicals or residues such as pesticides (DDT for example) and PCBs that are no longer used or their manufacture has been banned but are still present in the environment. They are often found in sediments.
Load allocation	Portion of a receiving water's TMDL that is attributed to one of its existing or future nonpoint sources of pollution or to natural background sources (EPA).

M

MS4	Municipal Separate Storm Sewer System for collection of urban runoff, which in the City of Los Angeles is separated from the sewers for collecting sewage.

N

NPDES	National Pollutant Discharge Elimination System. A provision of the Clean Water Act that prohibits the discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or, where delegated, a tribal government on an Indian reservation.
Nonpoint source	Diffuse pollution source or a source without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land by stormwater. Common nonpoint sources are agriculture, forestry, urban areas, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.
Nonstructural BMP	See institutional BMP.
Non-vegetative BMP	Structural BMP that prevents or reduces pollutants and runoff without utilizing vegetation such as grass, shrubs, and trees.
Nutrient	Chemical compound, usually containing nitrogen or phosphorus, that stimulates plant growth.

O

Open area	Any area that can be used for implementing BMPs without eliminating the primary use. Open area includes open space, privately owned undeveloped land, parks, parking lots, playgrounds and schoolyards.
Open space	Essentially unimproved land (natural areas) as defined in the California Government Code Section 65560 (b).
Organic compound	Substance containing mainly carbon, hydrogen, nitrogen, and oxygen.
Organochlorine pesticides	Organic pesticides containing chlorine, such as DDT, most of which are now banned.

P

PAHs	Polyaromatic hydrocarbons: class of hydrocarbons typically produced by incomplete combustion of organic materials.
PCBs	Polychlorinated biphenyls: group of toxic, persistent chemicals used in electrical transformers and capacitors for insulating purposes, and in gas pipeline systems as lubricant. The sale and new use of PCBs were banned by law in 1979.

pH	Measure of the acidity (pH less than 7) or alkalinity (pH greater than 7) of a solution.
Pathogens	Microorganisms (e.g., bacteria, viruses, or parasites) that can cause disease in humans, animals and plants.
Percolation	Movement and filtering of fluids through porous materials.
Point source	Stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution, such as a pipe, ditch, ship, ore pit, or factory smokestack.
Pollutant	Contaminant in a concentration or amount that adversely alters the physical, chemical, or biological properties of the natural environment.
Pollutant load	Amount of pollutants entering a water body. Loads are usually expressed in terms of a weight and a time frame, such as pounds per day (lb / d).

R

Receiving waters	Creeks, streams, rivers, lakes, estuaries and other bodies of water into which urban runoff flows.
Reclamation plant	Plant in which raw sewage is treated physically, chemically, and biologically, to become reusable water.
River reach	Section of the river, often between designated tributaries, that has similar characteristics such as geometry, physical, and width.
Runoff	A term used to describe the flow of water, from rain, snowmelt, or other sources, over the land surface, and is a major component of the water cycle.

S

SSO	Sanitary Sewer Overflow: an occasional unintentional discharge of raw sewage from a municipal sanitary sewer.
Sand filter	Device that filters storm water runoff through a sand layer into an underdrain system that conveys the treated runoff to a detention facility or to the ultimate point of discharge.
Sediments	Product of erosion processes, usually small organic and inorganic particles that are transported by flowing water and ultimately settle the bottom.
Semi-arid	Climatic regions that receive low annual rainfall (250-500 mm or 10-20 in).
Septic tank	Underground storage tank for wastes from homes not connected to a sewer line. Waste goes directly from the home to the tank.

Solid waste	Waste type that includes predominately household or domestic waste with sometimes the addition of commercial wastes collected by a municipality.
Source control BMP	See institutional BMP.
Stakeholder	Individual or organization that has an interest in the outcome of the watershed plan.
Stormwater	Urban runoff generated by rainfall that does not seep into the earth and flows overland to flowing or open bodies of water.
Stressor	Any physical, chemical or biological entity that can induce an adverse response. Stressors cause impairments of water bodies.
Structural BMP	Any urban runoff management practice that requires construction, installation, and maintenance (as opposed to institutional BMPs).
Sub-watershed	Smaller basin of a larger drainage area that all drains to a central point of the larger watershed.

T

TMDL	Total Maximum Daily Load: sum of the individual wasteload allocations and load allocations. A margin of safety is included with the two types of allocations so that any additional loading, regardless of source, would not produce a violation of water quality standards (EPA).
TSS	Total Suspended Solids: small solid particles that remain in suspension in water as a colloid due to the motion of the water.
Thermal desorption	Process of heating soil anywhere between 200 and 1000°F in order to vaporize contaminants with low boiling points. The vaporized contaminants are collected and treated.
Toxicity	Degree to which something is able to produce illness or damage to an exposed organism.
Treatment control	Structural BMP that focuses on removing pollutants from BMP urban runoff.
Tributary	Stream or river which flows into a main stem (or parent) river, and which does not flow directly into a sea.

U

Urban runoff	Water from city streets and adjacent residential or commercial properties that can transport a range of pollutants. In the dry season, the bulk of the flow is from anthropogenic sources. During wet weather, the flow includes storm generated runoff (stormwater) which can be at much higher volumetric rates.

V

Vegetative BMP	Structural BMP that reduces pollutants and/or the volume of urban runoff by utilizing vegetation such as ornamental grass, shrubs, and trees. An example is a "vegetative swale" designed to intercept and convey surface stormwater runoff, promote infiltration, interception of sediment by the vegetation and provide a landscape feature in urban areas.

W

WLA	Waste load allocation: the portion of receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution (EPA).
Watershed	All the land that drains downslope to a common lowest point.
Water quality standards	Standards that set the goals, pollution limits, and protection requirements for each water body. These standards are composed of designated (beneficial) uses, numeric and narrative criteria, and anti-degradation policies and procedures.
Watershed plan	Document that provides assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to development and implementation of the plan.
Wet season	Period in which rainfall occurs, in Southern California from November 1st to March 31st.

Preface

Council Motion

On March 2, 2007, Council members Ed Reyes (CD 1) and Bill Rosendahl (CD 11) introduced Council Motion 07-0663 (*Appendix 1-1*) to develop a water quality master plan with strategic directions for planning, budgeting and funding to reduce pollution from urban runoff in the City of Los Angeles. The Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR) was developed by the Bureau of Sanitation, Watershed Protection Division in collaboration with the stakeholders to address the requirements of the Council Motion.

Water Quality Standards

The City's beaches, lakes, rivers and harbors are major elements of what makes living in or visiting the City of Los Angeles a great experience. The City is under a legal mandate, through the Clean Water Act, to ensure that its waters meet water quality standards. It is important that urban runoff management becomes a critical element in all of the City's planning, development and redevelopment through an integrated and citywide approach for improving and protecting the quality of the City's waters. Since the City's waters are parts of larger watersheds, it is equally important to work together with neighboring cities.

Environmental Responsibility

In May 2007, Mayor Villaraigosa released Green LA, an action plan to reduce greenhouse gas emissions, and create a more sustainable environment. Likewise, the City Council has adopted several motions that support the greening of Los Angeles. The City now looks at its rivers, lakes and coastal waters as essential for the quality of life in Los Angeles. As the City moves through the first half of the 21st Century, urban runoff should no longer only be viewed as a nuisance or flooding danger that should be swiftly removed by "channelized" streams to the ocean. Instead, urban runoff is a valuable resource to augment our diminishing water supplies as the City grows. In addition to protecting the quality of the City's waters, the WQCMPUR supports the Mayor's initiatives to transform Los Angeles to the cleanest and greenest big city in America by:

- Restoring the natural ecosystems of bays, rivers and lakes where possible;
- Capturing urban runoff for recharging the aquifers and for other beneficial uses such as irrigation; and
- Implementing urban runoff strategies that promote the sustainability of the City of Los Angeles.

Challenges

The City of Los Angeles covers a large area and is highly urbanized. Most of its land area is impervious due to extensive development. A network of storm drains rapidly conveys urban runoff from rooftops, streets, parking lots and other impervious

surfaces. Urban runoff pollutants - for instance from traffic, industrial activities or other sources - end up in the receiving waters, often without any form of treatment. The challenge of meeting water quality standards is to develop an extensive approach that combines source control of urban runoff pollutants, reduction of urban runoff volumes, and treatment technologies for removing pollutants from urban runoff. Additional challenges include:

- **Administration** – A citywide and unified approach is needed as urban runoff management affects all City departments;

- **Legislative and policy** – Effective urban runoff management will need policy changes at local, county and state levels, for instance, to regulate the use of urban runoff pollutants and to provide guidelines for the use of urban runoff in infiltration and irrigation;

- **Funding** – While the Stormwater Pollution Abatement Charge provides funding for the City's current Watershed Protection Program, additional funding is needed for implementation of the WQCMPUR;

- **Science** – With urban runoff management being a relatively new area with many uncertainties, development of science-based methods is essential to identifying pollutant sources and finding the best solutions for improving water quality;

Approach

The WQCMPUR seeks a broad watershed-based perspective to improve water quality and bring the City of Los Angeles into compliance. The strategy is to build on ongoing successful initiatives and programs, identify common grounds (for benefits and funding), and seek new initiatives that will address complex problems. This approach will also promote water conservation and factor in objectives identified by other plans, including increased recreation opportunities and support for the greening of Los Angeles. Successful implementation of the WQCMPUR requires a consensus for change with citizens, neighborhoods, City government, businesses, non-governmental organizations (NGO's), consultants, universities, adjoining cities, and other agencies. Hence, implementation of water quality improvement projects should be through collaboration and partnerships with all stakeholders.

WQCMPUR Document

A great amount of data and information has been reviewed and used for developing the WQCMPUR. *Chapters 1 through 8* present an overview of the existing status of urban runoff management in the City. Some of the elements in this part include a description of the four watersheds in the City of Los Angeles, urban runoff pollutant sources and their distribution over the City, regulatory requirements for water quality, existing watershed management, and related plans for compliance with regulatory requirements. *Chapter 9* looks at the future of urban runoff management in the City of Los Angeles and distinguishes between three initiatives, which include:

- **Water Quality Management Initiative** - discusses the various technical components that go into developing projects for the Water Quality Management Plans to comply with stormwater regulations;

- **Citywide Collaboration Initiative** – discusses what is needed to revise and develop City policies, ordinances, and guidelines for urban development and redevelopment to focus on green solutions, Low Impact Development (LID), and stormwater use while increasing coordination Citywide;

- **Outreach Initiative** – discusses how the City will enhance outreach activities to reach target audiences, and establish methods to quantify the water quality benefits achieved through outreach activities.

Chapter 10, the financial plan, evaluates current and future revenues, and provides an estimate of the costs needed for implementing the strategies proposed by the WQCMPUR as well as opportunities for funding.

Executive Summary

ES.1 Introduction

The Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR) was developed in response to City Council Motion CF 07-0663, dated March 2, 2007, *Appendix 1-1*, "A Water Quality Compliance Master Plan is needed to provide strategic direction essential for planning, budgeting and funding efforts to reduce pollution from urban runoff. This plan should guide the City's efforts to meet its CWA mandates. The need for this plan is urgent, and the City needs to show leadership immediately."

The development of the WQCMPUR was a combined effort of the Management Committee (Mayor's Office, Council Districts 1 and 11, Office of the Chief Legislative Analyst, Board of Public Works, Bureau of Sanitation), the Project Team, and stakeholders. The WQCMPUR provides a description of the Los Angeles watersheds, the concerns about the quality of urban runoff, the ongoing City efforts to address those concerns, a strategy for future urban runoff management, and a financial plan to support this strategy.

The primary goal of the WQCMPUR is to help meet water quality regulations. Implementation of the WQCMPUR over the next 20 to 30 years will result in cleaner neighborhoods, rivers, lakes and bays, augmented local water supply, reduced flood risk, more open space, and beaches that are safe for swimming. The WQCMPUR also supports the Mayor and Council's efforts to make Los Angeles the greenest major city in the nation. These goals are summarized in *Table ES-1*.

Throughout the WQCMPUR, one will find the following underlying themes:

- Identifying where the beneficial uses of our waters are impaired, and applying technologies and strategies to improve water quality;
- Planning and building more livable, healthier and sustainable communities;
- Investing in research and technologies to support allocation of City tax dollars to work toward the most cost effective solutions;
- Reducing administrative barriers and fostering new partnerships among City departments, allowing for a clearer focus on water quality improvement;
- Increasing public involvement and participation through education and outreach, creating a strong stewardship mentality among citizens;
- Leveraging the strength and motivations of the residents of Los Angeles to build, support, and to share in the achieving of our mission; and

Table ES-1
WQCMPUR Goals and Key Objectives

Goals	Purpose	Key Objectives	Reference
1) Comply with water quality standards	Improve water quality in City watersheds	– Meet NPDES MS4 Permit requirements – Meet TMDL-specific numeric waste load allocations – Meet other water quality standards	– ***Appendix 5.1*** summarizes numeric WLAs – ***Section 9.7*** describes implementation of a compliance assessment once every five years
2) Implement a watershed-wide approach to water quality compliance	Establish a comprehensive solution by building upon ongoing watershed planning work being conducted by other organizations	– Establish Citywide numeric BMP design and performance criteria – Establish quantitative nexus between BMP selection and water quality standards attainment – Establish Water Quality Management Plans for four watersheds	– ***Section 9.2*** and ***Appendix 9.2*** describe Water Quality Management Plan development process, including need for BMP design and performance criteria – ***Appendix 9-3*** describes process for developing quantitative nexus
3) Maximize the use of BMPs that support multiple benefits	Use the need to comply with TMDLs as an opportunity to support other City and watershed goals	– Establish metrics in each Water Quality Management Plan that measure benefits achieved, e.g., number of green streets or acres where urban runoff is captured, treated, and used	– ***Sections 9.2*** and ***9.7*** note that these types of metrics will be developed in association with each Water Quality Management Plan
4) Establish comprehensive Citywide approach to compliance	Establish urban runoff management as a requirement in all City new development and redevelopment activities	– Establish Low Impact Development Ordinance – Establish Stormwater Use Ordinance – Establish Stream Protection Ordinance	– ***Section 9.3*** describes the activities planned for establishing a Citywide collaborative approach to urban runoff management
5) Support urban runoff goals of the Water IRP	Ensure that implementation is consistent with Water IRP	– Implement BMPs that support Water IRP dry and wet weather runoff numeric goals – Implement applicable Go-Policy Directives	– ***Section 8.3.8*** provides overview of Water IRP goals – ***Table 9.2*** links Go-Policy Directives to strategy elements
6) Engage the community	Create a sense of stewardship at all levels of the community	– Implement outreach activities on a variety of levels – Encourage participation in development of Water Quality Management Plans	– ***Section 9.4*** describes planned outreach activities – ***Section 9.6*** describes opportunities for stakeholder participation

Â Conducting assessments of the implementation of the plan, and the progress towards meeting water quality regulations in each watershed.

ES.2 Watersheds

Four watersheds encompass the City of Los Angeles: Los Angeles River, Ballona Creek, Dominguez Channel, and Santa Monica Bay. Each watershed has unique

characteristics, needs, and opportunities that require specific approaches and solutions. These watersheds comprise many cities that share responsibility for meeting water quality regulations. For example, the Los Angeles River Watershed has 42 responsible cities and agencies. Jurisdictional coordination is key to successful urban runoff management on a watershed-wide basis.

ES.3 Water Quality

City of Los Angeles and other agencies monitor the water quality at our beaches, and in rivers, creeks, and lakes on a regular basis. So far, water quality monitoring has mostly focused on the receiving waterbodies, and the pollutants that are regulated by adopted TMDLs. For the prioritization of pollution generating areas and the development of pollution reduction measures, there may be a need for more water quality data in the tributaries, and storm drains that transport pollutants to the receiving waters.

ES.4 Pollutants of Concern

The most common pollutants causing impairments include: trash, metals, coliform bacteria, oil and grease, nutrients, and toxic organic compounds, such as pesticides and herbicides. These pollutants come from many sources, and are found in the water column, or are deposited in sediments and fish tissues. Understanding pollutant sources is critical to improving water quality. If the source can be reduced or eliminated, water quality benefits can be more quickly realized with lower cost.

ES.5 Regulatory Requirements

The Federal Clean Water Act (CWA), the State Porter-Cologne Act, and the California Ocean Plan provide the basis for the protection of water quality in fresh and marine waters. The Los Angeles Regional Water Quality Control Board (LARWQCB), and the California Environmental Protection Agency (Cal EPA) implement State and Federal water quality regulations. Water quality regulations applicable to urban runoff management are primarily implemented through the National Pollutant Discharge Elimination System Permit for the Municipal Separate Storm Sewer System (NPDES MS4 Permit). Earlier versions of the NPDES MS4 Permit were mostly narrative with requirements for implementation of Best Management Practices. Future NPDES MS4 Permits, however, are likely to also include numeric water quality standards, or action levels, and pollutant load allocations that are specified in Total Maximum Daily Loads (TMDLs). A TMDL establishes the maximum amount of a pollutant that a waterbody can receive from all sources, including the MS4, while still meeting water quality goals.

Many Los Angeles waterbodies have been designated as impaired because of poor water quality. As of December 2008, the LARWQCB has adopted 14 TMDLs to address these impairments, of which 13 have been approved by the State Water Resources Control Board (SWRCB), Office of Administrative Law (AOL), and U.S. EPA and are, therefore, effective. By 2012, the LARWQCB will have developed as many as 60 TMDLs, required under a Federal Consent Decree.

ES.6 Best Management Practices

Urban runoff management relies on the use of Best Management Practices (BMPs) to control the discharge of pollutants to receiving waters. BMPs are designed to reduce pollutant concentrations at the source, to reduce the volume of runoff that carries pollutants to the receiving water or to remove pollutants from runoff in the storm drain system. BMPs may be either non-structural (control of pollutants through programmatic activities such as product substitution, education or ordinance implementation) or structural (facilities that improve water quality through some treatment mechanism). The selection of BMPs will be based on minimum design storm criteria and BMP performance criteria. Structural BMPs are also anticipated to result in significant urban runoff reuse and groundwater recharge.

ES.7 TMDL Implementation Plans

Water quality planning is an ongoing activity in the City. Some planning efforts respond directly to regulatory requirements, e.g., the need to establish specific TMDL implementation plans. TMDL implementation plans delineate a stepwise approach and schedule for meeting TMDL requirements. To date, the City has developed, in conjunction with other responsible agencies, two TMDL implementation plans. Four additional implementation plans are required by 2011 and more are expected as new TMDLs are adopted. Future plans will have a watershed focus that addresses multiple TMDL requirements and builds on other watershed planning efforts.

ES.8 Watershed Management Plans

Several watershed management plans have been developed for the Los Angeles area. These plans in general have a broader mission that goes beyond compliance with water quality regulations. Examples include the Los Angeles River Revitalization Master Plan, the City's Water Integrated Resources Plan (Water IRP), the Ballona Creek Watershed Management Master Plan, Dominguez Watershed Management Master Plan, the Greater Los Angeles County Integrated Regional Water Management Plan and others. Implementation of the WQCMPUR will build upon ongoing watershed management planning work in order to use resources efficiently and maximize water quality benefits.

ES.9 Implementation Strategy

The WQCMPUR Implementation Strategy describes the direction and activities required to achieve the goals and objectives outlined in *Table ES-1* and meet and go beyond the NPDES MS4 Permit requirements. Building upon currently ongoing water quality improvement efforts, the Implementation Strategy is divided into three initiatives that are closely correlated:

- **Water Quality Management Initiative** - This initiative describes how Water Quality Management Plans for each of the City's four watersheds and TMDL-specific Implementation Plans will be developed to ensure compliance with water quality regulations. Using the guidelines of the WQCMPUR, these Water Quality Management Plans and TMDL Implementation Plans will:

- Identify BMPs for implementation that will result in compliance with water quality regulations by using design storm and BMP performance criteria;

- Select and prioritize the BMPs for implementation in the watersheds, focusing on the BMPs outlined in the Citywide Collaboration and the Outreach Initiatives;

- Coordinate with ongoing watershed management activities where common goals exist;

- Support the urban runoff management goals of the Water IRP;

- Establish a quantitative nexus between the BMPs selected for implementation and water quality standards attainment;

- Establish metrics to measure success.

Â **Citywide Collaboration Initiative** – This initiative recognizes that urban runoff management is closely linked with urban development and redevelopment, requiring:

- Citywide collaboration and coordination of urban runoff management;

- City policies and guidelines for urban development and redevelopment that focus on using green solutions to manage urban runoff; and

- Strategies to promote Low Impact Development (LID) and stormwater use.

Â **Outreach Initiative** – This initiative promotes public education and community engagement with a focus on preventing urban runoff pollution and will:

- Enhance outreach activities to reach appropriate target audiences;

- Establish methods to quantify water quality benefits achieved through outreach activities; and

- Promote community engagement in all of the City's urban runoff management activities.

*Table ES-***2** shows the subinitiatives in a matrix of identifiable programs in each initiative. The Implementation Strategy identifies and prioritizes recommended activities for each initiative and subinitiative as follows:

Â "High priority recommended activities" are included in the Implementation Strategy Action Plan, *Table ES-3,* which includes the lead City department and schedule.

Â "Other recommended activities" have not been included in the Implementation Strategy Action Plan because they may be less urgent and / or they may need

Table ES-2
Framework of the Water Quality Compliance Implementation Strategy

Initiatives	Subinitiatives	Purpose
Water Quality Management	Water Quality Management Plans	Establish four Water Quality Management Plans that include NPDES MS4 Permit and TMDL-specific requirements
	Jurisdictional Partnerships	Establish agreements within each watershed to support Water Quality Management Plan implementation
	Research & Evaluation	Continue pilot studies and research to support Water Quality Management Plan implementation
Citywide Collaboration	General Plan Update	Guide establishment of Citywide policies for urban runoff management towards compliance with NPDES MS4 permit
	Green Solutions	Implement low impact development activities to promote green landscapes, stormwater use, and multi-benefit projects
	Runoff Management	Implement a runoff management program that increases infiltration and reduces pollutant loading and peak flows
	Source Reduction	Reduce waste and toxics material generation at the source and improve enforcement activities
Outreach	Pollutant-Specific Outreach	Develop outreach for specific pollutants, but integrate education messages/materials where possible
	Stormwater NPDES and TMDLs Outreach	Inform general public, community, business and environmental leaders and organizations about meeting NPDES MS4 Permit and TMDL requirements
	School Outreach	Continue to enhance school education programs, teacher training and community linkages
	Business Outreach	Target appropriate businesses to address most significant pollutant concerns
	Employee Training Program	Review training materials and evaluate effectiveness of program
	Mass Media Advertising	Continue advertising programs; revise or enhance as needed
	Stakeholder Involvement	Coordinate stakeholder involvement activities with Prop O project implementation
	Collaboration with Other Programs	Continue collaboration with non-profits, government agencies and other organizations to support TMDL implementation efforts

further development and evaluation. Other recommended activities can be found in *Chapter 9, Implementation Strategy*.

Implementation of high priority recommended activities depends on the financial resources available to the Watershed Protection Program. Whereas a few high priority recommended activities in *Table ES-3* have already begun under the existing budget, many others will require additional financial resources before they can be implemented. Delays in additional funding will affect the schedules and delay milestones.

Table ES-3
Implementation Strategy Action Plan with High Priority Recommended Activities

Initiative	RA	Lead	Task	Year									
				1	2	3	4	5	6	7	8	9	10
Water Quality Management	1	BOE WPD	Implement TMDL compliance projects currently identified in CIP	•	•	•	•	•					
	2	WPD	Complete BMP Prioritization Methodology Phase II	•									
	3	WPD	Establish BMP siting, design storm and BMP performance criteria	•									
	4	WPD	Develop methodology for quantitative nexus between BMP selection and water quality standards attainment	•									
	5	WPD	Develop Water Quality Management Plan (WQMP) for Ballona Creek Watershed	•	•					**R**			
	5	WPD	Develop WQMP for Los Angeles River Watershed		•	•					**R**		
	5	WPD	Develop WQMP for Santa Monica Bay Watershed			•	•					**R**	
	5	WPD	Develop WQMP for Dominguez Channel Watershed				•	•					**R**
	6	BOE WPD	Implement future CIP projects for TMDL compliance			•	•	•	•	•	•	•	•
	10	WPD	Establish jurisdictional partnership agreements in each watershed	•	•	•	•	•					
	12	WPD	Participate in regional and national research opportunities	•	•	•	•	•	•	•	•	•	•
Citywide Collaboration	15	DCP WPD	Review and update General Plan for implementation of urban runoff management goals	•	•	•							
	16	WPD	Develop Low Impact Development strategy	•	•	•							
	17	WPD	Develop Stream Protection Ordinance	•	•								
	23	WPD BSS	Evaluate the use of public right of ways for local management of urban runoff (green streets)	•	•								
	30	WES D WPD	Support implementation of urban runoff goals of Water IRP	•	•	•	•	•	•	•	•	•	•
	31	WPD	Revise SUSMP requirements	•	•								
	32	WPD DRP	Evaluate use of publicly owned land for infiltration and urban runoff management	•	•	•							
	40	WPD	Establish water quality requirements for reuse of urban runoff	•	•								
Outreach	50-67	WPD	Evaluate and implement future outreach program elements as identified in Section 9.4.1	•	•	•	•	•	•	•	•	•	•
	68-69	WPD	Implement pilot studies to quantify benefits of non-structural BMPs	•	•	•	•						
	70	WPD	Create link to WQCMPUR activities on WPD website	•									
All Initiatives	71	WPD	Develop metrics for measuring success	•	•	•	•	•					
	72	WPD	Implementation strategy assessment and review					**R**					**R**

RA = Recommended Activity in ***Chapter 9***; this Action Plan only includes the high priority recommended activities.
R = Review and revise document

Using the WQCMPUR for strategic direction, metrics and numeric targets will be established more specifically in the development of Water Quality Management Plans for the City's four watersheds. The progress of implementation of the WQCMPUR and Water Quality Management Plans will be assessed every five years. This assessment may include the following:

- Review of water quality data and status of compliance with water quality regulations;
- Progress of implementing multi-benefit urban runoff projects;
- Status of city-wide collaboration activities; and
- Estimates of the pollution prevented through source reduction activities, particularly through increased community engagement and implementation.

Stakeholder participation is critical for the success of the WQCMPUR. The City will continue involving all stakeholders in future watershed planning and evaluate and seek collaboration and partnerships with all stakeholder organizations for the implementation of water quality improvement activities.

As a strategic document, the WQCMPUR does not require an Environmental Impact Report. California Environmental Quality Act requirements will be evaluated on an individual basis for specific projects.

ES.10 Financial Plan

It is estimated that the total cost for implementation of the WQCMPUR over the next 20 to 30 years will approximately be in the range of $7 billion to $9 billion. The financial plan for the WQCMPUR has identified a gap between these estimated costs and the current revenues for the City's Watershed Protection Program. The WQCMPUR recommends that the most sustainable approach for funding future water quality compliance activities is to seek an increase in tax revenues to pay for annual O&M costs and fund the Capital Improvement Program with debt financing. One option for increasing revenues is the Stormwater Pollution Abatement Fund (SPAF), which was created in 1991. The SPAF is funded by Stormwater Pollution Abatement Charge (SPAC) assessed to property owners in the City. The first and last time the SPAC was increased was in 1993/94, and revenues from the SPAF have remained the same ever since. Currently, the SPAC is $1.92 per month per Equivalent Dwelling Unit (EDU; the "average rate" for home owners). A stepwise increase over five years to $8.25 per month per EDU is recommended, but will require voter approval per Proposition 218.

Additional funding may be sought through a partnership with the County of Los Angeles Flood Control Program by: 1) modifying the scope of this program to include allocations for water quality improvement; and 2) increasing revenues generated (tax

increase) by this program to cover the cost of water quality improvement projects that will eventually be implemented within the County of Los Angeles including the cities. The City and County are in the planning stages of developing a request that may be put forward to County property owners (50% approval required) sometime in 2010.

For the City's part, it intends to spread the cost of the CIP over a long period of time to avoid high annual funding requirements by use of debt financing and avoid annual requests to voters for an increase in taxes for stormwater related projects.

Chapter 1
Introduction

The Water Quality Compliance Master Plan for Urban Runoff (WQCMPUR) has been developed in response to a Council motion asking for a strategic framework for urban runoff management in the City of Los Angeles. The ultimate goal of the WQCMPUR is that the City's rivers, lakes and coastal waters will meet all water quality regulations to protect public health and the environment. The WQCMPUR advocates a citywide approach and identifies how the City should manage urban runoff:

- *Chapters 2 to 8* summarize the current status of urban runoff management in the City of Los Angeles; and

- *Chapters 9 and 10* provide strategic directions and identify future opportunities for urban runoff management and funding.

1.1 Council Motion

On March 2, 2007, the City Council approved Council Motion CF 07-0663 introduced by Council members Ed Reyes (CD1) and Bill Rosendahl (CD11), *Figure 1-1*, *Appendix 1-1*. With public health, the environment and water quality legal mandates in mind, this motion calls for the development of the WQCMPUR for the City of Los Angeles with the purposes of:

- Providing strategic directions for planning, budgeting and funding for reducing pollution from urban runoff; and

- Guiding the City's efforts in meeting the Clean Water Act mandates for water quality.

Figure 1-1
Council Members Ed Reyes and Bill Rosendahl

In addition to these overarching goals, the Council Motion requires the WQCMPUR to incorporate the following elements:

- Identify pollutants of concern in the City (by type and location);
- Prioritize polluted areas in the City;
- Develop timetables for regulatory compliance;
- Review the City's existing efforts in reducing pollutants from urban runoff;
- Develop strategies for the City to meet Clean Water Act standards;
- Demonstrate that strategies will comply with water quality standards;
- Identify water quality data gaps to put the program on a sound footing; and
- Estimate costs and identify sources of financial support.

The WQCMPUR addresses the requirements of the Council Motion. The City of Los Angeles has been at the forefront of urban runoff management and water quality protection since the founding of the Watershed Protection Division (formerly the Stormwater Management Division) within the Bureau of Sanitation in 1990. The need for the WQCMPUR does not advocate a complete transformation of past watershed management practices in the City. Instead, the WQCMPUR builds on existing efforts by evaluating strengths and weaknesses and proposes strategic directions for how urban runoff should be managed in the future. Even though urban runoff management is a monumental task in a highly urbanized city as large as Los Angeles, the WQCMPUR should result in the City working together towards improving the quality of our waters.

1.2 Background and Scope

For many decades the focus of urban waste management has been on collecting, treating and disposing of wastewater and solid waste, because of their immediate and potentially large impacts on public health. Urban runoff management is a relatively new development triggered by the federal Clean Water Act and its subsequent amendments in the 1970's and 1980's. Under this Act, urban runoff must meet National Pollutant Discharge Elimination System (NPDES) Permit requirements, which are designed to reduce pollutants carried in urban runoff from point sources.

Pollutants carried by urban runoff can have significant impacts on water quality, aquatic ecosystems and public health. To address these concerns and to remain compliant with NPDES requirements, many cities in the United States have developed urban runoff management programs. However, even with these programs in place, urban runoff pollutants can still seriously impact water quality. Where the impact is significant, Total Maximum Daily Loads (TMDLs) are established to set limits to the amount of pollutants that a specific water body can receive and still meet

water quality standards. Fourteen of these TMDLs have already been adopted in the Los Angeles area; adoption of over 60 TMDLs by 2012 is expected. As a result, the need to enhance the City's urban runoff management program has become more urgent because of approaching regulatory deadlines to meet the TMDL requirements that will eventually be incorporated into the NPDES Permit for the Municipal Separate Storm Sewer System (MS4).

In response to Clean Water Act regulatory mandates, the City of Los Angeles started its Watershed Protection Program (formerly named Stormwater Program) in 1990. The Watershed Protection Division, which is responsible for this program, has been tasked with:

- Satisfying federal, state, regional, and local regulatory requirements;
- Coordinating City programs to minimize polluted runoff;
- Optimizing beneficial use of beaches and receiving waters by reducing pollutant loads through watershed management;
- Reducing waste disposal by providing public and employee education programs;
- Improving the waste disposal infrastructure;
- Expanding the use of technical knowledge regarding urban runoff issues; and
- Minimizing the adverse effects of flooding on the City of Los Angeles.

While the City is one of the nation's leaders in urban runoff management, the approach might best be described as reactive to specific problems. Planning efforts have been done in a partly integrated and localized manner, but not on a watershed-wide basis. This approach has resulted in the development and implementation of a variety of stormwater programs and projects, including public outreach and education, inspection, enforcement, scientific studies and construction of structural Best Management Practices. In contrast to this approach, the WQCMPUR is expected to proactively address current and future water quality regulations. It provides an overarching framework with strategic directions for development of Water Quality Management Plans and TMDL-specific Implementation Plans that will bring the City into compliance with water quality standards, *Figure 1-2*.

The concept of a watershed-wide approach is not new. *Chapter 8* discusses various management plans that have already been developed for the City of Los Angeles watersheds. These plans usually present a broad view of how these watersheds should be managed, but with less attention to specific water quality issues. The primary focus of the WQCMPUR is on improving the quality of the waters within City limits. However, the WQCMPUR advocates a watershed-wide approach to coordinate the City's efforts with other cities and agencies in the watersheds.

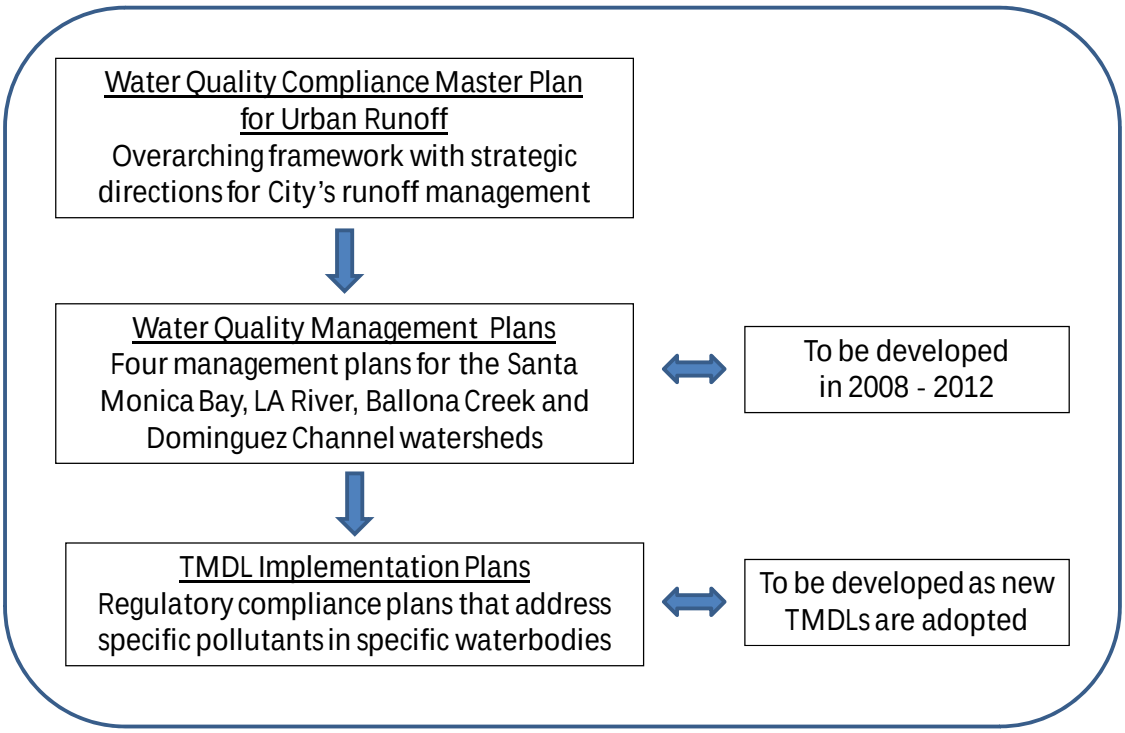

Figure 1-2
Urban Runoff Management in City of Los Angeles

In summary, the WQCMPUR takes a comprehensive view of our City and provides the strategic directions for managing urban runoff over the next 20 to 30 years. However, urban runoff management is an area with many remaining technical unknowns in an ever-changing public policy landscape. The WQCMPUR will be revisited to adjust its course in response to demographic, regulatory, political, and technological changes.

1.3 WQCMPUR Development

The development of the WQCMPUR was a citywide effort carried by many divisions and departments in the City along with input from water quality regulators, non-government and environmental organizations and the public. Such collaboration with stakeholders is critically important for any master plan, and it will be even more important for the implementation of the WQCMPUR. The first draft of the WQCMPUR was developed in nine months through the efforts of the following committees:

- The Management Committee met biweekly and consisted of the Mayor's Office, Council Districts 1 and 11, the Office of the Chief Legislative Analyst and Bureau of Sanitation's Watershed Protection Division. This committee managed the development of the WQCMPUR by providing oversight of and directions to the Project Team;

- The Stakeholder Advisory Committee met in the River Center in three workshops on June 27, August 14 and December 4, 2007. These workshops were attended by 70-100 people from environmental organizations, government agencies and internal City departments. The breakout sessions during these workshops, *Figure 1-3*, provided many suggestions for the development of the WQCMPUR;

Figure 1-3
Stakeholder Workshops

- The Citywide Committee originally met on a monthly basis to discuss citywide collaboration in urban runoff management. The major participants in this committee were the Departments of Public Works, Water and Power, Harbor and Airports, Recreation and Parks, Planning and Building and Safety. Later meetings of the Citywide Committee were canceled as most City departments attended the stakeholder workshops where citywide collaboration was one of the major topics. In addition, the Watershed Protection Division met with the individual City Departments in several follow-up meetings; and

- The Project Team with staff from the Watershed Protection Division and consultants met on a weekly basis and was responsible for developing the WQCMPUR.

The stakeholder workshops and discussions with various City departments provided a wealth of ideas, suggestions and concerns or questions. While some ideas and suggestions may not have been included in this document, they remain valuable for the future implementation of the WQCMPUR.

The project schedule for developing the WQCMPUR consisted of the following phases:

- In Phase 1, the scope of the WQCMPUR was developed with a detailed breakdown of the multiple tasks to be performed. In addition, the members of the Project Team were selected and strategies for stakeholder involvement were developed;

- In Phase 2, the focus was on summarizing and evaluating the current status of runoff management in the City, including urban runoff pollutants and their sources, water quality data and monitoring, water quality regulations, existing efforts for attaining water quality standards, and compliance with current TMDLs and the NPDES MS4 (Municipal Separate Storm Sewer System) Permit. Most of the information collected in this phase can be found in *Chapters 2* through *8;*

- In Phase 3, using the data collected in Phase 2 as a basis, the focus shifted towards developing the future strategies for urban runoff management and evaluating the financial implications of implementing these strategies. The results can be found in *Chapters 9* and *10*; and

- In Phase 4, the draft documents were extensively reviewed by the Management Committee and stakeholders and finalized by the Project Team.

Chapter 2
Watersheds and Pollutants

2.1 Introduction

The term “watershed” describes all the land that drains to a common low point. Water moves through both underground and surface drainage pathways that converge into streams and rivers. Eventually the water reaches a receiving waterbody such as a river, stream, lake, wetland or the ocean.

Integral with the watershed is the water that flows over, under and through it. For the purposes of the WQCMPUR, water is characterized as stormwater or urban runoff:

- Stormwater is the water from rain events and that finds its way to the City’s streets, storm drain system, streams and rivers, beaches, wetlands, estuaries, bays and harbors. In Los Angeles, stormwater occurs almost entirely during the wet season.

- Urban runoff includes stormwater, but also other sources of water not directly associated with rain events. Urban runoff includes natural sources such as groundwater seepage and springs. It includes anthropogenic sources of water, such as landscape overwatering, car-washing, illegal connections to the stormwater system, illegal dumping and treated water from industrial facilities (each requiring a specific permit). Urban runoff occurs in some form throughout the year, though the magnitude of flow tends to be much greater after rain events.

Urban runoff is collected by the City’s storm drain system. This is a system of underground pipes, devices, conveyance networks and treatments that is completely separate from Los Angeles’ sewer system, which collects residential, commercial and industrial wastewater. Except for illicit connections, there is no sewage entering into the storm drain system. The storm drain system typically is considered to start on City streets with the gutters that convey runoff to the storm drain inlets or “catch basins”. Almost all catch basins are marked with “do not dump – drains to ocean” warnings. The catch basins may have external screens and / or internal capture devices to separate trash from urban runoff. The catch basins provide a visible “link” between the City’s watersheds and an underground pipe network of small pipes connecting to larger pipes, ultimately empting into constructed channels or streams and creeks. The smaller creeks and streams may empty into wetlands, lakes or flood control basins. The larger water flows generally end up in rivers that discharge into harbors or directly into the ocean.

Watersheds can be broken down into smaller sub-watersheds, basins and catchments, divisions that depend on site-specific conditions, inter-jurisdictional considerations or on the level of detail needed for effective management. A portion of a watershed may have unique environmental factors, be subject to certain historical impairments or fall under the political jurisdiction of multiple agencies.

It will become apparent that there are complex interrelationships within a watershed that require a great deal of cooperation among responsible agencies when discussing watershed management. This chapter introduces some of these important watershed quality management issues.

2.1.1 City of Los Angeles Watersheds

The City of Los Angeles lies within four major watersheds. The boundaries are illustrated in *Figure 2-1***,** and the total watershed areas and portions within the City are summarized in *Table 2-1* for the following watersheds:

- **Los Angeles River watershed** – This is the largest regional watershed shown on *Figure 2-2* and significant portions of impaired sub-watersheds are within City boundaries. For water quality compliance with respect to metals, the watershed has been divided into six "jurisdictional groups." The City has joint responsibility for water quality management in each of these defined areas, *Ref. 2-1*. Water from the Los Angeles River discharges into San Pedro Bay from the Los Angeles River Estuary.

- **Santa Monica Bay watershed** – The Santa Monica Bay watershed is comprised of numerous sub-watersheds emptying into Santa Monica Bay. The northern portions of the watershed, outside the Los Angeles City limits, extend to the Los Angeles County / Ventura County Line, *Figure 2-3*. To the south, the watershed extends to the Palos Verdes Peninsula. There is also the very small Marina del Rey sub-watershed that can be viewed as part of the Santa Monica Bay watershed, but it is sometimes treated as a separate watershed with respect to water quality management.

- **Ballona Creek watershed** – This watershed contains the Ballona Creek, Ballona Creek Estuary and Ballona Creek Wetlands, *Figure 2-4*. As the Ballona Creek discharges into the Pacific Ocean, the Ballona Creek watershed could also be viewed as a sub-watershed of the Santa Monica Bay watershed.

- **Dominguez Channel watershed** – This watershed includes the drainage areas of the Dominguez Channel, the Wilmington Drain / Machado Lake, Dominguez Channel Estuary and the Torrance-Carson Channel that all eventually discharge through the Dominquez Channel into the Los Angeles Harbor area, *Figure 2-5*. The Los Angeles / Long Beach Harbor is itself subdivided into several distinct waterbodies.

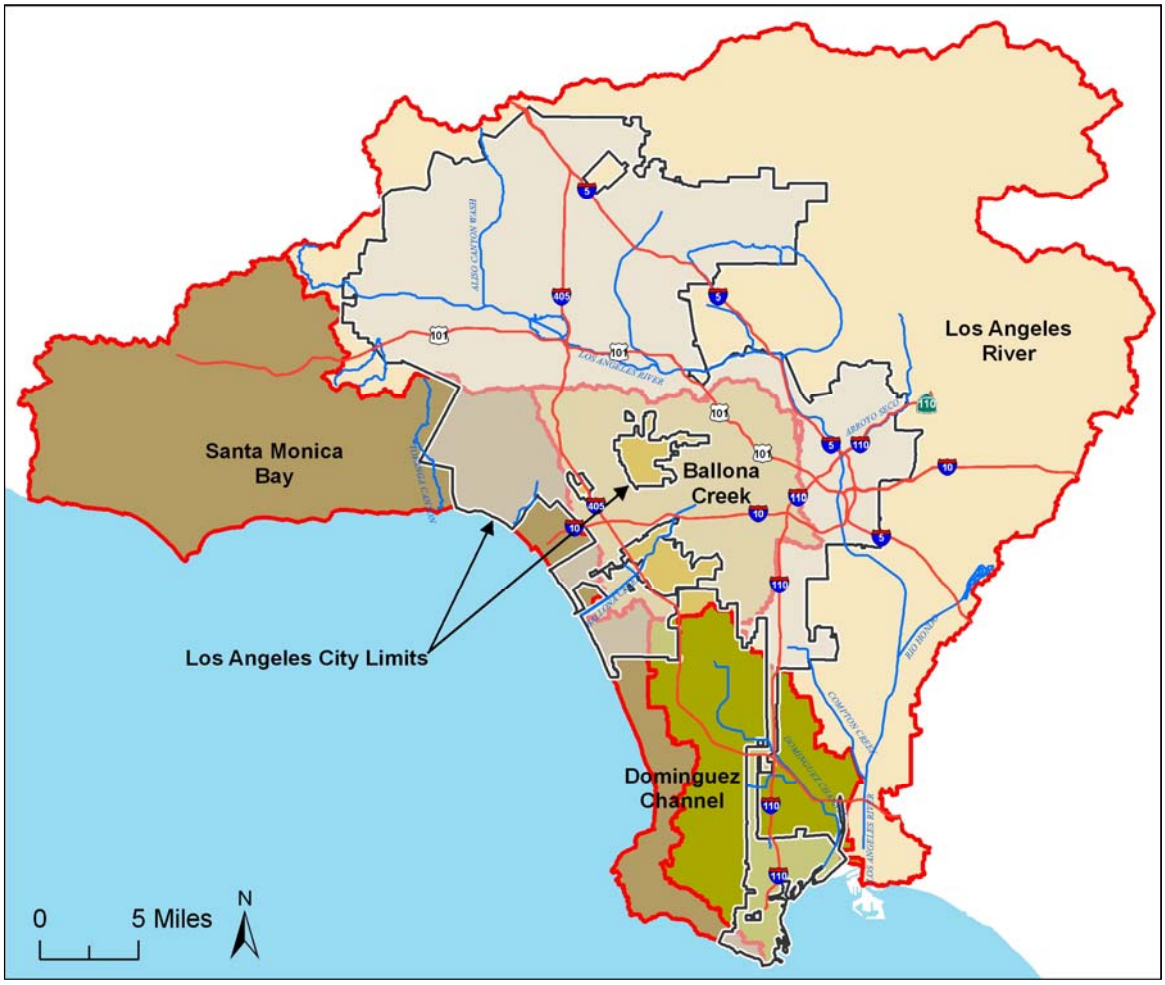

Figure 2-1
Watersheds
This figure illustrates four regional watersheds, superimposed with Los Angeles City limits.

Table 2-1
City of Los Angeles Area Watersheds
Total land areas and areas within the limits of City of Los Angeles[(1)]

City/Agency	Land Area (acres)	Area[(1)] (sq. miles)	% LA City
Los Angeles River			
Los Angeles	177,500	277	33
Other cities	157,000	245	
Other agencies	199,000	311	
Total	**533,000**	**833**	
Santa Monica Bay			
Los Angeles	21,000	32.8	12
Other cities and agencies	161,000	252	
Total	**182,000**	**285**	
Ballona Creek			
Los Angeles	66,400	104	81
Other cities	10,000	15.6	
Other agencies	5,600	8.7	
Total	**82,000**	**128**	
Dominguez Channel			
Los Angeles	22,100	34.5	32
Other cities and agencies	47,900	74.8	
Total	**70,000**	**109**	

(1) The Santa Monica Bay total area was from ***Ref. 2-2***. Other areas are from ***Ref. 2-3***.

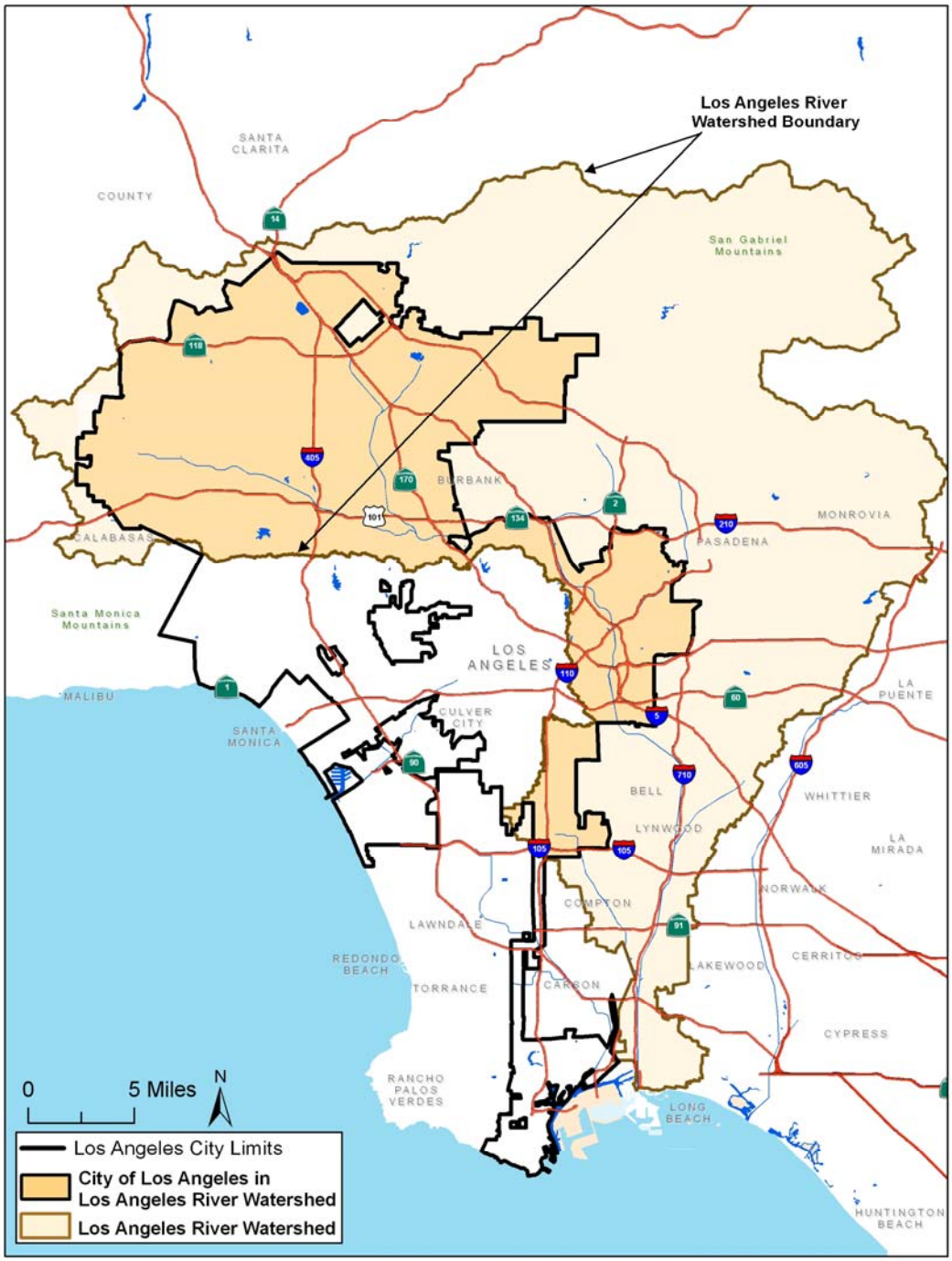

Figure 2-2
Los Angeles River Watershed
Urban runoff from the Los Angeles River watershed ultimately discharges into Los Angeles and Long Beach Harbors. Figure illustrates portions of Los Angeles River watershed within and outside the Los Angeles City limits.

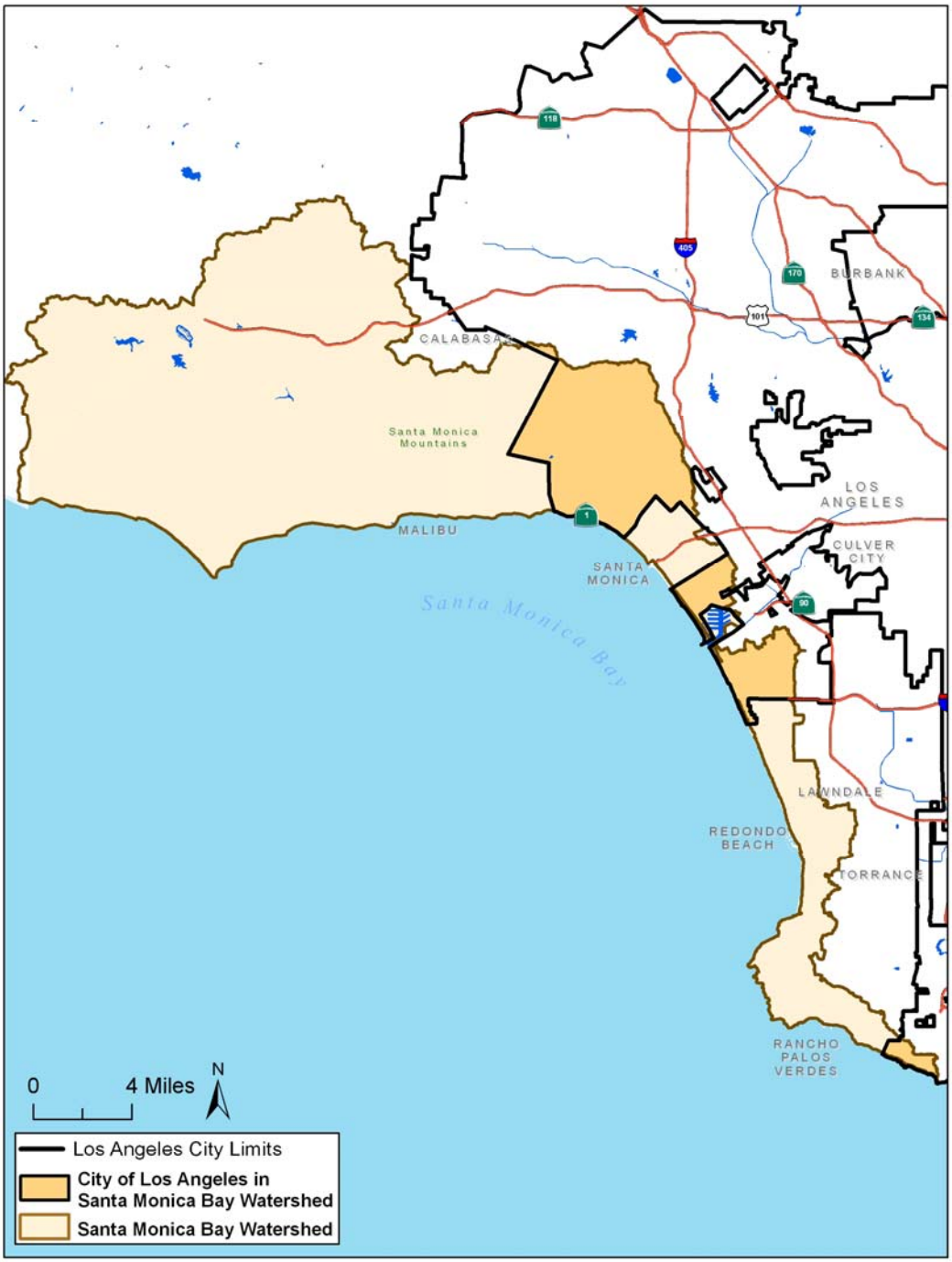

Figure 2-3
Santa Monica Bay Watershed
This figure illustrates the intersection of the City of Los Angeles with the Santa Monica Bay watershed. Runoff from the numerous sub-watersheds ultimately discharges into Santa Monica Bay.

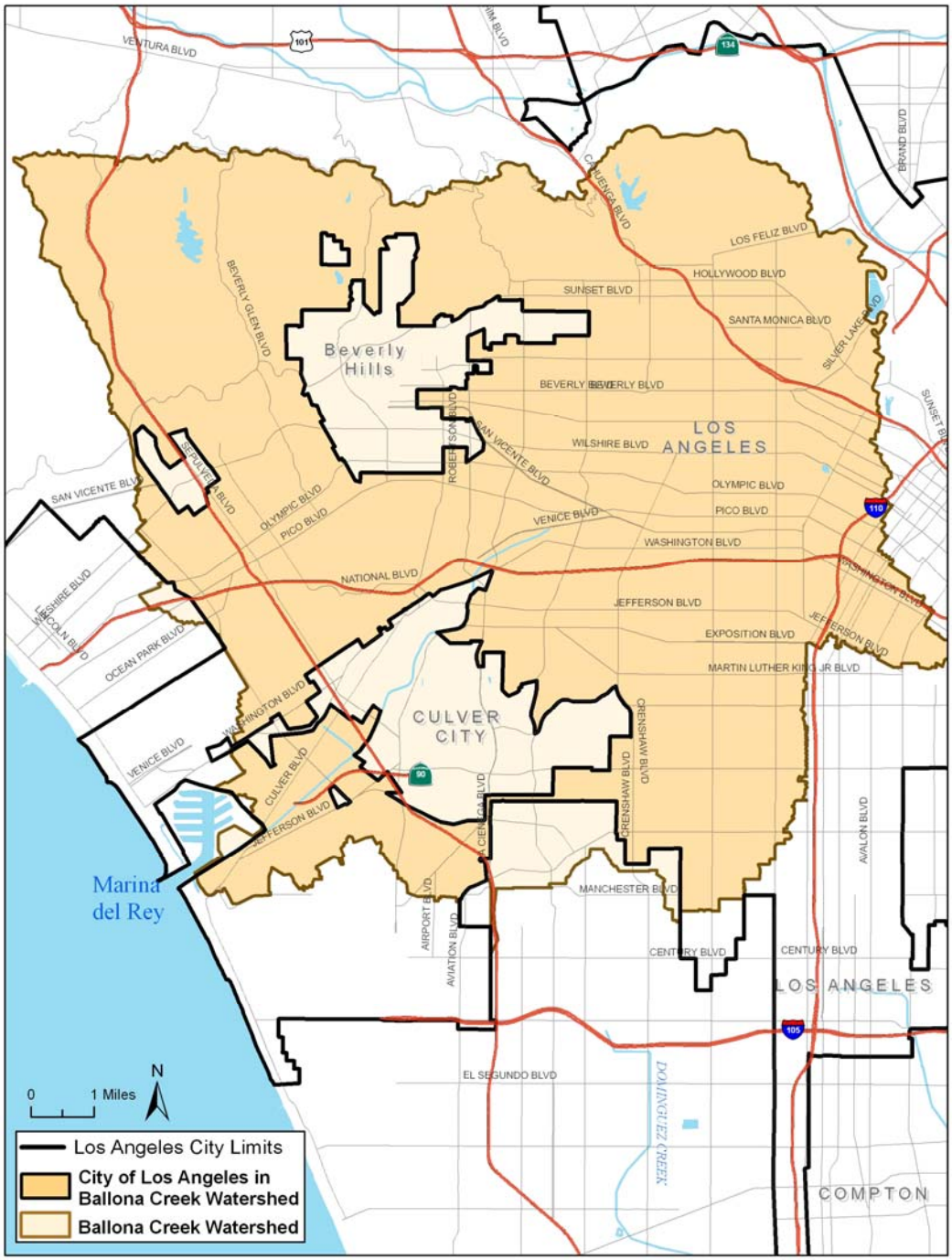

Figure 2-4
Ballona Creek Watershed
Runoff from Ballona Creek watershed ultimately discharges into Santa Monica Bay from Ballona Creek, just south of Marina del Rey.

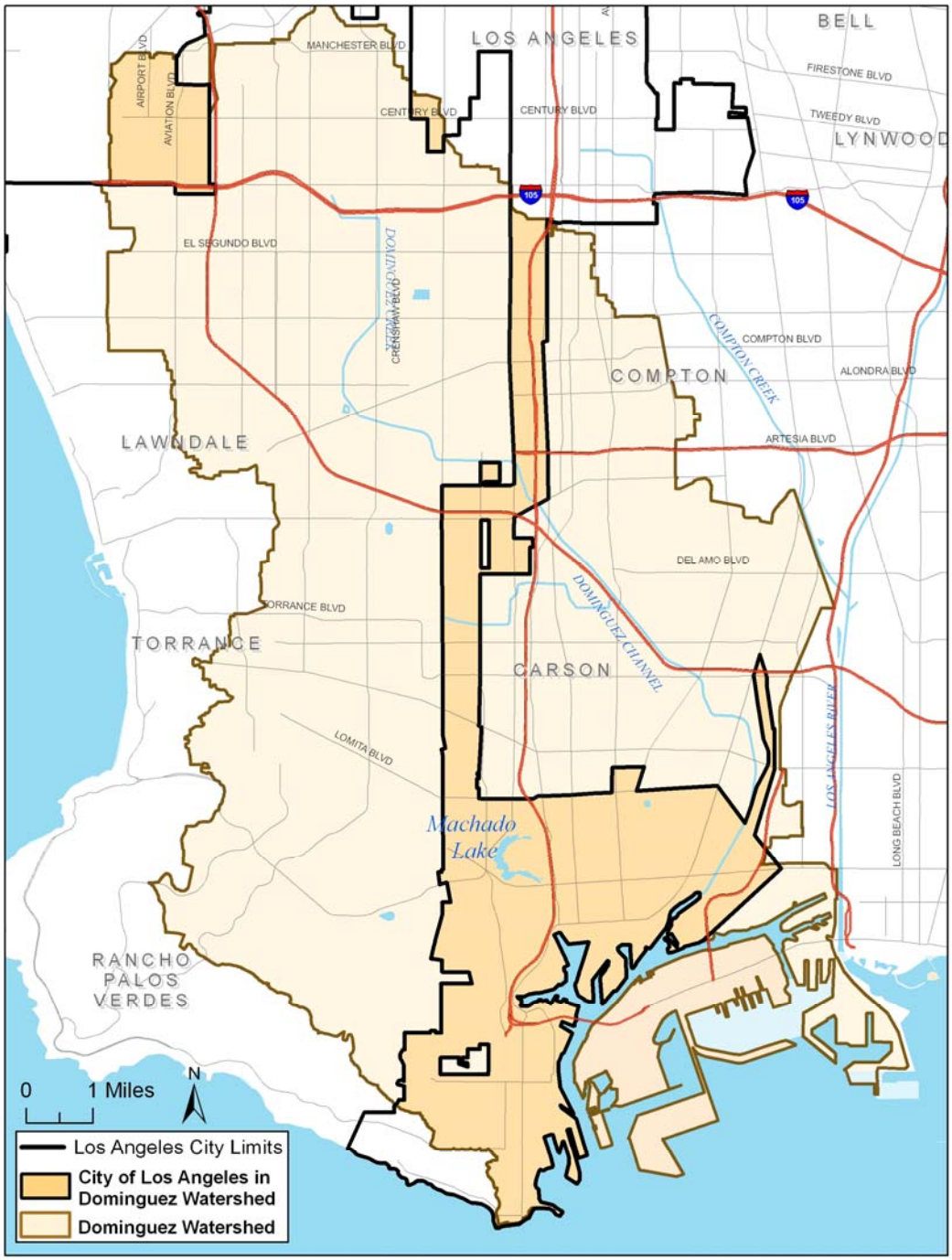

Figure 2-5
Dominguez Channel Watershed
Runoff from the Dominguez Channel watershed discharges into Los Angeles Harbor in the San Pedro area.

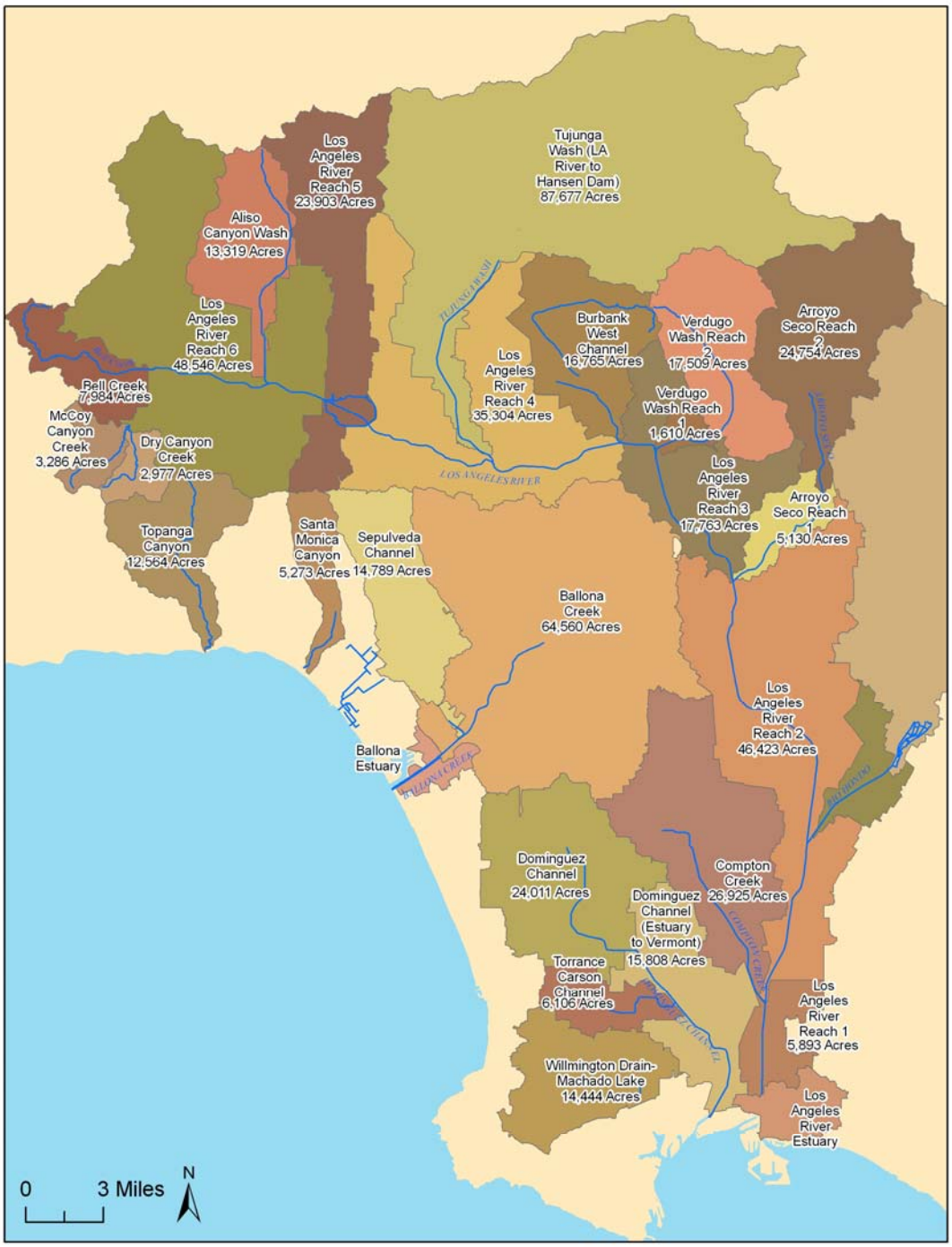

Figure 2-6
Los Angeles Area: 303(d) List-Impaired Subwatersheds and Reaches
Many of sub-watershed boundaries of the Los Angeles River, Dominguez Channel and Ballona Creek watersheds are illustrated above.

Sub-watersheds often have specific water quality impairments. *Figure 2-6* illustrates many of the sub-watersheds and reaches within the Los Angeles River, Santa Monica Bay, Ballona Creek, and Dominguez Channel watersheds that have been identified with impairments (as identified in the 303(d) List, *Section 2.3*). The figure also has estimated drainage areas for these sub-watersheds. *Appendices 2-1* through *2-4* summarize some of the characteristics of the four Los Angeles area watersheds. *Appendix 5-2* lists impairments found in each watershed and the association with specific waterbodies within the watersheds.

The "connectivity" of a stream system is the primary reason for describing effects on various waterbodies on a watershed or sub-watershed level. "Connectivity" refers to the physical connections between a river and its tributaries, between surface water and groundwater, and between wetlands and waterbodies. However, watersheds do not often follow political boundaries and this can complicate the management of watershed-based issues. For example, *Table 2-1* illustrates the ownership breakdown of the four major watersheds into the portions owned by the City of Los Angeles, other cities, and agencies. Regulatory compliance is the responsibility of each city and agency that owns land draining into impaired waterbodies. The City of Los Angeles is one of the largest owners in each of the main watersheds and, therefore, is often the lead agency for compliance as designated by the Los Angeles Regional Water Quality Control Board (LARWQCB). State and Federal owned lands (parks and other natural areas) do not fall under the jurisdiction of the LARWQCB even though they are part of the area in the Santa Monica Bay and Los Angeles River watersheds. The focus of the WQCMPUR are the portions of the watersheds, which fall under the jurisdiction of the LARWQCB, and more specifically within the City limits.

Regulatory compliance may be a complex task, especially for watersheds composed of many cities, such as the Los Angeles River watershed, which includes over 40 cities. The percentage of land ownership in a particular watershed is often the basis for cost sharing of management activities discussed later in WQCMPUR. Dividing watersheds into sub-watersheds with unique issues or common elements may help to manage the complex interrelationships between the responsible cities and agencies. Coordination is critical for the success of any runoff management strategy that uses a watershed-wide approach.

2.1.2 Geography

The Los Angeles River watershed is the largest of the four area watersheds and includes all the lands draining into the Los Angeles River, *Figure 2-1*. The river is 51 miles long, originates in the western San Fernando Valley in Canoga Park and discharges into San Pedro Bay. The first 30 miles of the River are within the City of Los Angeles. The total watershed area is 833 square miles, with about 324 square miles of the upstream portion covered by the forest and open space of the Santa Monica, Santa Susana and San Gabriel Mountains. Los Angeles River tributaries originate at an elevation of 795 feet in the western part of the San Fernando Valley collecting runoff from the northern slopes of the Santa Monica Mountains (North of Mulholland Drive) and the southern slopes of the San Gabriel Mountains. The steep

slope of the River, averaging about 16 feet per mile, results in rapid drainage to the San Pedro Bay at Long Beach.

The Santa Monica Bay watershed runs along the coast from the Ventura-Los Angeles County line in the north to the Palos Verdes Peninsula in the south, and has a total watershed area of 285 square miles (not including the Ballona Creek watershed, which also discharges into Santa Monica Bay). A detailed description of the watershed can be found in *Ref. 2-4.* As mentioned previously, the Marina del Rey watershed could be viewed as a sub-watershed of the surrounding Santa Monica Bay watershed. The total area of the Marina del Rey watershed is 2.9 square miles – a small percentage of the Santa Monica Bay watershed.

The Ballona Creek watershed is located on the coastal plain of the Los Angeles basin, with the Santa Monica Mountains to the north and the Baldwin Hills to the south. This watershed collects runoff from the southern part of the Santa Monica Mountains (south of Mulholland Drive) and the western part of the City of Los Angeles and drains into Santa Monica Bay. Ballona Creek is predominantly channelized and the watershed is highly developed with both residential and commercial properties. The Ballona Creek has a drainage area of approximately 128 square miles.

The Dominguez Channel watershed is also termed a "management area" that includes some land with storm drains that do not empty into Dominguez Channel, but is geographically connected with the land that does drain into the channel *(Ref. 2-5).* This area includes the communities of Wilmington and San Pedro. The Dominguez Channel watershed is the most urbanized watershed in Los Angeles County. In the northern and eastern portions of the watershed, the Rosecrans and Dominguez Hills rise to about 200 feet elevation. In the southwest portion of the watershed, the Palos Verdes Hills rise to an elevation of 1,480 feet. The Dominguez Channel drains an area of approximately 109 square miles into the Los Angeles Harbor / Long Beach Harbor areas**.** The forty-acre Machado Lake is located in the Wilmington section of this watershed within the Ken Malloy Harbor Regional Park.

Geographically, the four watersheds are substantially different from each other. Some of the important topographic features of the region are illustrated in *Figure 2-7*.

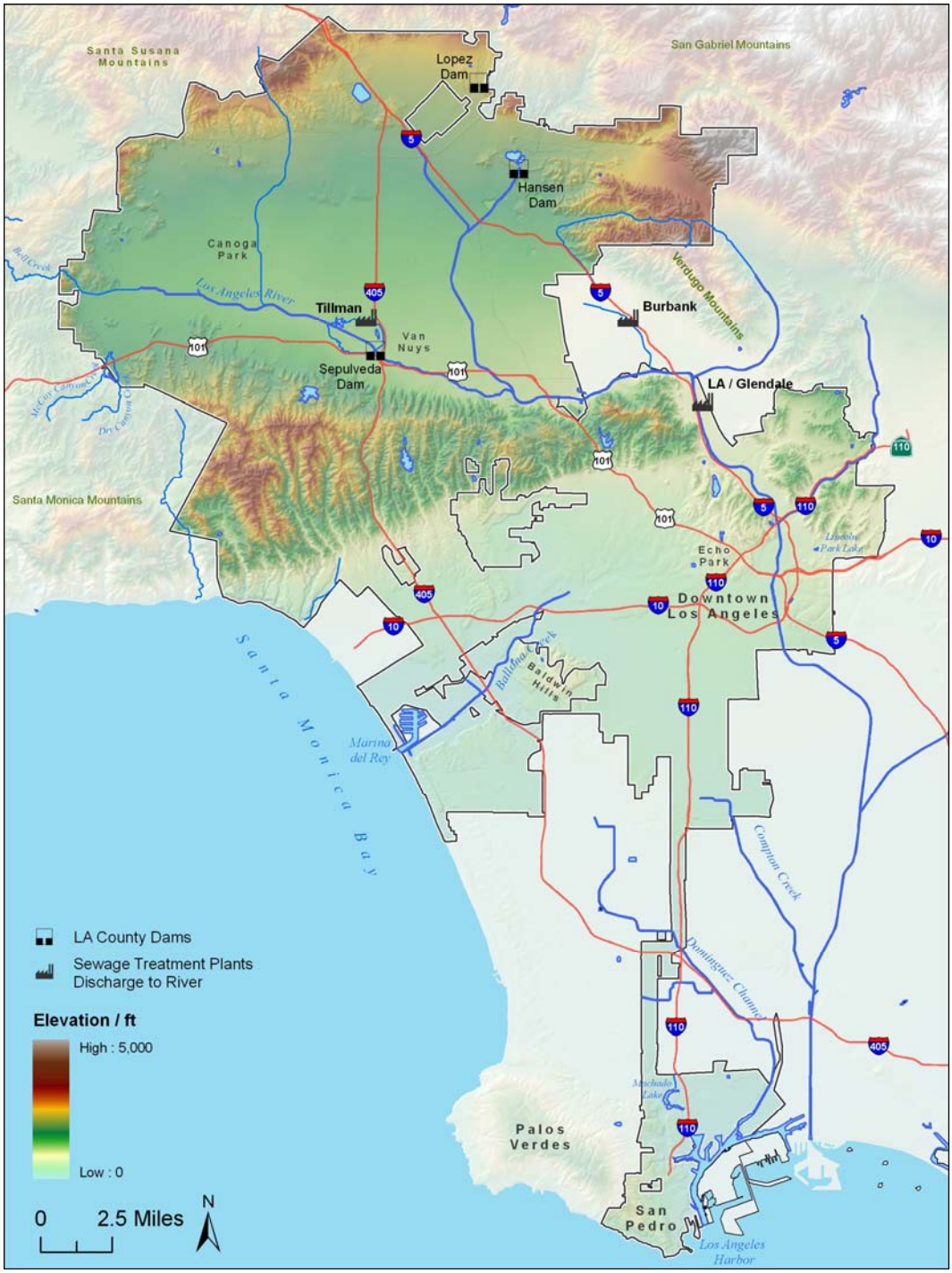

Figure 2-7
Topographic and Significant Hydraulic Features in City of Los Angeles

2.1.3 Rainfall

The Los Angeles climate can be characterized as "semi-arid" with average annual rainfall of 15 inches per year. Historically, 80% of recorded annual rainfall has been between 7" and 26". On average, 94% of seasonal rain falls between the end of October and the beginning of May as illustrated by *Figure 2-8 (Ref. 2-6)*. However, in part due to the varied topography in the Los Angeles region, rainfall amounts vary significantly by location within the City. The average annual rainfall in the northern mountains is nearly twice as much as in the southern part of the City, near the Port of Los Angeles, as illustrated by *Figure 2-9*.

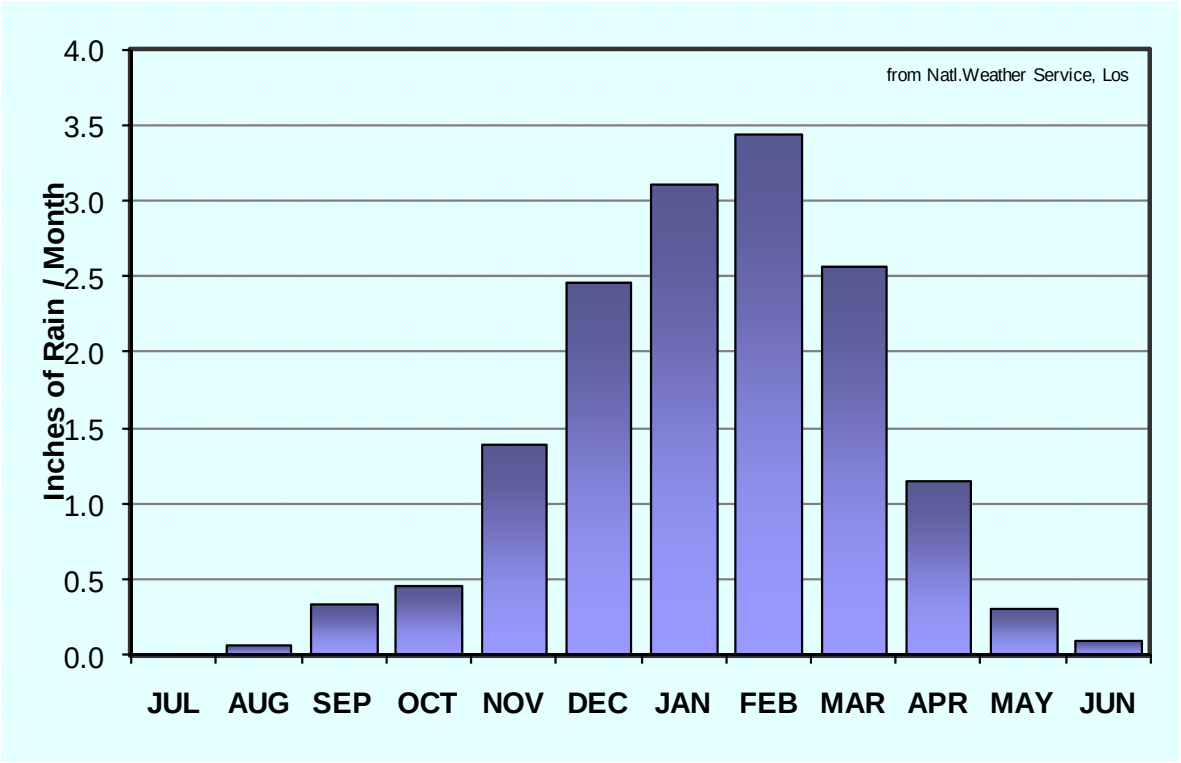

Figure 2-8
Average Monthly Rainfall in City of Los Angeles 1921-2006
The chart above summarizes the average monthly rainfall measured from 1921 to 2006. The average annual rainfall is approximately 15". Most rain falls between November and April, leaving the rest of the year mostly dry.

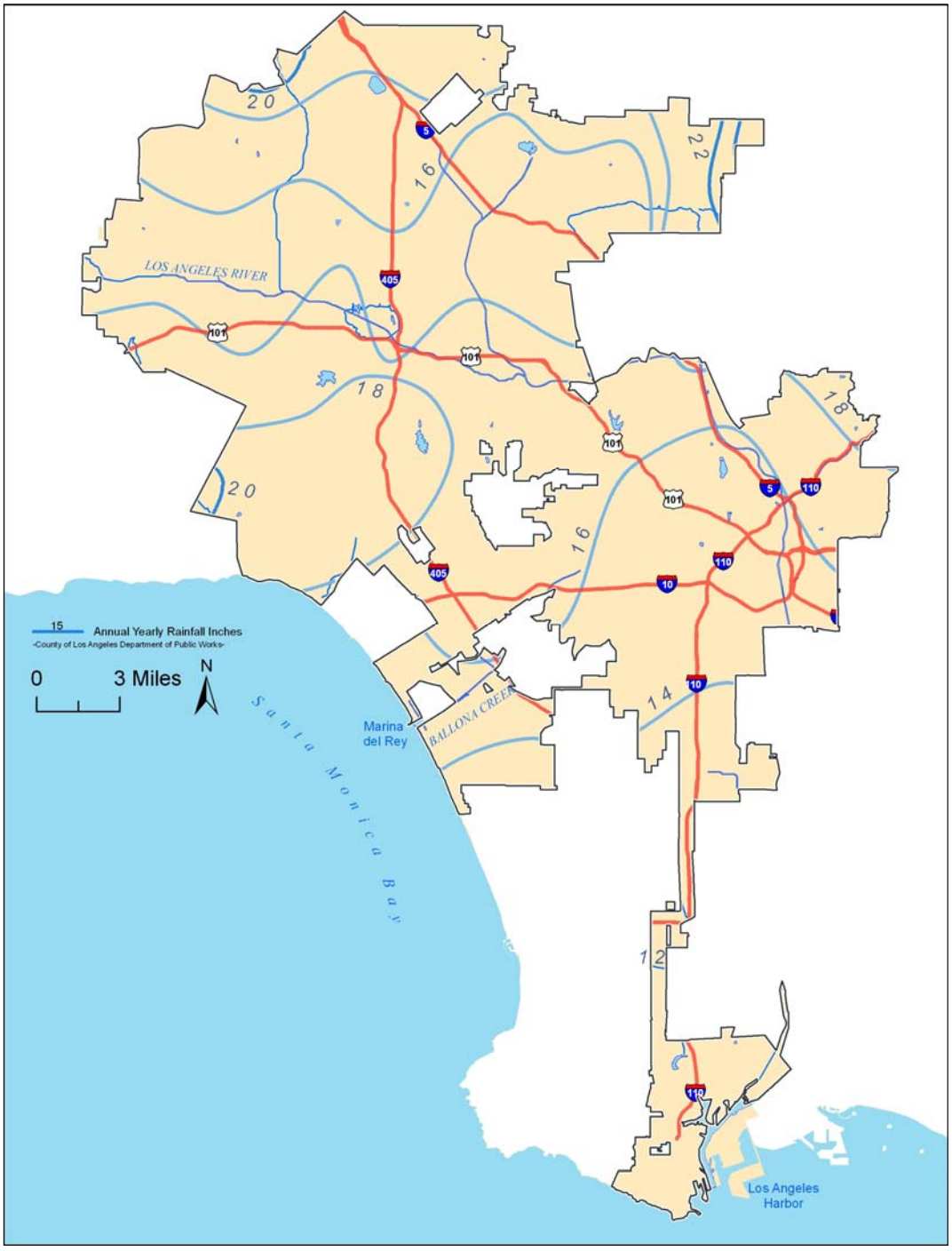

Figure 2-9
Mean Annual Rainfall Contours in City of Los Angeles

Statistically there will be 33 measurable rain events per year (*Ref. 2-7*). These rain events may be as little as 0.01 inches of rain. However, Los Angeles County rainfall data (*Ref. 2-8*) has indicated that the 1-year storm event (what you might expect in any given year) in Los Angeles is 1.7 inches of rain, the 5 year event (what you might expect once every five years) is 3.5 inches of rain and the 25 year event is 5.3 inches of rain; again, this varies depending on location in the city. Runoff management strategies employing structural "Best Management Practices, " or BMPs (as discussed in *Chapter 6*), must consider how much of the runoff flow from storm events can be economically handled as opposed to average seasonal rainfall. Runoff treatment systems will operate far below their design capacity during most of the year.

2.1.4 Hydrology and Water Resources

Figure 2-7 illustrates the locations of principal rivers and channels, dams, reservoirs and wastewater treatment plant discharge points. None of these facilities is designed to store, slow or treat all the water from storm events but, instead, have been engineered to convey runoff to the ultimate discharge points.

Rainfall that does not fall on impervious surfaces has a chance to infiltrate and possibly recharge groundwater. The degree to which this might happen is related to soil types and associated infiltration rates. *Figure 2-10* illustrates data on soil types in the City of Los Angeles. This information gives a "first cut" at areas that might be promising for groundwater infiltration purposes.

During most of the year runoff management needs to focus on the relatively low-volumetric, dry-weather runoff. Dry-weather runoff sources include landscape irrigation, street washing, car washing, groundwater seepage, illegal connections, hydrant flushing, construction runoff and other commercial activities. The dry-weather runoff can be considered the background flow rate to which stormwater is added on a non-periodic basis. The 3rd and 4th columns of *Table 2-2* summarize the estimated / measured dry weather flow rates for each of the four watersheds. The 5th and 6th columns of *Table 2-2* show estimates of average annual stormwater.

Urban runoff management options will need to consider seasonal conditions, perhaps with different performance criteria. For example, a 0.45" storm event was selected as the largest targeted storm to be managed in several urban runoff projects in the Santa Monica Bay watershed (Note that the Standard Urban Stormwater Mitigation Plans use a storm of 0.75". Also note that establishing design criteria is a high priority recommended activity of the Implementation Strategy, *Section 9.2*). If this same criterion were applied over the entire City, the amount of runoff requiring treatment could be 1.7 billion gallons.[1] *Table 2-2* summarizes the rainfall from a 0.45" storm for each of the main watersheds discussed in the WQCMPUR. Alternative management strategies might focus on pollutant source reduction or volume reduction to reduce

[1] For comparison, 1.7 billion gallons would fill the Los Angeles Coliseum about 12 times.

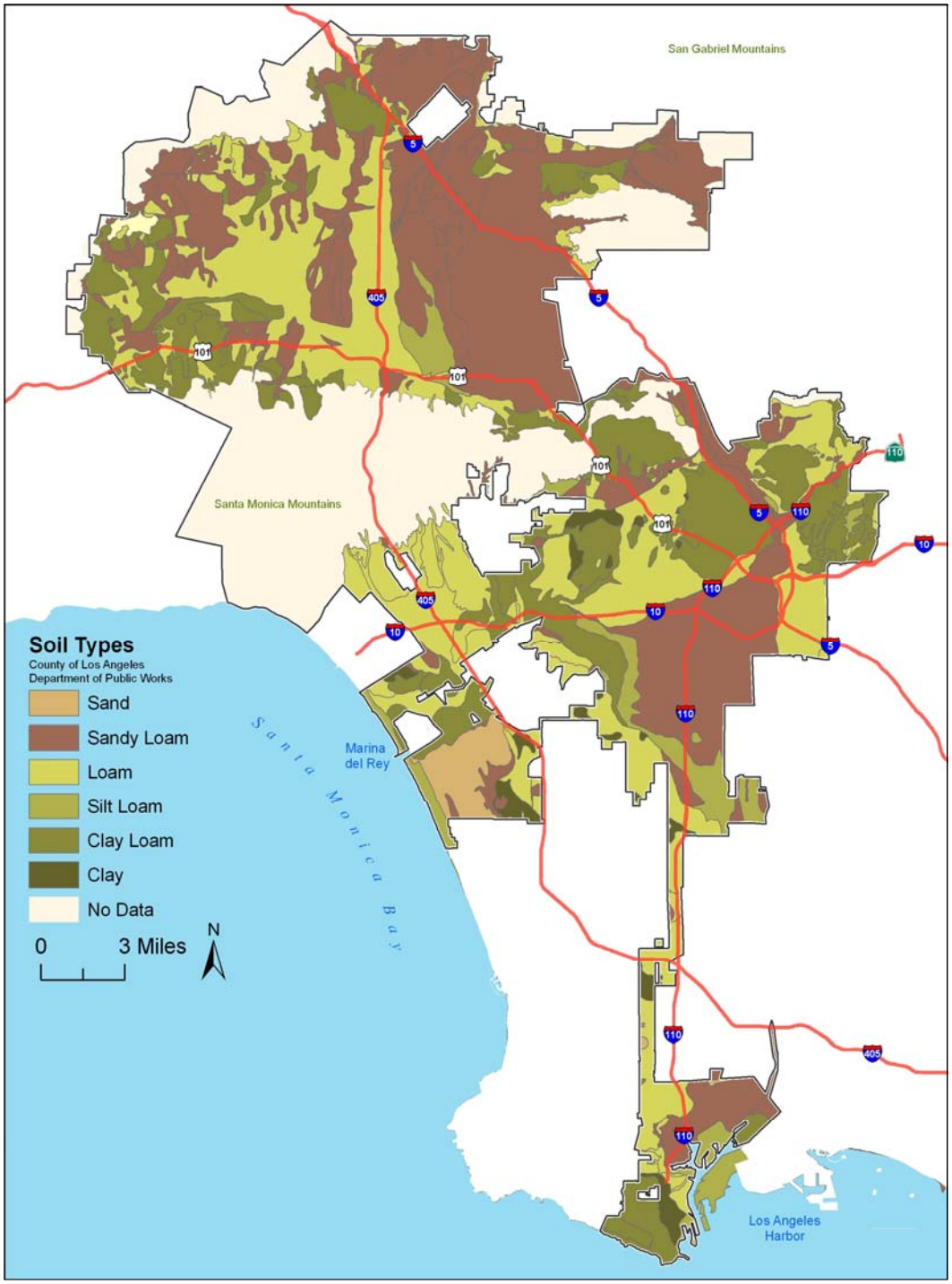

Figure 2-10
Soil Type Analysis

Table 2-2
Runoff from City of Los Angeles Area Watersheds
On an annual basis, the runoff associated with stormwater is significantly greater than the background (dry weather) runoff that is more or less constant all year. The runoff from a storm is concentrated over a short time period. The rightmost columns illustrate the possible runoff volume from a moderate storm over several Los Angeles area watersheds.

Watershed	Runoff Rate (gpd/ac)	Dry Weather Runoff (billion gallons/year)		Average annual runoff (billion gallons/year)(5)		Runoff from 0.45" storm (billion gallons)(5)(6)	
		Total Watershed	City	Total Watershed	City	Total Watershed	City
Los Angeles River	(1)	11	5.2	216	35	2.5	1.1
Santa Monica Bay (J2/3)(2)	(2)	5.5	3.7	74	5.3	0.3	0.16
Ballona Creek	230 (3)	7.3	5.8	34	13	0.5	0.39
Dominguez Channel	230 (4)	5.8	1.5	28	2.8	0.5	0.1
Total	-	**29**	**16**	**353**	**56**	**3.8**	**1.7**

(1) Dry-weather flow in Los Angeles River is measured at W.Wardlow Road (Long Beach), about 4.5 miles upstream from Long Beach Harbor. The two main sources are (a) groundwater seepage (2.9 mgd) and (b) dry weather runoff (26.6 mgd). It does not include treated discharges from three water reclamation plants (approximately 55 mgd).
(2) The runoff estimates given for Santa Monica Bay watershed are for Jurisdictions 2 and 3 (J2/3) only (therefore, not the entire watershed), which is the area most relevant for the City (***Appendix 2-2***) . The estimation of dry-weather runoff from Santa Monica Bay Jurisdictions 2 and 3 is based on the total expected flow (13cfs) in twenty major low-flow diversions described in "Low Flow Diversion Upgrade Calculations for Winter Dry-Weather Flow" from the Santa Monica Canyon Dry-Weather Diversion Compliance Workshop.
(3) Dry-weather flow in Ballona Creek is estimated from measurements at Sawtelle Boulevard, about 2.5 miles upstream from where the creek ends in the bay.
(4) Given the proximity of the Dominguez Channel watershed to the Ballona Creek watershed, the same runoff rate was used as an estimate.
(5) ***Ref. 2-9***. Runoff coefficient of 0.47 assumed. The City runoff total is based on an average rainfall of 14.95 inches per year and assumes that 47% of the rain ends up in storm drains. The average wet-weather runoff from just the City land (56 Billion Gallons/year) would fill the Los Angeles Coliseum more than 400 times.
(6) This table uses the 0.45" storm for illustrative purposes only. The Water Integrated Resources Plan, ***Ref.2-9***, identified this storm as the "largest targeted storm that needs to be managed in order to meet the Santa Monica Bay Bacteria TMDL. Note that the WQCMPUR Implementation Strategy, Section 9-2, recommends to establish design storm criteria for guiding the selection of structural BMPs.

treatment volumes. These considerations are factored into the Implementation Strategy discussed in *Chapter 9.*

Comparing dry weather flow and the estimates of stormwater volume in *Table 2-2,* it is obvious that the amount of runoff dramatically increases during a storm event. The Los Angeles River design capacity flowrate is 175,000 cfs, though the largest recorded daily flowrate in Los Angeles River was 43,000 cfs (24-hour average, on January 10, 1995).[2] Ballona Creek, though serving a smaller watershed, has a design flow capacity of 69,000 cfs; the USACE has estimated (2003) a 50-year "return flow" of 32,000 cfs for Ballona Creek. One of the considerations of stormwater runoff management, therefore, is the importance of reducing, delaying or diverting runoff to reduce

[2] This flowrate would fill the Los Angeles Coliseum in less than 8 minutes.

possible treatment capacities, whether treatment is with regional or distributed systems.

The intensity and duration of rainfall is another variable for pollution transport that has only been investigated on a limited basis. Studies have indicated up to 75% of the pollutant loadings could be discharged in the first 25% of the total storm volume (*Ref. 2-10*). If these studies are shown to be true, it may present an opportunity to target the portion of stormwater runoff most polluted instead of trying to manage the entire volume at a much higher cost. Such relatively concentrated stormwater is still much less concentrated than the water treated at wastewater plants. Developing the information that supports these observations may be important to implementing cost-efficient water quality strategies.

2.1.5 Land Use and Imperviousness

Urban development typically results in areas becoming significantly impervious to rainfall infiltration, thereby increasing the percentage of runoff entering the stormwater system, which was designed to mitigate the potential threat of major flooding. *Table 2-3* shows a breakdown of land use by watershed, with corresponding "imperviousness factors" that create a scale on how resistant the ground surface is to water infiltration. Major parts of the Los Angeles River (43%) and Santa Monica Bay (55%) watersheds are relatively open (they have a low imperviousness factor (< 25%). However, much of this land is in the mountains and generally "upstream" from suspected pollution sources. Within the City limits, watersheds are highly developed with residential, commercial and light industrial land use categories predominating. Transportation is also a major land use category in the Dominguez Channel Watershed. *Figure 2-11* illustrates the complex distribution of land use types found in the City of Los Angeles. As might be expected, the impervious areas in the City are associated with a high density of commercial and industrial facilities. These areas are concentrated in downtown Los Angeles and the harbor area of the Dominguez Channel Watershed. Certain land use categories can indicate potential "open areas" beyond that normally associated with parks or forests. For example, *Table 2-3* identifies considerable land use in each of the watersheds as "Education" that probably is associated with schools. Some of this land may be paved playgrounds or parking lots that might be useful open area when trying to meet water quality standards without compromising the primary use.[3]

[3] The use of the term "open area" goes beyond the term "open space" that has been defined in the California Government Code §65560 which is focused on the open space element of county or city general plans. As such, open space generally refers to land which is largely unimproved and devoted to preservation of natural resources and recreation among other specific uses. It also include "vacant land" which has seen no changes to the natural conditions. That definition might not include all parks, golf courses, engineered "green" structures to mitigate urban runoff associated pollution, or areas that have minor improvements such as a ground-level parking lot or a paved playground. In some of the planning discussed in the WQCMPUR, the document takes a broader view of open spaces and uses the term "open area" in lieu of open space.

Table 2-3
Land Use Categories in Major Watersheds with Associated Imperviousness Factors[1]
The dominant categories of land use in each watershed are in **bold font**.

Land Use	Imperviousness Factor	Los Angeles River		Santa Monica Bay Jurisdictions 2 & 3 [2]		Ballona Creek		Dominguez Channel	
		Acres	% Area	Acres	% Area	Acres	% Area	Acres	% Area
Vacant (open space with no improvements)	0.01	**213,517**	**39.6**	**14,403**	**48.6**	**11,198**	**13.7**	3,072	4.0
Golf Courses	0.03	4,680	0.9	418	1.4	1,092	1.3	747	1.0
Under Construction	0.15	1,494	0.3	32	0.1	367	0.5	350	0.5
Low Density Single Family / Rural Residential	0.21	11,761	2.2	1,327	4.5	2,688	3.3	1,361	1.8
High Density Single Family	0.42	**148,943**	**27.7**	**5,236**	**17.7**	**27,039**	**33.1**	**23,597**	**30.6**
Agriculture / Orchards / Horse Ranch	0.47	3,154	0.6	9	0.0	21	0.0	642	0.8
Education	0.47	10,925	2.0	381	1.3	2,518	3.1	2,618	3.4
Natural Resources Extraction	0.47	2,540	0.5	-	-	870	1.1	424	0.6
Multiple Family Residential / Trailer parks	0.55	22,289	4.1	1,593	5.4	**11,219**	**13.7**	5,007	6.5
Mixed Residential	0.59	15,614	2.9	610	2.1	7,404	9.1	3,354	4.4
Military	0.65	171	0.0	-	-	21	0.0	754	1.0
Heavy Industrial	0.66	1,576	0.3	928	3.1	32	0.0	4,576	5.9
Open Space / Recreation	0.74	9,573	1.8	663	2.2	1,640	2.0	2,138	2.8
Mixed Urban	0.89	498	0.1	15	0.1	184	0.2	78	0.1
Commercial / Industrial	0.91	303	0.1	2	0.0	74	0.1	172	0.2
General Office	0.91	8,323	1.5	291	1.0	1,324	1.6	1,395	1.8
Institutional	0.91	6,081	1.1	111	0.4	1,739	2.1	1,121	1.5
Light Industrial	0.91	25,575	4.7	383	1.3	2,369	2.9	**9,012**	**11.7**
Maintenance Yards Communications Facilities	0.91	968	0.2	10	0.0	178	0.2	149	0.2
Other Commercial	0.91	1,866	0.3	55	0.2	435	0.5	1,036	1.3
Other Facilities	0.91	5,942	1.1	142	0.5	139	0.2	988	1.3
Regular / Mixed Transportation	0.91	14,756	2.7	2,206	7.4	1,673	2.0	**9,032**	**11.7**
Retail / Commercial	0.97	20,630	3.8	774	2.6	6,874	8.4	4,921	6.4
Floodways and Structures	1.00	6,277	1.2	29	0.1	216	0.3	113	0.1
Receiving / Marina Waters	1.00	1,099	0.2	16	0.1	326	0.4	350	0.5
Total	**-**	**538,554**	**100**	**29,634**	**100**	**81,644**	**100**	**77,006**	**100**

(1) Source: ***Ref 2-11.***
(2) Land use data for Santa Monica Bay watershed are for Jurisdictions 2 and 3 (J2/3) only (therefore, not the entire watershed), which is the area most relevant for the City (***Appendix 2-2***).Other jurisdictions of the watershed have a larger percentage of vacant land use category.

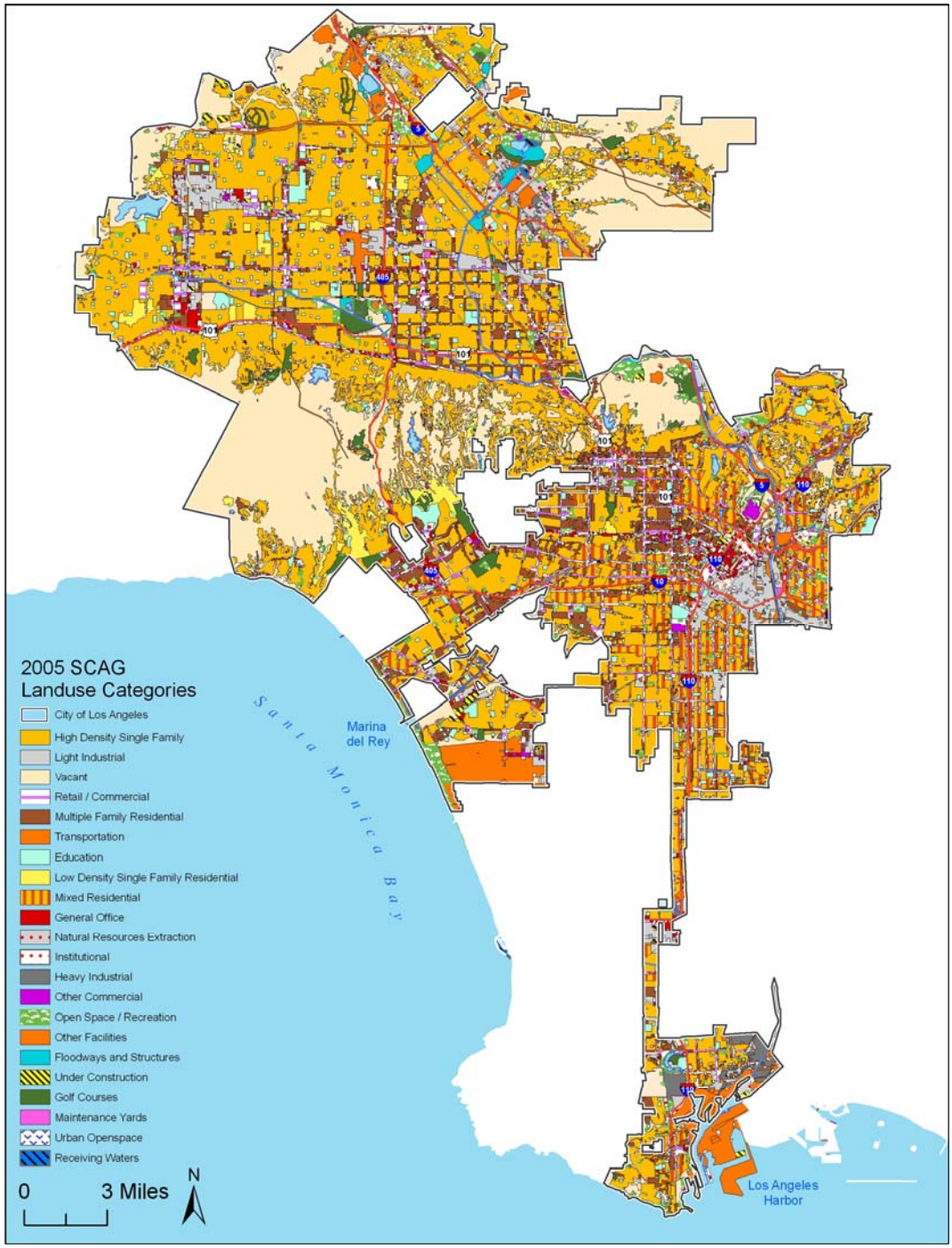

Figure 2-11
Land Use Distribution in City of Los Angeles
Land use definitions are defined by SCAG, ***Ref. 2-11***; the term "Vacant Land" refers to land still in its natural state.

As shown in later chapters, commercial and industrial areas (with very high imperviousness factors (>0.9) usually generate more pollution than other land use categories. Thus, runoff from these areas tends to be especially polluted and easily transported to the stormwater system.

2.1.6 Demographics

Population, number of residences and commercial/industrial activity (as indicated by employment) are expected to significantly increase by 2025 as summarized in *Table 2-4*. This may affect runoff pollution in two ways: (a) generation of runoff pollutants may increase; (b) redevelopment and new development may increase the imperviousness of the area, thereby reducing infiltration and increasing the amount of runoff entering the storm drain system. To counteract these tendencies, development and redevelopments in the City must develop Standard Urban Stormwater Mitigation Plans (SUSMP) to reduce the quantity and improve the quality of runoff that leaves the site (*Section 6.2.2*).

Table 2-4
City of Los Angeles Growth Factors
Population increases will result in more intensely used land, but will probably not result in significantly less "open" area." (1)

Category	Totals		
	2000	2025	% Increase
Population (City)(1)	3,788,752	4,357,359	15%
Households	1,295,410	1,596,055	23%
Employment	1,814,269	2,213,427	22%
Population (County)(1)	9,580,028	11,870,934	24%
Households	3,137,047	3,942,753	26%
Employment	4,453,477	5,520,139	24%
Traffic Indicators:			
Domestic Travel Miles(2)	1977 to 2001: up 110% nationally		
Average Commute Time(3)	1995 to 2001: up 10% nationally		
Total Vehicle Miles(4)	1996 to 2006: up 19% in California		
Projected Freeway miles(5)	2005 to 2028: up 141% in LA/Long Beach/Santa Ana		

(1) ***Ref. 2-11***.
(2) ***Ref. 2-12***.
(3) ***Ref. 2-13***.
(4) ***Ref. 2-14***.
(5) ***Ref. 2-15***.

Vehicular traffic has a complex relationship to population, where people live and where people work. It is difficult to express this relationship in a single metric. *Table 2-4* lists some of the indicators of increased traffic, with a projection toward 2025 based on recent trends. While traffic does not directly increase runoff (unless there is a drastic increase in road or highway construction), motor vehicles have been identified as a source of contaminants found in urban runoff.

Since the City of Los Angeles is already highly developed, future growth is not likely to result in a proportional increase of the runoff volume. As is discussed in *Chapter 9*,

one of the implementation strategies is to regulate future redevelopment to increase open areas and to limit the impact of "urban sprawl".

2.2 Water Quality Protection

The LARWQCB designates specific "beneficial uses" to each waterbody in a watershed (*Ref. 2-16*) under one of three "general use" categories:

- Population, including residential, industrial, agricultural, and water supply;
- Recreation and commercial, including water recreation and fishing;
- Habitat, focused on ecosystems.

Table 2-5 summarizes these beneficial uses, with specific descriptors and nomenclature. The objective of designating beneficial uses for waterbodies is to protect these waters for the intended use by setting relevant water quality standards. Therefore, water quality standards are a direct function of the designated beneficial use of each waterbody. For example, bacterial standards for REC-1 waters (water contact recreation) are stricter than for REC-2 waters (non-contact recreation). A more detailed discussion of beneficial uses can be found in *Chapter 5*. The designated beneficial uses are reviewed periodically (RWQCB *Triennial Review*) and may be added to, removed or modified.

Table 2-6 shows specific examples of City of Los Angeles waterbodies that have multiple beneficial uses; it also illustrates that identified beneficial uses can change depending on the specific location within the watershed.

A watershed-wide approach is needed for waters that have multiple beneficial uses and that are required to comply with multiple water quality standards.

2.3 Impairments to Water Quality

Impairments are defined to be elevated concentrations of contaminants that are not protective of, and in most cases are harmful to, the designated beneficial use of a waterbody. Impairments may be related to public health, health of marine or freshwater habitat, or aesthetics and appearance. Impairments are usually caused by recognized pollutants such as trash, pathogens, metals and organic chemicals. Waterbodies can also be impaired (or "stressed") by less obvious factors such as temperature, pH and odors. *Table 2-7* lists some common categories of impairments.

The four major watersheds in the Los Angeles region have impairments (pollutants or stressors) in various receiving waterbodies as determined by the LARWQCB in the most recently approved (2006) CWA Section 303(d) List, *Ref. 2-17*; this information is subject to change periodically as better data becomes available (*Appendix 2-5* contains a sample page from the 2006 303 (d) List).

Table 2-5
Beneficial Use Characterization

The SWRCB has identified certain beneficial use categories for waterbodies to assist in determining the level of impairment of each waterbody. Certain beneficial uses have a higher standard of impairment and will have lower acceptable limits of pollution(1).

Use Category	Beneficial Use	Abbreviation	Description
Population Uses	Municipal and Domestic Supply	MUN	Uses of water for community, military or individual water supply systems including, drinking water supply
	Agricultural Supply	ARG	Farming, horticulture, or ranching; including irrigation, stock watering, or support of vegetation for range grazing
	Industrial Process Supply	PROC	Industrial activities that depend primarily on water quality
	Industrial Service Supply	IND	Uses of water for industrial activities that do not depend on water quality including mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection or oil well re-pressurization
	Ground Water Recharge	GWR	Uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of salt water intrusion into freshwater aquifers
	Freshwater Replenishment	FRSH	Uses of water for natural or artificial maintenance of surface water quantity or quality
	Navigation	NAV	Uses of water for shipping, travel, or other transportation by private, military or commercial vessels
	Hydropower Generation	POW	Uses of water for hydropower generation
Recreation and Commercial Uses	Water Contact Recreation	REC-1	Recreational activities involving body contact with water and possibility of ingestion; swimming, wading, water skiing, skin and scuba diving, surfing white water activities, fishing or use of natural hot springs
	Limited Water Contact Recreation	LREC-1	Reduced frequency of use and risk of illness due to recreational contact
	Non-Contact Water Recreation	REC-2	Recreational activities involving proximity to water (non-contact), where ingestion is reasonably possibly; picnicking, sunbathing, hiking, beachcombing, camping, boating, sightseeing, tide pool and marine life study, hunting
	Commercial and Sport Fishing	COMM	Commercial or recreational collection of fish, shellfish, or other organisms intended for bait of human consumption
	Aquaculture	AQUA	Aquaculture or mariculture operations involving aquatic plants and animals for human consumption or bait purposes

Table 2-5 (Continued)
Beneficial Use Characterization.

Use Category	Beneficial Use	Abbreviation	Description
Habitat-Related Uses	Warm Freshwater Habitat	WARM	Support and preservation of warm water ecosystems.
	Cold Freshwater Habitat	COLD	Support and preservation of cold-water ecosystems.
	Inland Saline Water Habitat	SAL	Support and preservation of inland saline water ecosystem.
	Estuarine Habitat	EST	Support and preservation of estuarine ecosystems.
	Wetland Habitat	WET	Support and preservation of wetland eco-systems, and other unique wetland functions
	Marine Habitat	MAR	Support and preservation of marine eco-systems
	Wildlife Habitat	WILD	Support and preservation of terrestrial ecosystems
	Preservation of Biological Habitats	BIOL	Support of designated areas or habitats such as Areas of Special Biological Significance (ASBA), established refuges, parks, sanctuaries and ecological reserves
	Rare, Threatened, or Endangered Species	RARE	Support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.
	Migration of Aquatic Organisms	MIGR	Support of habitats necessary for migration, acclimatization between fresh and salt water
	Spawning, Reproduction, and/or Early Development	SPWN	Support of high quality aquatic habitats suitable for reproduction and early development of fish.
	Shellfish Harvesting	SHELL	Support of habitats suitable for the collection of filter-feeding shellfish for human consumption, commercial, or sport purposes.

(1) ***Ref. 2-16*** and ***2-18***.

Table 2-6
Beneficial Uses Identified for Selected Area Waterbodies

This table summarizes beneficial uses for waterbodies in the City of Los Angeles that are defined in the Basin Plan and revisions to the basin plan that are part of a "Triennial Review" process (recently reviewed in 2001 and 2004, and currently under review). Source should be consulted for specific beneficial use details and other waterbodies not listed."

Waterbody (Tributary/Reach)	Beneficial Uses[1, 2]				
Los Angeles River Watershed					
Los Angeles River (Reach 1)	MUN(P) WARM SPWN(P)	GWR SHELL IND(P)	LREC-1 RARE	REC-2 MIRG(P)	WILD MAR
Los Angeles River (Reach 2)	MUN(P) WARM	GWR IND(P)	REC-1 WET	REC-2	WILD
Verdugo Wash	MUN(P) WILD(P)	GWR WARM(P)	LREC-1(P)	REC-2(I)	
Pacoima Wash	MUN(P) WARM	GWR	LREC-1(P)	REC-2	WILD
Bull Creek	MUN(P) WARM	GWR(I)	REC-1	REC-2	WILD
Browns Canyon Wash & Creek	MUN(P) WARM(I)	GWR(I)	LREC-1(I)	REC-2	WILD
Compton Creek	MUN(P) WARM	GWR WET	LREC-1	REC-2	WILD
Arroyo Seco Reach 1	MUN(P) WARM(P)	REC-1(I) WET	REC-2(I)	WILD(P)	
Tujunga Wash	MUN(P) WILD(P)	GWR WARM(P)	LREC-1(P) COLD(P)	REC-2(I)	
Aliso Canyon Wash	MUN(P) WILD	GWR(I) WARM	REC-1(I)	REC-2(I)	
McCoy Canyon Creek	MUN(P) WILD	GWR(I) WARM(I)	REC-1(I)	REC-2(I)	
Dry Canyon Creek	MUN(P) WILD	GWR(I) WARM	REC-1(I)	REC-2(I)	
Bell Creek	MUN(P) WILD	GWR(I) WARM(I)	LREC-1(I)	REC-2(I)	
Santa Monica Bay Watershed					
Santa Monica Canyon	MUN(P)	LREC-1	REC-2(I)	WILD(P)	WARM(P)
Topanga Canyon Creek	MUN(P) WARM	REC-1(I) COLD	REC-2(I) MIRG(P)	WILD SPWN(I)	
Marina del Rey	NAV MAR	REC-1 RARE	REC-2 SHELL	COMM	WILD
Ballona Creek Watershed					
Ballona Creek	MUN(P)	LREC-1(P)	REC-2	WILD	WARM(P)
Ballona Creek Estuary	NAV MAR SPWN	REC-1 WILD SHELL	REC-2 RARE IND(P)	COMM MIRG	EST
Ballona Creek to Estuary	MUN(P)	LREC-1	REC-2	WILD(P)	WARM(P)
Dominguez Channel Watershed					
Dominguez Channel Estuary	NAV MAR	LREC-1 WILD	REC-2 RARE	COMM MIRG	EST SPWN
Dominguez Channel to Estuary	MUN(P) WARM(P)	LREC-1(P) RARE	REC-2	WILD(P)	

(1) (P): Potential Use; (I): Intermittent Use.

(2) ***Ref. 2-16***.

Table 2-7
Impairment Categories

Category	Examples of pollutants/indicators	Main concerns
Bacteria/viruses	Fecal coliforms, coliforms, enteroviruses	Infectious diseases of humans
Trash	litter (>5mm)	Aesthetics, leachate, odor
Metals	Copper, zinc, lead, mercury, others	Toxicity, in particular to aquatic life
Organics	PAHs, pesticides, others	Toxicity, in particular to aquatic life
Nutrients/algae	Ammonia, phosphates	Excessive algal growth due to elevated nutrients, potential for causing odor

Specific Los Angeles region "pollutants and stressors" from the List are identified in *Table 2-8*. While none of the regional waterbodies have all the impairments identified, many waterbodies have multiple impairments. Impairments may reside in the water column, the sediment, or the tissue of aquatic species. Runoff management and compliance with existing and future requirements is a complex task and it is felt that a watershed-wide approach will be the most efficient way to deal with the impairments, as opposed to an approach of addressing individual pollutants one by one.

Table 2-8
Identified Pollutants or Stressors in Los Angeles Region Waterbodies

Bacteria	Enteric Viruses	Nutrients (ammonia, others)
PAH compounds	1,1-DCE	PCE
Aldrin	PCBs	TCE
Chlordane	Dieldrin	DDT
Oil	Foam	pH
Trash	Odors	
"Heavy metals" (including lead, copper, zinc, chromium, selenium, cadmium)		
ChemA: (sum of: aldrin, dieldrin, chlordane, endrin, heptachlor epoxide, heptachlor, HCH, endosulfan, and toxaphene)		

PCE: tetrachloroethylene; DCE: dichloroethane; TCE: trichloroethylene; PCB: polychlorinated byphenols; DDT: dichlorodiphenyltrichloroethane; PAH: polyaromatic hydrocarbons; HCH: hexacyclochlorohexane.

2.4. Summary

- Understanding the interrelationship of pollutants with geography, the unique climate of Southern California, land use and the current and desired use of water resources is critical to understand the scope of the challenge to improve and protect the region's water resources.

- A watershed management approach will require the various responsible cities and agencies to work together in creative new ways to achieve common goals.

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Chapter 3
Water Quality

City of Los Angeles departments and other agencies in the City frequently sample our waters to determine the water quality. Most of these monitoring programs are driven by regulations: they are directed by the NPDES MS4 permit and TMDLs. Comparison of water quality data with the water quality standards is important to determine the current status of our waters, to demonstrate regulatory compliance and to prioritize the areas that will need to be the focus of future pollution reduction efforts. So far, water quality monitoring has mostly focused on the pollutants that are on the 303(d) List of impaired waters, but less data are available for the pollutants that may be regulated in the future. There also is a lack of knowledge of the distribution of pollutants at the sub-regional level and the local or parcel level.

3.1 Introduction

All of the City's receiving waters have water quality standards that are defined by the LARWQCB in the Basin Plan. These standards are used for establishing water quality numeric targets in the TMDLs. While the regulatory background of water quality standards and TMDL targets is further discussed in *Chapter 5*, the purpose of this chapter is to compare the existing water quality of the City's rivers, lakes and coastal waters with the water quality numeric targets. City departments and other agencies monitor the quality of the City's waters on a regular basis by taking samples and analyzing these samples in the laboratory for bacteria, metals and other pollutants. By comparing actual pollutant concentrations with the numeric targets, the current status of our waters can be determined. This comparison is also needed for developing urban runoff management strategies and selecting Best Management Practices (*Chapter 6*) to improve the water quality of the waters that are impaired.

3.2 Water Quality Numeric Targets

This section summarizes the water quality numeric targets for the City's waters for which TMDLs have been adopted, *Table 3-1*. *Appendix 3-1* provides a complete listing of these targets, categorized by pollutant and by water body. Water quality numeric targets for impaired waters that still do not have a TMDL are likely to change as the LARWQCB continues with developing these TMDLs. Any discussion of these future targets, therefore, would be premature.

Trash: The LARWQCB has established trash targets for Los Angeles River, Ballona Creek and Machado Lake. While trash does not necessarily impose a threat to public health, the presence of trash is unaesthetic and has a negative impact on aquatic life and wildlife. The trash numeric target requires that all particles larger than 5 mm be removed from urban runoff before it enters the receiving water, *Table 1* in *Appendix 3-1*. This target shall be met at all times except for storms larger than the 1-year 1-hour storm event. In order to comply with trash TMDL compliance milestones (phased reductions ending by 2015/2016, *Table 7-1*), the City of Los Angeles is

Table 3-1
Overview of Water Quality Standards in Adopted TMDLs

Water Quality Standard	Receiving Water Body	Chapter Reference
Trash	Los Angeles River Ballona Creek Machado Lake	3-1 3-2 3-3
Bacteria	Santa Monica Bay Ballona Creek and Sepulveda Channel Marina del Rey Harbor (Back Basins) Los Angeles Harbor (Inner Cabrillo Beach and Main Ship Channel)	3-4, 3-5 3-6 3-7 3-8
Metals	Los Angeles River Ballona Creek	3-9 3-10
Toxic pollutants(1)	Ballona Creek (Estuary) Marina Del Rey Harbor (Back Basins)	3-11 3-12
Nutrients	Los Angeles River	3-13

(1) Toxic pollutants include some metals.

equipping catch basins in the City with inserts and screens to prevent trash from entering the storm drain system, *Chapter 7.*

Bacteria: The water quality numeric targets for bacteria correspond to an acceptable level of risk of human illness associated with the presence of pathogenic organisms in waters used for recreation. The analysis of pathogens usually is time-consuming and expensive. Therefore, the bacterial quality of waters is assessed by analyzing the water for total and fecal coliforms, enterococcus and *E. coli*, because these indicator bacteria can be determined relatively fast and at competitively low cost. Although these bacteria are not necessarily pathogenic for humans, and some strains of *E.coli* are indeed known human pathogens, they are often used as indicators of probable contamination of natural waters by sewage. As shown by *Table 2* in *Appendix 3-1*, the City of Los Angeles currently has to comply with bacterial numeric targets in Santa Monica Bay, Ballona Creek, Ballona Creek Estuary, Sepulveda Channel, Marina del Rey Harbor (Back Basins) and Los Angeles Harbor (Inner Cabrillo Beach and Main Ship Channel). The applicable targets depend on the beneficial use designated for the water. For example, numeric targets for waters with water-contact recreation (REC-1 beneficial use) are stricter than for recreational waters without direct contact with water (REC-2 beneficial use). Also the type of water, fresh water or seawater, is a determining factor.

Metals: Waters within the Los Angeles River and Ballona Creek watersheds are waters in the City of Los Angeles that so far have to meet water quality numeric targets for metals. The metals for which targets have been developed are cadmium, copper, lead, selenium and zinc. As can be seen in *Table 3* in *Appendix 3-1*, the metal

numerical targets are not the same for each water body that is regulated. In particular for the Los Angeles River, the numerical targets vary along the course of the river. This is because segments of the river have different beneficial uses. In general, the beneficial uses that are most likely impacted by metals are related to habitats and aquatic life (for example, the WILD, WARM, RARE, WET and MAR beneficial uses in *Table 2-7*) and water supply (the MUN and GWR beneficial uses in *Table 2-7*). Other factors that may influence the value of the metal numeric targets include the flow rate in the river (dry-weather versus wet-weather flow) and the hardness of the water (this has an impact on the toxicity of metals to aquatic life).

Toxics: A major challenge when dealing with these regulations is that the identity of the pollutants that cause the toxicity is often unknown. Therefore, special studies are often done (and required by LARWQCB) to identify those pollutants so that subsequent mitigation efforts can be more focused towards reducing the toxicity. Toxicity is a concern for sediments and the water column. At present, only Ballona Creek (specifically its estuary) and Marina del Rey Harbor (Back Basins) have TMDLs that address toxicity, *Table 4* in *Appendix 3-1*. The Ballona Creek estuary has toxic numeric standards for its sediment with numerical targets for metals (cadmium, copper, lead, silver) and organic compounds (chlordane, DDT, PCBs, PAHs). Likewise, several metals and organics have been regulated for the sediment in the Back Basins of Marina del Rey Harbor. Regulation of toxics in Dominguez Channel and Los Angeles Harbor is expected soon.

Nutrients: Water quality numeric targets for nutrients usually concern nitrogen and phosphorus. For the City of Los Angeles, nutrient numeric targets have only been established for certain nitrogen-containing compounds in the Los Angeles River. During dry weather, most of the flow in the Los Angeles River is comprised of wastewater effluent from three Publicly Owned Treatment Works (POTWs) in the Los Angeles River watershed: the Donald C. Tillman Water Reclamation Plan, the Los Angeles-Glendale Water Reclamation Plant and the Burbank Water Reclamation Plant. These plants are major point sources of nitrogen in the Los Angeles River, and their effluents must meet the numeric targets listed in *Table 5* in *Appendix 3-1*, starting in 2007. A TMDL regulating algae, eutrophic conditions and ammonia in Machado Lake is expected soon, although it is not sure yet whether nutrients are the cause of these impairments.

3.3 Water Quality Monitoring Programs

3.3.1 Monitoring Requirements

The requirements of monitoring programs – sampling locations, type of pollutants, analytical procedures, etc. - depend on the purpose of monitoring. Many monitoring programs in the City of Los Angeles are obligatory to demonstrate compliance with water quality numeric targets and other regulations. The requirements of those programs are defined by regulatory agencies. For example, many TMDLs require the development of Coordinated Monitoring Plans (CMPs) by the City of Los Angeles and other responsible agencies, which are subsequently reviewed and approved by

the LARWQCB. Additional monitoring requirements have been developed by the SWRCB in the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (***Ref. 3-14***). This list of impaired waters is reviewed and updated by the SWRCB once every two years based on the available water quality data.

3.3.2 Existing Monitoring Programs

There are many sources where information can be found about the quality of the waters in the City of Los Angeles, a summary of which is in ***Appendix 3-2*****.** Among water quality monitoring programs, there are important differences with respect to their status (ongoing, completed or being developed), their focus (watershed-wide or local) and their duration (short-term or long-term). Long-term monitoring programs that consistently and frequently monitor the water quality in multiple locations of the watershed are the most valuable for comparing water quality numeric targets with actual water quality data. *Table 3-2* summarizes the monitoring programs that have been reviewed for the development of the WQCMPUR. The maps with monitoring locations, *Appendix 3-3*, show that all major waters in the City of Los Angeles are being and will be monitored, often by more than one monitoring program.

Referring to *Table 3-2*, there are several categories of monitoring programs:

- Most NPDES permits require monitoring. As the primary permit holder, Los Angeles County coordinates monitoring under the NPDES MS4 permit. This program includes Mass Emission Monitoring for estimating pollutant mass emissions from the storm drain system and Tributary Monitoring for identifying subwatersheds that contribute to exceedances of water quality standards. In addition, POTWs and industrial facilities with NPDES permits have programs for monitoring their effluents;

- The Status & Trends Monitoring Program was started by the City of Los Angeles in 1999. This program monitors metals and bacteria at several locations in Los Angeles River, Ballona Creek and Dominguez Channel and their tributaries to get a better understanding of the sources and distribution of pollutants and to identify high-pollution areas in the watersheds. The results of the Status & Trends Monitoring Program support the development of TMDLs and many Status & Trends monitoring locations have been included in the CMPs for TMDLs;

- As noted earlier, many TMDLs require the development of a CMP for approval by the LARWQCB. The City of Los Angeles is currently monitoring for compliance with the bacteria TMDLs in Santa Monica Bay, Marina del Rey Harbor and Los Angeles Harbor. Several CMPs for metals and toxic pollutants have been developed and are awaiting approval by the LARWQCB, or are currently being developed; and

Table 3-2
Major Monitoring Programs

Monitoring Program/Purpose	Monitoring agencies	Monitoring locations	Sampling Frequency[4]	Pollutants	Monitoring Since[5]	Chapter Reference
Mass Emission Monitoring (NPDES MS4 permit)	LA County, City of Los Angeles	Figure 1, 2 (App. 3-3)	Minimum 5 times a year	Over 120 pollutants	1994	3-15
Wastewater treatment plants[1] (NPDES permits)	City of Los Angeles & Burbank	At the plants	Daily/ Weekly/ Monthly/ Quarterly	BOD/COD, metals, toxics, nutrients, and organics	1975	
Other[2] (NPDES permits)	Permittee	Various	Various	Various	Various	
Status & Trends[3]	City of Los Angeles	Figure 3, 4, 5 (App. 3-3)	Various	Metals and Bacteria	1999	
Los Angeles River Metals TMDL	City/ County of Los Angeles DPW	Figure 6 (App. 3-3)	Monthly	Copper, Lead, Selenium, Zinc, and Cadmium	CMP submitted in 2007	3-16
Los Angeles River Nutrients TMDL	City of Los Angeles/ Burbank	At the wastewater treatment plants	Daily	Ammonia, Nitrate, and Nitrite	CMP submitted in 2005	3-17
Santa Monica Bay Beaches Bacteria TMDLs	City of Los Angeles, LA County (J2 & J3)	Figure 7 (App. 3-3)	Daily/ Weekly	Total coliform, Fecal coliform, Enterococcus, and E. coli	2004	3-18
Ballona Creek Metals TMDL	City of Los Angeles	Figure 8 (App. 3-3)	Monthly	Copper, Lead, Selenium, Zinc, and Cadmium	CMP submitted in 2007	3-19
Ballona Creek Bacteria TMDL	City of Los Angeles	Figure 9 (App. 3-3)	Weekly	Total coliform, Fecal coliform, Enterococcus, and E. coli	CMP submitted in 2008	3-20
Ballona Creek Estuary Toxics Pollutants TMDL	City of Los Angeles	Figure 10 (App. 3-3)	Monthly	Copper, Lead, Cadmium, Silver, Zinc, Chlordane, DDTs, PCBs, and Total PAHs	CMP submitted in 2007	3-19
Marina del Rey Harbor Mothers'' Beach and Back Basins Bacteria TMDL	City of Los Angeles, LA County	Figure 11 (App. 3-3)	Daily/ Weekly/ Monthly	Total coliform, Fecal coliform, Enterococcus, and E. coli	2007	3-21
Marina del Rey Harbor Mothers' Beach and Back Basin Toxic Pollutants TMDL	County of Los Angeles DPW	Figure 12 (App. 3-3)	Daily/ Weekly/ Monthly	Total coliform, Fecal coliform, Enterococcus, and E. coli	CMP submitted in 2007	3-22

Table 3-2 (Continued)
Major Monitoring Programs

Monitoring Program	Monitoring agencies	Monitoring locations	Sampling Frequency[4]	Pollutants	Monitoring Since[5]	Chapter Reference
Los Angeles Harbor Bacteria TMDL	City/ County of Los Angeles DPW	Figure 13 (App. 3-3)	Daily/ Weekly	Total coliform, Fecal coliform, Enterococcus, and E. coli	2005	

(1) For example, City of LA Hyperion Treatment Plant, Burbank Treatment Plant, others.
(2) For example, DWP Scattergood, LA World Airports, Southern California Edison, others.
(3) The Status & Trends Monitoring Program monitors in the LA River, Ballona Creek and Dominguez Channel watersheds.
(4) Daily sampling is five, six or seven times per week.
(5) Monitoring usually starts six months after approval of the CMP by LARWQCB.

- Many other organizations also perform water quality monitoring in the City of Los Angeles, including environmental organizations such as Santa Monica BayKeeper and Heal the Bay and research organizations such as Southern California Coastal Water Research Project (SCCWRP).

3.4 Water Quality Data

Most of the available water quality data concern metals and bacteria. Less is known about the presence and distribution of other pollutants in the City of Los Angeles watersheds.

In order to develop and select strategies for reducing pollutants in urban runoff, it must be known how much the pollutant concentrations exceed the water quality numeric targets. Clearly, while a 10% reduction of a pollutant may be achieved relatively easily, a reduction of, for example, 90% or greater requires implementation of highly effective control measures, or perhaps the implementation of a series of control measures. This comparison of pollutant concentrations with the applicable targets is a complex exercise that must take many factors into account, including the following:

- Reliability of water quality data;
- Variation of pollutant concentrations over time;
- Spatial variation of pollutant concentrations within the watershed or the water body;
- Variation of pollutant concentrations during dry and wet weather;
- Spatial variation of water quality numeric targets within the watershed or the water body; and

Â Difference of water quality numeric targets for dry and wet weather conditions.

Metals are one group of pollutants for which a lot of data exists. Dissolved metals cause toxicity in aquatic life and this toxicity is affected by the pH and temperature. Using copper as an example of one of the five metals in the Los Angeles River Metals TMDL, *Figure 3-1* (dry weather) and *Figure 3-2* (wet weather) illustrate the complexity by showing for each one of the six reaches in the river the TMDL numeric target, the average concentration and the 95 percentile concentration of copper. It can be noted that these three parameters vary considerably along the river, which would imply that assessment of individual river segments is required instead of the "one size fits all" approach. In addition, the numeric targets and trends of the copper concentrations are different during dry and wet weather conditions.

Bacteria are a second group of pollutants for which a relatively large number of water quality data is available. Bacteria monitoring under the Santa Monica Bay Beaches Bacteria TMDLs started in 2004. As an example, *Figure 3-3* shows the compliance with bacterial standards at various locations along the coastline during the summer dry-weather period (April through October) of 2007. The implementation of Low-Flow Diversions (LFDs) at the major storm drain outfalls (*Chapter 7*) has greatly reduced the number of exceedances at the beach during the summer.

Numeric targets for bacteria are sometimes more frequently exceeded during the winter period (November through March), *Figure 3-4* versus *Figure 3-5*. This increase can mainly be attributed to two main factors:

Á Currently, urban runoff in the winter period is discharged into the ocean rather than diverted to the sewer system through the LFDs. This is because the capacity of the LFDs is not sufficient for handling the larger volume of urban runoff in the winter. The capacities of the LFDs are currently being increased for meeting the Dry-Weather Santa Monica Bay Beaches Bacteria TMDL requirements for winter runoff (compliance required by 2009, *Table 7-1*); and

Á Bacterial loadings strongly increase during storm events, which typically occur in the winter. *Section 7.3.1.2* discusses the various projects that are currently being implemented to comply with the Santa Monica Bay Beaches Bacteria Wet Weather TMDL.

The scattering of fecal coliform data in *Figure 3-5* illustrates the challenges when evaluating the bacteria quality of the water at the beaches, in particular in the winter and during storm events. Similar scattering of data has been observed for total coliforms and enterococcus. Implementation plans for bacteria TMDLs will need to address this variability to ensure compliance with numeric targets of all regulated indicator bacteria.

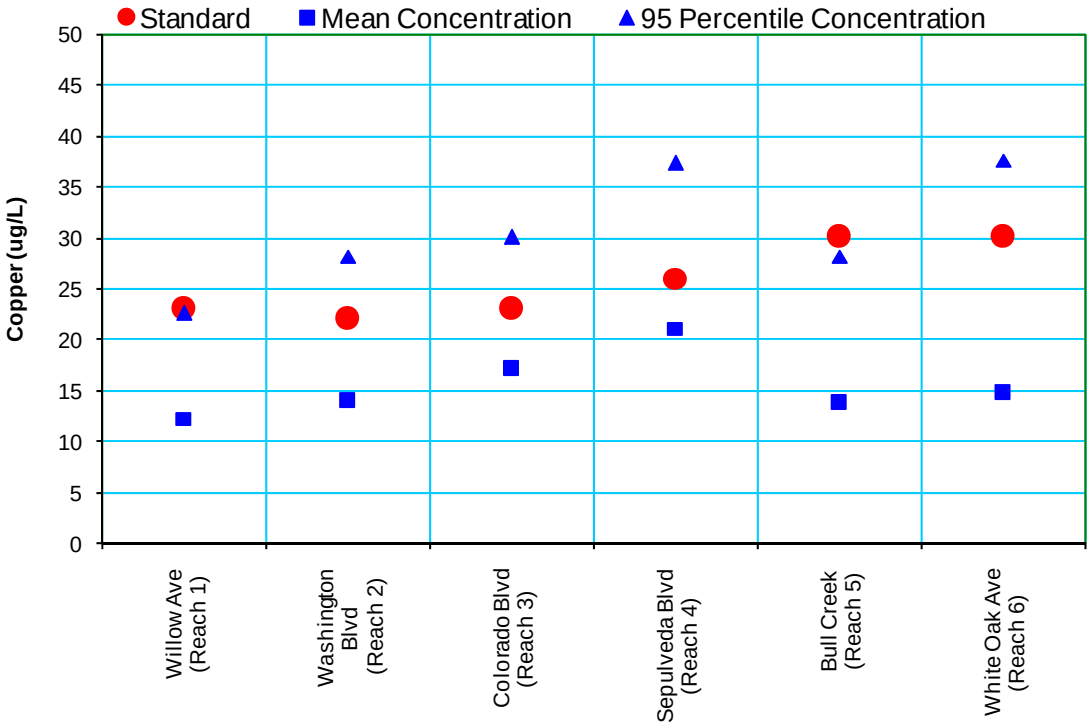

Figure 3-1
Dry Weather Copper Concentrations and Numeric Targets in Los Angeles River
Data from City of Los Angeles Status & Trends Monitoring Program (2001-2006).

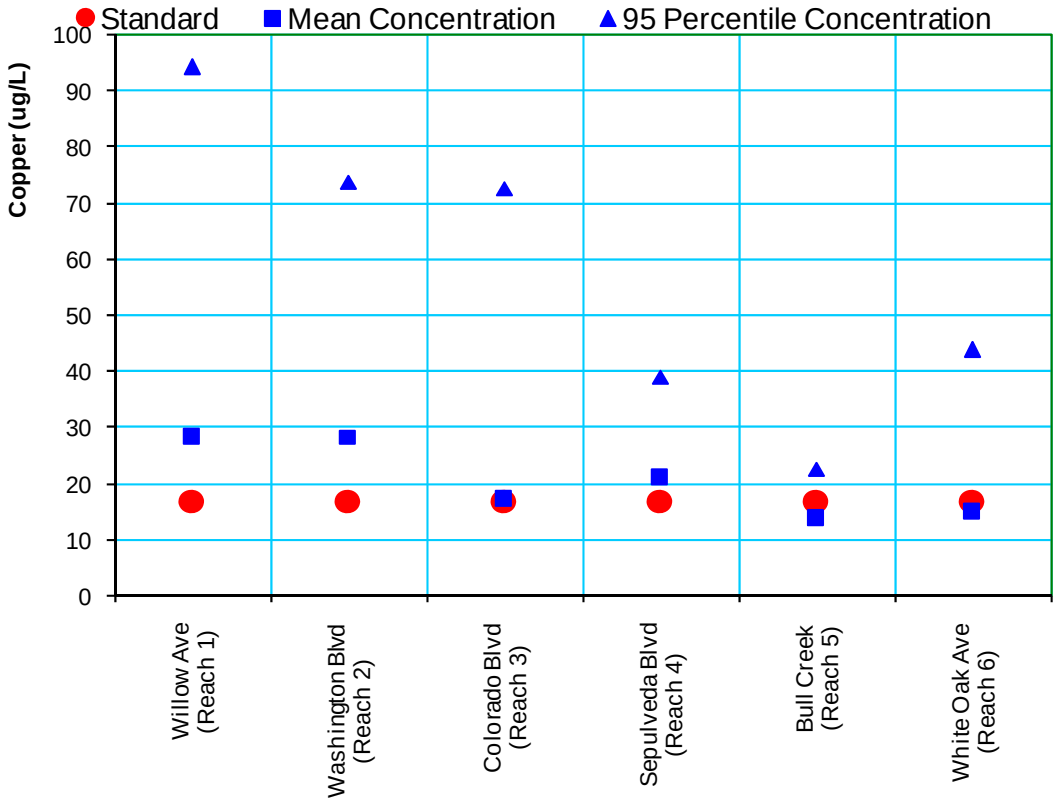

Figure 3-2
Wet Weather Copper Concentrations and Numeric Targets in Los Angeles River
Data from City of Los Angeles Status & Trends Monitoring Program (2001-2006).

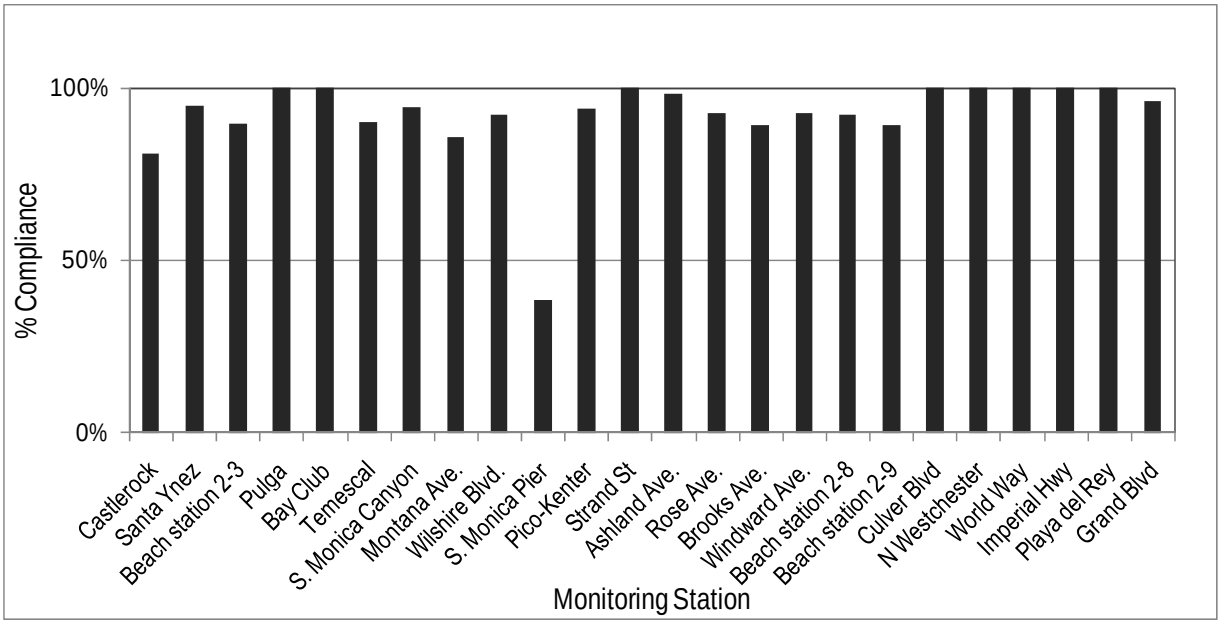

Figure 3-3
Compliance Levels with the Santa Monica Bay Beaches Bacteria TMDL at the Northern Monitoring Stations that Receive Urban Runoff from the City of Los Angeles (Apr – Oct, 2007)
Percentage compliance is the ratio of samples meeting all numeric targets for bacteria and the total number of samples taken.

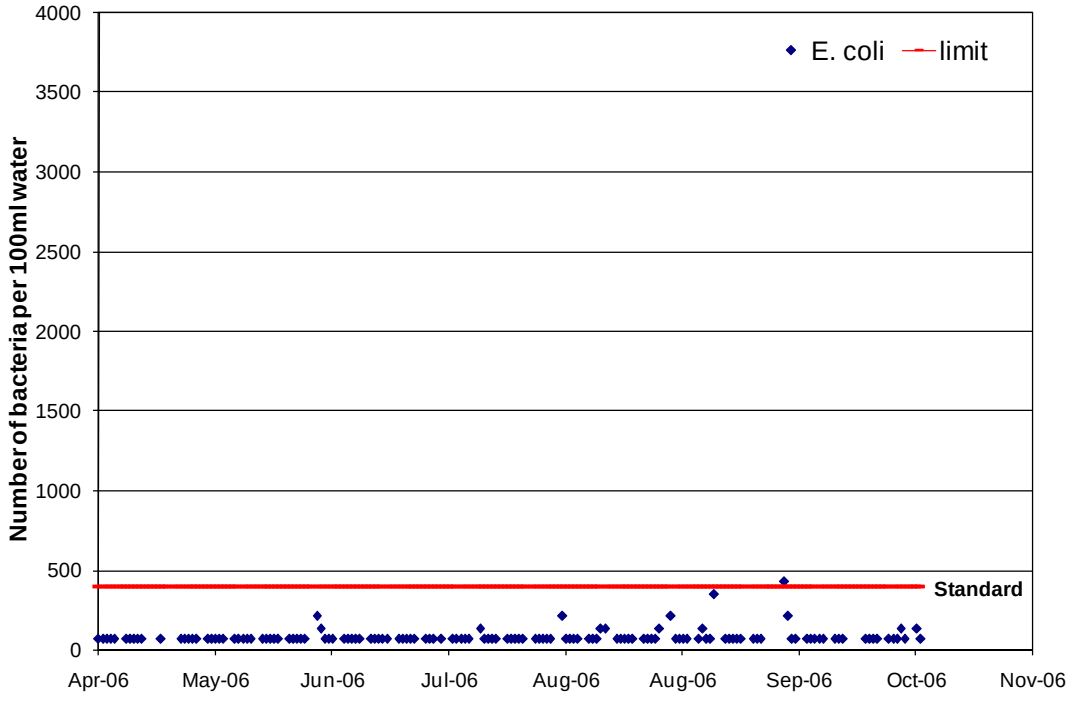

Figure 3-4
Fecal Coliforms at a Beach at Santa Monica Canyon during Summer (Apr – Oct, 2007)
Monitoring by City of Los Angeles on behalf of the responsible agencies as described in ***Ref. 3-18***.

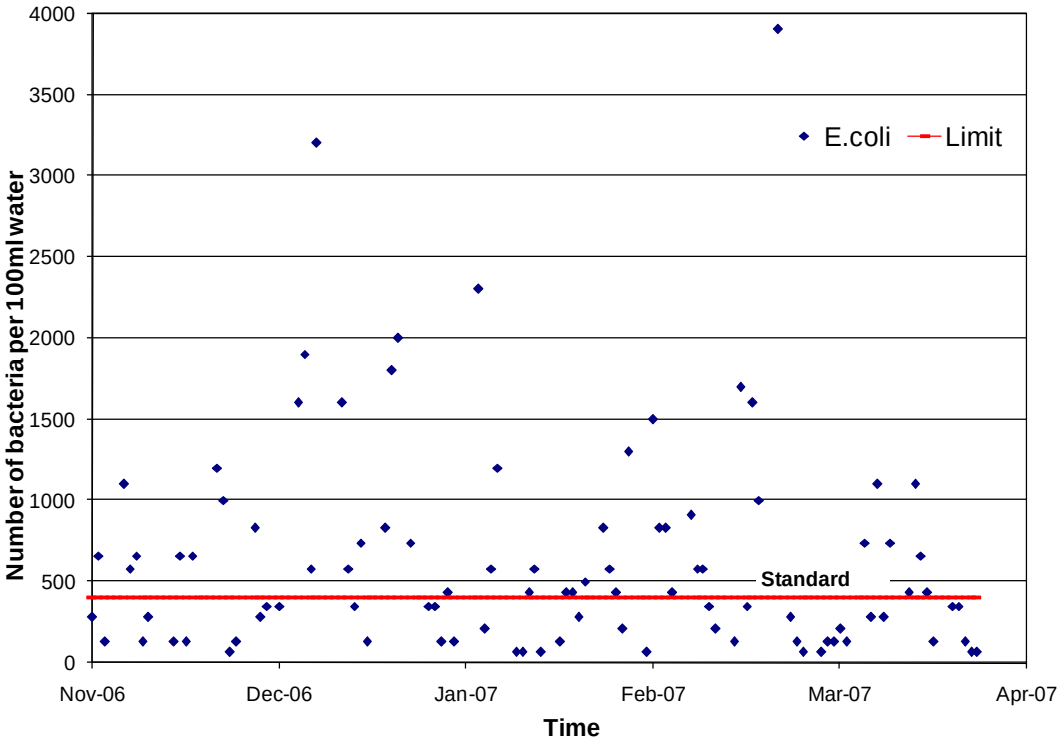

Figure 3-5
Fecal Coliforms at a Beach at Santa Monica Canyon during Winter (Nov 2006 – Mar 2007)
Monitoring by City of Los Angeles on behalf of the responsible agencies as described in ***Ref. 3-18.***

3.5 Water Quality Data Gaps

The availability of sufficient and reliable water quality data is a prerequisite for the development of strategies for reducing urban runoff pollution. The previous sections of this chapter have identified various data gaps:

- Most of the available water quality data concerns pollutants that are included on the 303(d) List of impaired waters. There is limited water quality data of the pollutants that will be regulated in the future;

- The water quality data gaps become more apparent when descending from the watershed to the parcel level. Water quality data of receiving water bodies (watershed level) are relatively abundant as it provides the basis for 303(d) List of impaired waters, even though many gaps may still exist. WPD is working together with the LARWQCB to close these gaps by additional monitoring, so that future TMDLs will be developed on a scientific basis. Water quality data of tributaries and major storm drains (regional or sub-regional level) that discharge into receiving water bodies is sparse. These data are needed to identify major pollution sources and their distribution within a watershed. Water quality data of local storm drains (local or parcel level) is almost non-existent, but is needed to

identify locations for targeting source reduction and capture and treatment of runoff; and

Â In an attempt to address water quality data gaps, the LARWQCB is requiring all new NPDES permits for POTWs to include an integrated regional monitoring program. In response to this new permit requirement, the Los Angeles River watershed POTWs with the assistance of a working group coordinated by the Los Angeles and San Gabriel Rivers Watershed Council recently developed the Los Angeles River Watershed-Wide Monitoring Program. This program provides a framework for monitoring at the watershed scale by:

- Expanding the monitoring of ambient conditions related to key beneficial uses to the entire watershed;

- Attempting to improve the coordination and cost-effectiveness of disparate monitoring efforts; and

- Providing a framework for periodic and comprehensive assessments of watershed condition.

Monitoring under this program began in 2008 and will address the following five core management questions:

Á What is the condition of streams in the watershed?

Á Are conditions at areas of unique interest getting better or worse?

Á Are receiving waters near discharges meeting water quality objectives?

Á Is it safe to swim?

Á Are locally caught fish safe to eat?

3.6 Summary

The main conclusions of this chapter are:

Â Many water quality monitoring plans have been and are being developed in the Los Angeles region. The focus of most of these programs is to evaluate the water quality of receiving waters and to verify compliance with the numeric targets for pollutants in receiving waters.

Â Comparison of the concentrations of and numeric targets for pollutants often is site- and pollutant-specific.

Â Water quality data gaps become larger for the pollutants that will be regulated in the further future (as opposed to pollutants that are already regulated or will be regulated in the near future).

Â For the prioritization of high pollution generating areas and the development of pollution reduction measures, there is a need for more water quality data in the tributaries and storm drains that transport pollutants to the receiving waters.

References

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3-2. Los Angeles Regional Water Quality Control Board (2004). Total Maximum Daily Load for Trash in the Ballona Creek and Wetland; Resolution No. 04-023.

3-3. Los Angeles Regional Water Quality Control Board (2007). Total Maximum Daily Load for Trash in Machado Lake; Resolution No. R4-2007-006.

3-4. Los Angeles Regional Water Quality Control Board (2002). Total Maximum Daily Load for Bacteria at Santa Monica Bay Beach; Resolution No. 02-004.

3-5. Los Angeles Regional Water Quality Control Board (2006). Wet Weather Total Maximum Daily Load at Santa Monica Bay Beach Bacteria; Resolution No. 2006-006.

3-6. Los Angeles Regional Water Quality Control Board (2006). Total Maximum Daily Load for Bacteria in Ballona Creek, Ballona Estuary and Sepulveda Channel; Resolution No. 2006-011.

3-7. Los Angeles Regional Water Quality Control Board (2006). Total Maximum Daily Load at Marina del Rey Mother's Beach and Back Basins Bacteria; Resolution No. 2006-009.

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3-12. Los Angeles Regional Water Quality Control Board (2005). Total Maximum Daily Load for Toxic Pollutants in Marina del Rey Harbor; Resolution No. 2005-012.

3-13. Los Angeles Regional Water Quality Control Board (2003). Total Maximum Daily Load for Nitrogen Compounds and Related Effects in the Los Angeles River; Resolution No. 03-016.

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3-18. City of Los Angeles and other responsible agencies (2004). Coordinated Monitoring Plan for Santa Monica Bay Beaches Bacteria TMDL.

3-19. City of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Ballona Creek Metals and Ballona Creek Estuary Toxic Pollutants TMDL; Submitted to RWQCB in 2007.

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3-21. County of Los Angeles and other responsible agencies (2007). Coordinated Monitoring Plan for Marina del Rey Harbor and Mothers' Beach and Back Basins Bacteria TMDL.

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Chapter 4
Pollutants

4.1 Introduction

Urban runoff, whether dry weather or stormwater generated, collects sediments, pathogens, fertilizers, nutrients, hydrocarbons, metals and other pollutants as it travels through an urban area. Pavement and compacted areas, roofs, reduced tree canopy and limited open areas are all factors that increase urban runoff (both volume and peak flowrates) and pollutant loads that degrade water quality and habitats. Dry-weather flows such as washwater, over-irrigation and illicit discharges have also been documented as being significant sources of pollutants during dry-weather conditions (*Ref. 4-1*).

Urban runoff pollutants usually are anthropogenic but are sometimes from natural sources (*Ref. 4-2*). Source identification is a necessary element to develop an effective water quality implementation strategy. In addition to local studies (for example, *Ref. 4-3*), numerous studies throughout the U.S. have examined the typical sources of urban runoff and associated pollutants. *Appendix 4-1* provides a summary list of the pollutants of concern in the Los Angeles region, their general sources in the environment, and their primary sources in urban runoff; it also summarizes the possible environmental impacts and adverse public health effects. As was discussed in *Chapter 3*, most of the studies of watershed pollution have focused on the receiving waterbodies – not on the upstream watershed or sub-watershed. This has created some degree of uncertainty regarding the specific sources of many pollutants. The subsequent sections provide a more detailed discussion of the known sources of pollutants.

4.2 Classes of Pollutants

Trash: Trash or litter (such as plastic bags, aluminum cans, plastic bottles, polystyrene products, and paper) is found throughout the watersheds, and is transported via storm drains and is subsequently discharged into the receiving waterbodies. Trash may also reach the receiving waterbodies through direct deposition. Based on regional litter characterization studies, plastics are not only the most environmentally damaging component but also one of the most abundant as shown in *Table 4-1* (*Ref. 4-4*).

Table 4-1
Characterization of Trash in Urban Runoff
Trash characterization conducted by Caltrans and UCLA over multiple sites and storm events.

Category	River Clean-up[1]	Catch Basin Cleaning[2]		Freeway Catch Basins	
	Volume (%)	Weight (%)	Volume (%)	Weight (%)	Volume (%)
Plastic-Bags	34	25	19	7	12
Plastic-Film		30	24		
Plastic-Moldable	15	9	19	21	16
Polystyrene	3	7	17	5	15
Paper	4	20	17	9	14
Cloth	18	3	1	6	5
Metal	19	4	3	13	5
Wood	2	1	1	16	10
Glass	1	0	0	1	0
Cardboard	3	0	0	10	11
Cigarette Butts	0	0	0	10	11
Other	0	1	0	2	1

(1) Sorting activity undertaken as part of the Los Angeles River Clean-up Event that occurred on April 30, 2004.
(2) Sorting activity of material collected on June 10, 2004.

The City has studied how trash is generated within the City of Los Angeles based on the amount of trash retrieved by the crews that clean the catch basins (*Ref. 4-5*). The study's results were based on data from 1999 to 2004 and are expressed as annual generation rates (cf / ac-yr). Data indicates that the central part of the City contributes disproportionately more trash per unit area. The central part of the City is characterized with higher population density, has more commercial and industrial areas, and has more pedestrian traffic than other areas of the City. This central part has already been targeted for priority installation of screens and inserts at catch basins to reduce trash from discharging into the Los Angeles River and Ballona Creek. Catch basins in the "medium" trash generation areas will be retrofitted with screen covers on the openings during the next few years. The medium and high trash generation areas in the City are depicted in *Figure 4-1*.

Metals: Certain metals, including lead, copper and zinc (sometimes referred to as "heavy" metals), can be toxic to aquatic life at relatively low concentration and tend to accumulate in the food chain (*Ref. 4-6*). It is generally concluded that the primary sources of metals in stormwater can be traced to weathering or wearing of a variety of metal-containing surfaces. Numerous studies have identified metal generation as being derived from automobile activities. One study, conducted in the San Francisco Bay area **(***Ref. 4-7***)**, concluded automobile-related activities were primary pollution sources in urban runoff for certain metals including copper (80% of total) and zinc (80%). A number of studies have found elevated amounts of metals along transportation corridors as well as from weathering of roof surfaces (*Ref. 4-8, 4-9* and *4-10*). The Center of Environmental Science at the Leiden University in the

Netherlands found that a major source of zinc in stormwater is corrosion from buildings (*Ref. 4-11*). Therefore, understanding the distribution of metallic surfaces such as roofs, and of automobile activities in the watershed, will assist in identifying the spatial distribution of metal pollution generation.

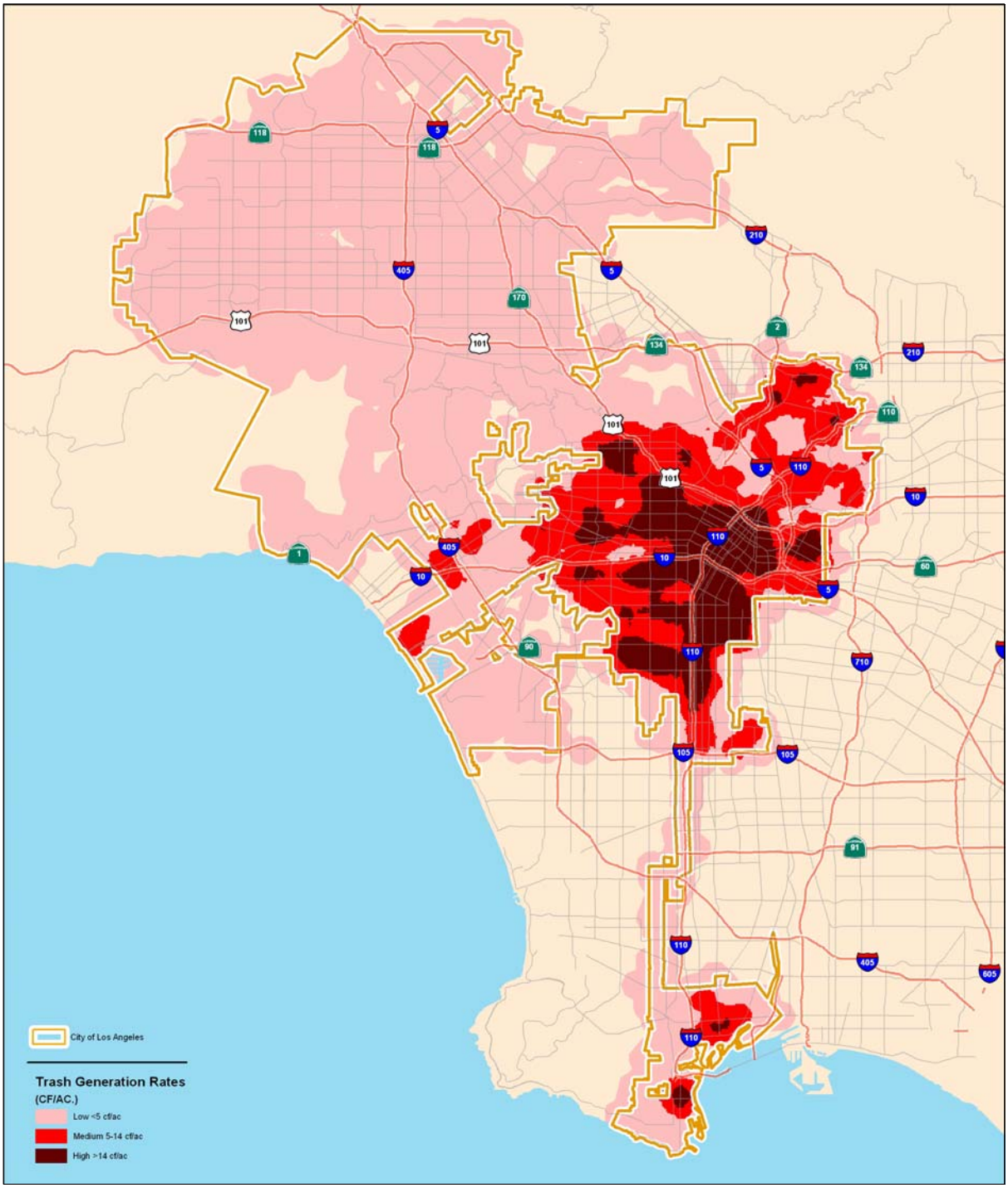

Figure 4-1
High Trash Generation Areas

T he three key metals having multiple listings in the various reaches of the local waterbodies are copper, zinc and lead and to a lesser extent, cadmium and selenium. With respect to copper, the dominant source in urban areas appears to be the friction material used in automobile brake pads, followed by wear of building materials and the use of copper-containing substances used in landscaping. The single largest source of zinc has been found to be automobile tires; secondary sources are asphalt and zinc-coated surfaces such as galvanized steel. Finally, with respect to lead, its historical source has been its use in gasoline and the subsequent deposition from exhaust emissions. Currently, the concentration of lead in gasoline is significantly lower than historic levels. However, lead still persists in sediments and finds its way to receiving waterbodies during rain events.

Watershed Protection Division (WPD), as part of past studies, has mapped both the traffic and the atmospheric deposition of those three metals. The maps from that study can be found in *Appendix 4-2*. Maps 1 and 2 relate to traffic density and Maps 3, 4 and 5 illustrate the atmospheric deposition of copper, lead and zinc (*Ref. 4-12*). Atmospheric deposition is more concentrated in downtown Los Angeles, which seems to correlate to some extent with local traffic patterns. However, the maps also indicate that there is a wide distribution of these three metals with significant presence in non-urbanized areas.

Due to the geographically widespread and non-point nature of generation of the metals, local structural projects might not result in the reduction that is required for compliance. However non-structural source control efforts that target the generation of the pollutants, especially targeting their use in automobiles, may provide significant reduction opportunities.

Bacteria: An epidemiological study by the Santa Monica Bay Restoration Commission in 1995 linked illness from swimming in the Santa Monica Bay to the exposure to bacteria from urban runoff discharges (*Ref. 4-13*), but there is a significant information gap regarding the sources, fate, and transport of these bacteria. Existing bacteria standards are based on the analyses for total coliform, fecal coliform and / or enterococci (indicator bacteria), but there is increased discussion about changing the focus to common pathogens such as enteric bacteria. Past studies have made direct association between increased urban land use and increasing bacterial loadings from urban runoff. WPD data, summarized in *Chapter 3*, indicates that precipitation and water quality are closely associated. Increased precipitation levels result in higher bacteria concentrations in the receiving water.

Recently completed and ongoing studies in our region that have attempted to close this knowledge gap. Bacteria pollution is partially attributed to multiple species especially birds and to a lesser extend mammals. With respect to land use, regional studies and monitoring indicate that single-family residential areas generate higher concentrations of bacteria in urban runoff than other land uses, which may possibly be correlated to a higher density of household pets. The high bacteria presence in residential areas is in contrast to other groups of pollutants where highest

concentrations are often observed in or near industrial and commercial areas. This poses the problem that when attempting to control areas that discharge multiple types of pollutants, such as trash, metals and bacteria, then almost all critical land uses must be targeted and thus most of the watershed. The information gap related to the sources of bacteria is discussed at the end of this chapter. *Appendix 4-3* is a list of completed and ongoing source identification studies that summarizes the current available knowledge for identification of the data gaps.

Polyaromatic Hydrocarbons and Oil & Grease: A review of the Los Angeles County Department of Public Works (LACDPW) monitoring data for Los Angeles River and Ballona Creek during recent rain seasons indicates that petroleum oil constitutes 95% of the total amount of Oil and Grease (O&G) in urban runoff (*Ref. 4-14*). A study conducted in Richmond, California (*Ref. 4-15*), found that in urban runoff O&G resembles used automobile crankcase oil. Studies of polyaromatic hydrocarbons (PAHs), which are also petroleum derived substances, indicate that their profile in urban runoff also mirrors PAHs found in used motor oil. These studies suggest that about 96% of the source of these pollutants come from motor oil (*Ref. 4-16, 4-17*). Other studies have indicated combustion of diesel fuel represents a significant source of PAH.

The limited presence of O&G and PAHs in the various regional watersheds indicates that they are not very broadly distributed and that there are a few areas of high pollutant concentrations (See *Appendix 5-2* that identifies the waterbodies impaired by O&G or by PAH compounds). The source to these pollutants is thought to occur through vehicle leaks or through improper disposal of used motor oil. Historical trends indicate a gradual reduction in their concentrations. Much of this reduction may be attributed to used-motor oil programs and other anti-dumping measures that have increased awareness and have resulted in reduced illicit discharges of motor oil. With the decline of illicit dumping, vehicle leaks may have become the primary source of O&G and PAHs. Therefore, the vehicle density may be used as an indicator of the spatial distribution of O&G and PAHs.

Legacy Toxic Organics: The Ballona Creek and Dominguez Channel estuaries and portions of the Marina Del Rey and Los Angeles Harbors have been found to have high concentrations of toxic organics, including PCBs, aldrin, dieldrin, DDT and chlordane in sediment. Sampling in local waterbodies (*Ref. 4-14)* indicates little presence of these pollutants in urban runoff. Since all of these of these substances have been banned for use in the U.S., the source of many of these compounds appears to be historical. Therefore, the reduction of these pollutants may require on-site treatment or dredging and landfilling.

Nutrients: While nutrients are found in urban runoff, this has historically been associated with major point sources along the Los Angeles River - wastewater treatment (commonly referred to as Publicly Owned Treatment Works, or POTW) plant effluent discharges. The City of Los Angeles (and the City of Burbank) is addressing this problem through modification of its wastewater treatment plants.

The D.C. Tillman and Los Angeles-Glendale Water Reclamation Plants have reduced the levels of nitrogen compounds in their effluents by as much as 80% in 2007. These reductions are expected to result in compliance with the nutrient TMDL for the Los Angeles River. Urban runoff also may contain nutrients from other sources, such as over-application of fertilizers upon landscaping and golf courses.

4.3 Land Use-Based Modeling

It is reasonable to expect that by targeting the areas with the highest pollutant generation rates will reduce compliance costs. However, as previously discussed, this is often times difficult because of the lack of source-related data within the watershed or sub-watershed. Analyzing land use and associated pollutants has been a common approach in modeling and predicting stormwater pollutant loads and their spatial distribution as an alternative to this lack of hard data.

Many past pollution-loading models rely on the EPA's National Urban Runoff Pollution studies (NURP) (*Ref. 4-18*). There are several "Graphical Information System" (GIS) applications for use in regional watersheds, employing land use as the load indicator. In Los Angeles County, land use as an indicator has been used in pollutant-loading models (*Ref. 4-19, 4-20*). In 2001 the Los Angeles County Pollutant Loading Model *(Ref. 4-21)* was released in a joint effort between the City and the County of Los Angeles.

Subsequent efforts such as the BMP Planning Application Model *(Ref. 4-22)* and the Structural BMP Prioritization Methodology model *(Ref. 4-23, 4-24),* that are currently being developed in cooperation between the City, County, State and Heal the Bay, are based on the County model. In the Los Angeles regional models, the pollutant concentrations for each land use are based on eight land use sites that were monitored by LACDPW from 1994 to 2000 (*Ref. 4-25*). *Table 4-2* indicates how land use correlates to the generation of pollutants.

The basic premise of these pollution models (that predict "pollution loads") is that the amount of pollutants present in the drainage area runoff is a function of the type of land use (See *Appendix 9-4* for an example of a land use model application.)

The Structural BMP Prioritization Methodology Model was used on an application in the Ballona Creek Watershed. The results of the study are illustrated in *Figures 4-2a* and *4-2b*. This example included the predicted concentrations of metals and bacteria within Ballona Creek Watershed and indicates there is a correlation of zinc in runoff with industrial and commercial areas. The model expressed results in terms of "priority" catchments – locations where structural BMPs might be most effectively employed. In this case, however, the identified priority catchments are distributed over a wide area, which reflects that industrial and commercial areas are also distributed over a wide area of the watershed.

Table 4-2
Land Use Based Concentrations

The data is from 1994-2000 MS4 monitoring conducted by Los Angeles County, ***Ref. 4-25***. The column categories are a consolidation of over 100 land use categories.

Name	Unit	HDSF Residential[2]	Light Industrial	Retail/ Commercial	Vacant[3]	Transportation	Education	Multi Family Residential	Mixed Residential
Oil & Grease	mg/l	1.3	1.7	3.3	no data	3.1	no data	no data	no data
BOD[1]	mg/l	16	20	27	12	21	13	11	18
Ammonia	mg/l	0.41	0.59	1.26	0.13	0.29	0.33	0.47	0.67
Nitrate	mg/l	3.9	4.1	2.6	5.2	2.9	2.6	5.3	6.8
Nitrite	mg/l	0.1	0.09	0.16	0.05	0.09	0.09	0.1	0.12
Total Coliform	MPN/100ml	1,366,667	454,000	1,140,000	9,187	692,500	no data	no data	no data
Fecal Coliform	MPN/100ml	933,333	338,220	528,750	1,397	328,750	no data	no data	no data
Enterococci	MPN/100ml	610,000	98,200	86,250	679	32,000	no data	no data	no data
Total Copper	µg/l	15	32	39	15	56	24	12	19
Dis. Copper	µg/l	8.5	20	14	no data	33	13	6.9	12
Total Lead	µg/l	10	17	18	no data	10	4.9	6	11
Total Cadmium	µg/l	no data	no data	0.73	no data	1.1	no data	no data	no data
Total Zinc	µg/l	79	639	241	46	291	138	146	203
Dis. Zinc	µg/l	44	407	152	no data	192	66	83	133

(1) BOD refers to biological oxygen demand, which is a measure of the easily metabolized organic material in water.
(2) The Vacant land use category includes parks, mountains, forests and open areas.
(3) HDSF refers to high-density single-family land use.

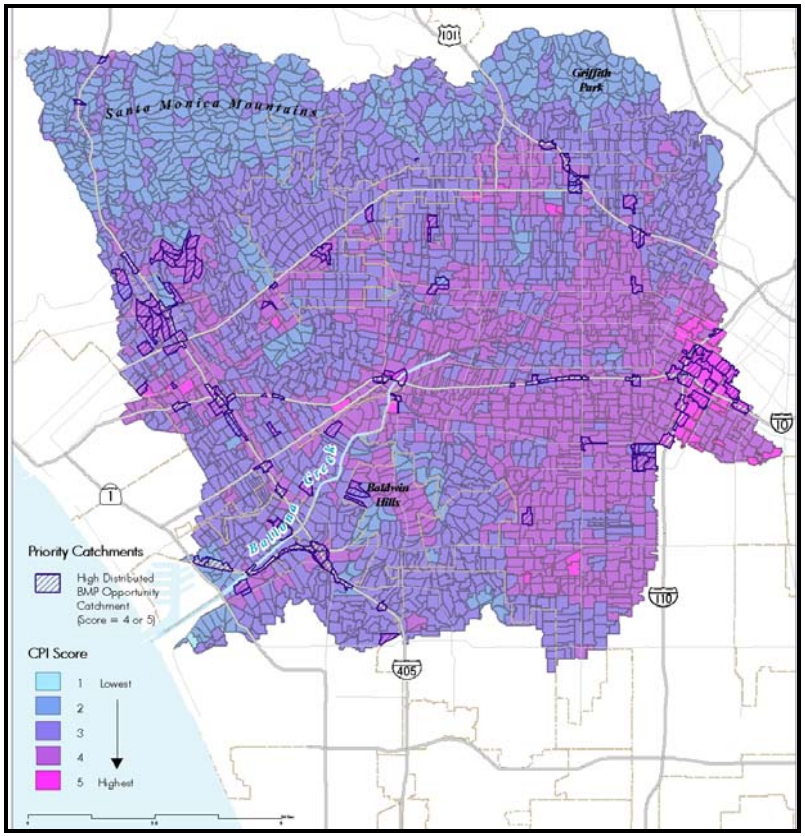

Figure 4-2a Ballona Creek Prioritization Area – Distributed Catchments. Figure identifies catchments with a high Catchment Priority Index (CPI) that might be seen as priority targets for implementing BMPs that could reduce trash, nutrients, metals and bacteria loads to the Ballona Creek Watershed. In this case, most of the identified sites are industrial or commercial sites (***Ref. 4-24***).

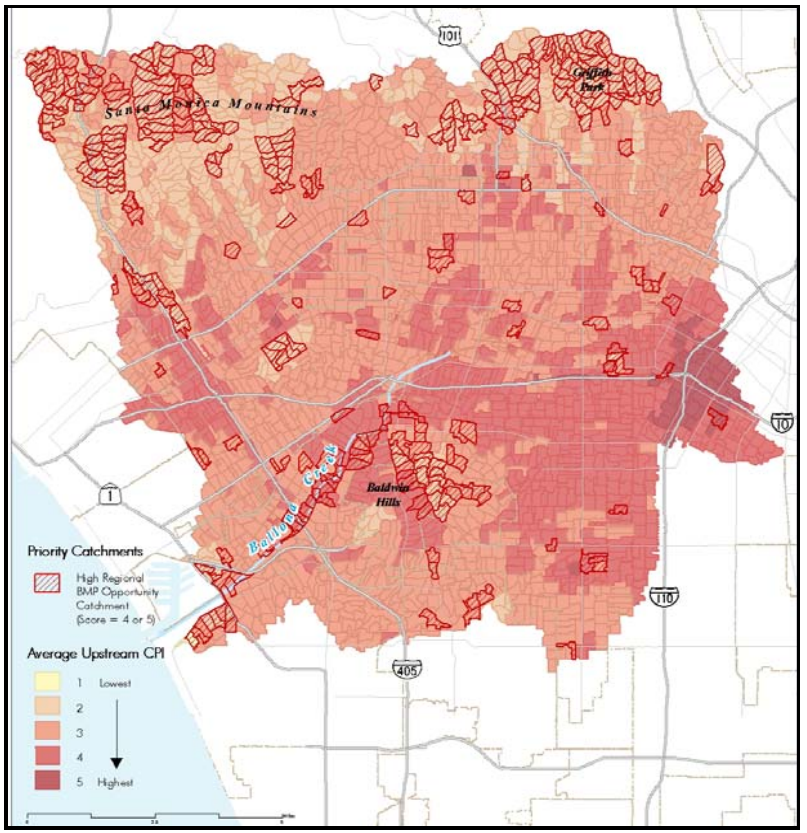

Figure 4-2b Ballona Creek Prioritization Area – Node Catchments. Figure identifies "downstream regional node" catchments with a high Catchment Priority Index (CPI). These are typically located near storm drains that could be chosen as locations for regional treatment BMPs (***Ref. 4-23***).

In a second example that focused on O&G and PAHs, the presence of vehicles associated with various land uses has been mapped. *Appendix 4-2, Map 1*, indicates that oil leaks are more likely in industrial and commercial areas because of the greater vehicular presence.

Discharges from industrial facilities (under the state General Industrial Activity Stormwater Program (GIASP)) were also quantified and mapped. *Appendix 4-2* shows the presence of GIASP facilities within the City of Los Angeles (*Map 6*), and the spatial distributions of the metal (copper, lead and zinc) (*Maps 7, 8,* **and** *9*) released from those facilities. The modeling indicates that discharges from these facilities can be a major source of pollutants for the Dominguez Channel and Los Angeles River watersheds.

With the possible exception of trash, however, pollutants are broadly distributed and are not confined to small geographical areas. The highest releases of metals are observed along transportation corridors, and industrial and commercial areas. In contrast, the highest bacteria counts are observed in single-family residential areas. The difficulty posed by this situation is compounded when attempting to use BMPs to target multiple pollutants such as metals and bacteria – the target areas become most of the City of Los Angeles.

The principal advantages of land use modeling are the following:

- Prioritization of “key” land uses can be targeted;
- Existing databases can be easily incorporated; and
- Cost relative to sampling programs is low.

The limitations of land use modeling are as follows:

- Pollution-causing activities are not always confined within single land uses and thus land use is not always the best indicator of pollution generation;
- Automobile traffic, which is a major pollutant source, is not reflected in the land use model since roads are divided among multiple land uses and are not delineated as a separate land use;
- These models are based on monitoring a limited number of land use sites; and
- There is sometimes poor differentiation between land use categories.

Because of these limitations, modeling results should preferably be validated by actual field investigations.

4.4 Data and Knowledge Gaps

Work is needed to address the missing information regarding the generation of pollutants, their spatial distribution, and their geographic prioritization in the following areas:

- Identify and quantify the sources of bacteria, metals and other pollutants that have pending TMDLs;
- Expand land use-based monitoring;
- Monitor tributary storm drains to identify hot spots;
- Review LARWQCB Water Quality data from GIASP facilities;
- Incorporate new modeling approaches to better predict the spatial distribution of pollutants; and
- Quantify aerial deposition of pollutants.

4.5 Summary

The main conclusions regarding the sources and distribution of pollutants:

- With the possible exception of trash, most other pollutants are widely distributed geographically;
- Automobiles constitute the single most important source of metals, PAHs and O&G;
- Compliance with water quality standards may require that the vast majority of the City's area be targeted for stormwater treatment;
- An alternative to structural BMPs is source control to target a few key contributing activities that are widely distributed; and
- There is a need for additional source identification studies and watershed-based monitoring.

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Chapter 5
Governing Regulations

5.1 Introduction

Federal and State water quality regulations provide the context for characterizing water quality data. These regulations not only provide the basis for identifying where water quality problems exist, but they also establish requirements for implementing water quality controls in problem areas. Accordingly, this chapter provides an overview of the key Federal and State regulations for evaluating and protecting local and regional water quality.

5.2 Water Quality Protection

The Federal Water Pollution Control Act and its amendments of 1972, 1977, 1981, and 1987 comprise what is commonly known as the Clean Water Act (CWA). The CWA provides the basis for the protection of all inland surface waters, estuaries, and coastal waters. The federal Environmental Protection Agency (EPA) is responsible for ensuring the implementation of the CWA and its governing regulations (primarily Title 40 of the Code of Federal Regulations) (*Figure 5-1*), but may delegate its authority to the State.

California implements the CWA by promulgating water quality protection laws and regulations and issuing discharge permits through state regulatory agencies. The State, at its own discretion, has in many instances established requirements that are more stringent than federal requirements.

California‘s primary statute governing water quality is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act) (Water Quality, Division 7 of the California Water Code) (*Figure 5-1)*. The Porter-Cologne Act grants the California State Water Resources Control Board (“State Board”) and nine California Regional Water Quality Control Boards (“Regional Boards”) broad powers to protect water quality and is the primary vehicle for implementation of California’s responsibilities under the CWA.

The Porter-Cologne Act grants the State and Regional Boards authority and responsibility to adopt plans and policies, to regulate discharges to surface and groundwater, to regulate waste disposal sites, and to require cleanup of discharges of hazardous materials and other pollutants. The governing Regional Board for the Los Angeles area watersheds is the Los Angeles Regional Water Quality Control Board (LARWQCB).

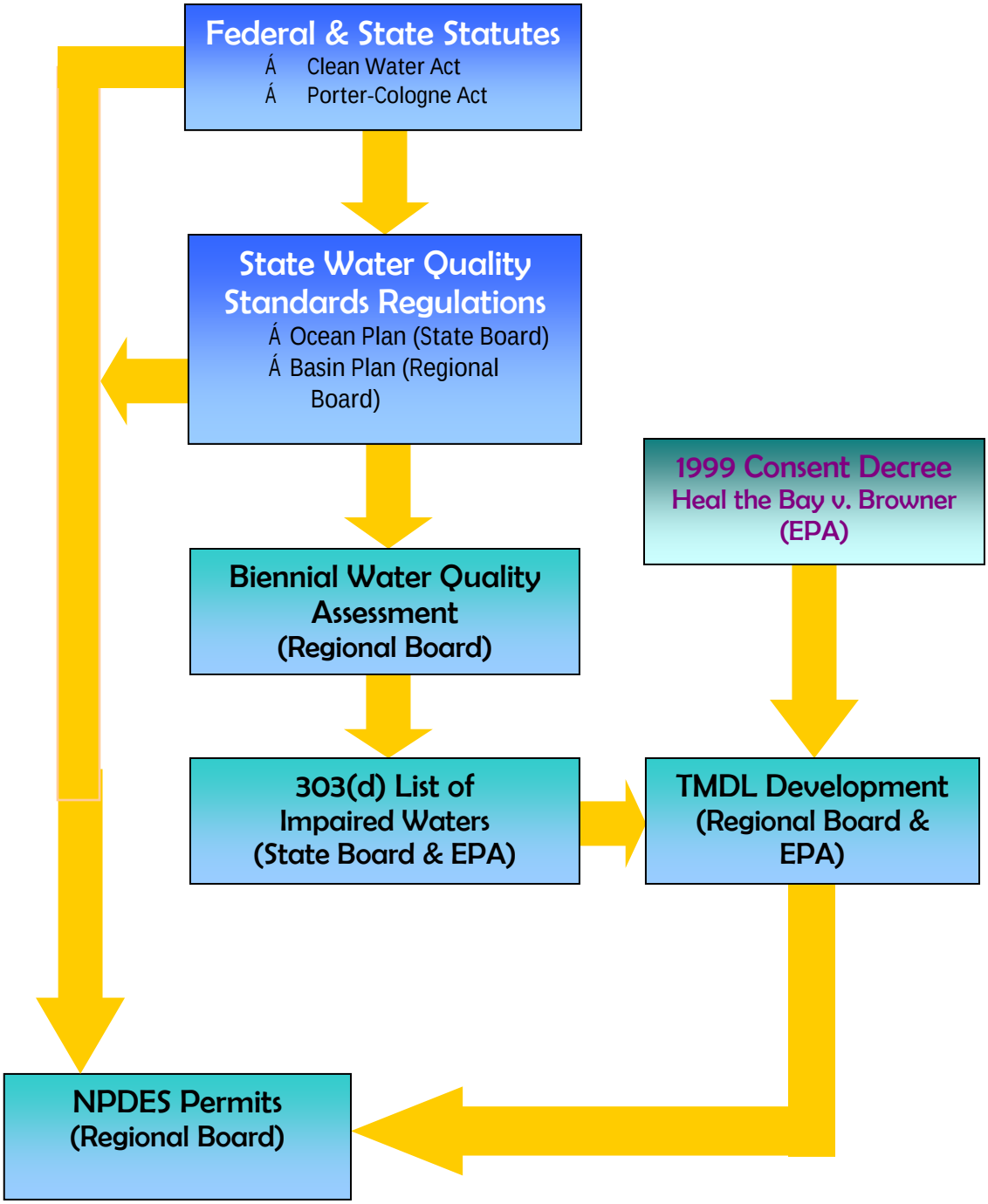

Figure 5-1
Key Federal and State Statutes, Regulations and Programs Associated with TMDL Development and Implementation

5.3 NPDES Permits

National Pollutant Discharge Elimination System (NPDES) (CWA, Section 402) permits are required for point source discharges to surface waters (including storm drains) under the jurisdiction of the CWA (*Figure 5-1*). NPDES permits are required for both wastewater and stormwater discharges. NPDES permits contain discharge requirements that include: (a) technology-based limits (based on the ability of dischargers in the same industrial category to treat the discharge); and (b) water quality-based limits, which are applied if technology-based limits are believed insufficient to provide protection of the receiving water's water quality standards.

The EPA has delegated its authority for issuing NPDES permits to the State of California. In turn, each Regional Board is responsible for developing and issuing the permits for their respective regions. All NPDES permits issued by the Regional Board are also considered Waste Discharge Requirements (WDRs), which are issued under the authority of the Porter-Cologne Act (*Figure 5-1*). Not only do the WDRs address federal NPDES program requirements, but they also address additional provisions of Article 4 of the Porter-Cologne Act. These additional provisions regulate the discharge of wastes that are not made to surface waters, but that may impact the region's water quality by affecting underlying groundwater basins. Such WDRs are issued for Publicly-Owned Treatment Works, wastewater reclamation operations, municipal and industrial (including construction site) stormwater discharges, discharges of wastes from industries, subsurface waste discharges such as septic systems, sanitary landfills, dairies, and a variety of other activities that can affect water quality. The resulting number of active NPDES permits in the Los Angeles Area watersheds is substantial (*Table 5-1*).

5.3.1 Wastewater

Dischargers apply for a permit by submitting a Report of Waste Discharge. The Regional Board prepares a draft permit for public review and comment. A final permit is issued for a period of 5 years, after which the discharger must reapply for authorization to continue to discharge. When a permit is renewed any changes in Basin Plan requirements to protect water quality that have occurred since the last permit was authorized are incorporated into the new permit, e.g., requirements associated with an adopted TMDL.

Wastewater point sources in the Los Angeles area include both sanitary treatment and industrial facilities. NPDES permits authorizing these discharges include both technology- and water quality-based effluent limits. A listing of all permits can be obtained from the LARWQCB (*Ref. 5-1*).

Table 5-1
Number of Active LARWQCB-Issued NPDES Wastewater and NPDES MS4 Permits

Watershed	Permit Type[(1)]	Active Permits[(1)]
Ballona Creek	Wastewater	100
	MS4	5
Dominguez Channel	Wastewater	54
	MS4	10
Los Angeles River	Wastewater	141
	MS4	33
Santa Monica Bay	Wastewater	80
	MS4	9

(1) ***Ref. 5-2***, as of February 2008.

5.3.2 Stormwater

Stormwater point sources are the storm drains that discharge collected stormwater from impervious areas such as paved streets, parking lots, and building rooftops to local area waterbodies. Stormwater NPDES permits issued to municipalities are often referred to as Municipal Separate Storm Sewer System Permits (or "NPDES MS4 Permits"). Such permits typically rely on the use of Best Management Practices (BMPs) to control pollutants carried by stormwater runoff and include requirements for inspection, monitoring and public outreach.

In large cities with interconnected municipal storm drain systems, NPDES MS4 Permits are often issued to multiple permittees that work cooperatively to implement the permit. This is the case for the Los Angeles area where the MS4 is permitted under a single permit issued to Los Angeles County (*Ref. 5-3*) and 84 incorporated cities (all except the City of Long Beach).

An important element incorporated into the NPDES MS4 Permit is the requirements associated with development or redevelopment of a site. The NPDES MS4 Permit requires that all new development/redevelopment projects incorporate stormwater mitigation measures. These measures are addressed by developers through the preparation of a Standard Urban Stormwater Mitigation Plan (SUSMP) or a Site-Specific Mitigation Plan (*Ref. 5-4*). The primary purpose of these plans is to reduce the quantity and improve the quality of stormwater runoff that leaves a site.

5.4 Water Quality Standards

5.4.1 Development

The Porter-Cologne Act gives the State and Regional Boards different responsibilities to establish water quality regulations. Chapter 3, Article 4, Section 13170 of the Porter-Cologne Act requires the State Board to establish the California Ocean Plan (*Ref. 5-5*). This plan establishes regulations for the protection of human health and marine

species in ocean waters, including Santa Monica Bay. The State Board periodically reviews and revises the Ocean Plan through a public stakeholder process.

Chapter 4, Article 3, Section 13240 of the Porter-Cologne Act requires that Regional Boards adopt a Water Quality Control Plan ("Basin Plan") to protect inland freshwaters and estuaries (***Ref. 5-6***). The Basin Plan for each Regional Board establishes the level of protection required for specific waterbodies under its jurisdiction. The surface waters under the Los Angeles Regional Board jurisdiction include, but are not limited to, the Los Angeles River, Dominguez Channel, Santa Monica Bay, and Ballona Creek. The Water Quality Control Plan, Los Angeles Region (Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties) is published by the LARWQCB (***Ref. 5-6***). This Basin Plan is periodically updated and undergoes a triennial review process, most recently in 1995, 2001 and 2004. Amendments of Basin Plans go through a public stakeholder process.

Section 303 of the CWA establishes the foundation for the protection of water quality through the development and implementation of water quality standards. These standards consist of both the beneficial uses of each waterbody under CWA jurisdiction and the water quality criteria or objectives required to protect those uses (***Figure 5-1***). Under the Porter-Cologne Act water quality standards for inland waters are established in the Basin Plan by each Regional Board. The LARWQCB Basin Plan recognizes many types of beneficial uses, but not all of these uses are applicable to every waterbody. ***Chapter 2, Table 2-8***, lists beneficial uses identified by the LARWQCB Basin Plan applicable to waterbodies in the four Los Angeles area watersheds.

Each Regional Board is required to set water quality objectives that are protective of beneficial uses. Section 13241 of the California Water Code lists the specific factors that are to be considered when establishing water quality objectives.

5.4.2 Evaluating Compliance

The State and Regional Boards evaluate compliance with water quality standards through the following CWA-mandated processes:

- CWA Section 305(b) requires that each state assesses the water quality status of each waterbody under CWA jurisdiction every 2 years and report these findings to EPA. For this assessment, the state reviews available water quality data, compares these data to water quality objectives, and evaluates whether the beneficial uses of each waterbody are supported, ***Figure 5-1***.

- CWA Section 303(d) requires states to "regularly" identify waterbodies not meeting water quality standards even after all required effluent limitations have been implemented (e.g., through a discharge permit). These waters are often referred to as "303(d) listed" or "impaired" waters. All waterbodies on the 303(d) List are required to have a Total Maximum Daily Load (TMDL) developed.

In practice, the Regional Board and State Board conduct the Section 305(b) assessment and this information is used to develop the Section 303(d) List of impaired waters (*Figure 5-1*).

5.4.3 California 303(d) List and TMDL Development

The State Board has established guidelines for the development of the 303(d) List (*Ref. 5-7*). Each list, which is subject to EPA approval, includes the waterbody name, the pollutant of concern, the probable source or stressor (if known), and a proposed schedule for the development of the TMDL. A TMDL establishes the maximum amount of a pollutant that a waterbody can receive from both point and nonpoint sources and still meet water quality standards.

The most recent EPA-approved 303(d) List for California is the 2006 list, which provides updated information on impaired waters, likely pollutant sources, and priority for TMDL development. Many of the required TMDLs on this list date back to the results of the 1996 and 1998 water quality assessments which resulted in the identification of approximately 700 water quality impairments in the Los Angeles region. A March 22, 1999 Consent Decree between EPA and several environmental organizations established a 13-year TMDL development schedule to address these numerous impairments (Heal the Bay Inc., et al. v. Browner, et al. C 98-4825 SBA). This Consent Degree prioritizes the development of TMDLs as indicated in *Appendix 5-2*.

The development of TMDLs affecting waters in the Los Angeles area watersheds is the responsibility of the LARWQCB; however, because of the Consent Decree, EPA Region 9 supports the development of TMDLs in the region by providing technical and funding resources. The process for approving the TMDL begins with the Regional Board. Adoption of a TMDL requires an amendment to the Basin Plan and is subject to a substantial public review process. After the LARWQCB adopts the TMDL as a Basin Plan amendment, it is submitted to the State Board for approval. Once the State Board approves the TMDL, it is submitted to EPA Region 9 for final review and federal approval. The TMDL is not in effect until the EPA has issued its formal approval.

Existing and Planned TMDLs: To date, a number of TMDLs have received EPA approval in the four watersheds that are the focus of the WQCMPUR (*Table 5-2*) (*Ref. 5-2*). Some of these TMDLs address multiple pollutants and waterbodies. Each TMDL includes wasteload allocations, implementation requirements and a compliance schedule. Established wasteload allocations and key compliance dates are

Table 5-2
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Ballona Creek	Ballona Creek Metals TMDL	Ballona Creek	Copper (dissolved)	2005-007	2007-015	Original: 1/11/2006 Revised: 10/29/2008
		Ballona Creek	Lead			
			Selenium			
			Shellfish Harvesting Advisory			
			Toxicity			
			Zinc			
		Sepulveda Canyon	Copper			
			Lead			
			Selenium			
			Zinc			
	Ballona Creek Trash TMDL	Ballona Creek	Trash	2001-014	2004-023	Original: 8/28/2002 Revised: 8/11/2005
		Ballona Creek Wetlands	Trash			
	Ballona Creek, Ballona Estuary, and Sepulveda Channel Bacteria TMDL	Ballona Creek	Indicator Bacteria	2006-011	N/A	4/27/2007
			Viruses (enteric)			
		Ballona Creek Estuary	Indicator Bacteria			
		Sepulveda Canyon	Indicator Bacteria			
	Ballona Estuary Toxic Pollutants TMDL	Ballona Creek Estuary	Chlordane (tissue & sediment)	2005-008	N/A	1/11/2006
			DDT (sediment)			
			Lead (sediment)			
			PAHs			
			PCBs (tissue & sediment)			
			Sediment Toxicity			
			Zinc (sediment)			

Table 5-2 (Continued)
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Los Angeles River	Los Angeles River Nutrient TMDL	Burbank Western Channel	Ammonia	2003-009	2003-016	Original: 3/23/2004 Revised: 9/27/2004
		Compton Creek	pH			
		Los Angeles River Reach 1 (Estuary to Carson St.)	Ammonia			
			Nutrients (algae)			
			pH			
		Los Angeles River Reach 2 (Carson to Figueroa St.)	Ammonia			
			Nutrients (algae)			
		Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)	Ammonia			
			Nutrients (algae)			
		Los Angeles River Reach 4 (Sepulveda Dr. to Sepulveda Dam)	Ammonia			
			Nutrients (algae)			
		Los Angeles River Reach 5 (Within Sepulveda Basin)	Ammonia			
			Nutrients (algae)			
		Rio Hondo Reach 1 - (Confluence Los Angeles River to Santa Ana Freeway)	pH			
		Rio Hondo Reach 2 (At Spreading Grounds)	Ammonia			
		Tujunga Wash (LA River to Hansen Dam)	Ammonia			

Table 5-2 (Continued)
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Los Angeles River	Los Angeles River Metals TMDL	Reach 1(Estuary to Carson St.)	Cadmium	2005-006	2007-014	Original: 1/11/2006 Revised: 10/29/2008
			Copper, Dissolved			
			Lead			
			Zinc, Dissolved			
			pH			
		Reach 2 (Carson to Figueroa St.)	Copper			
			Lead			
		Reach 3 (Figueroa St. to Riverside Dr.)	Copper			
			Lead			
		Reach 4 (Sepulveda Dr. to Sepulveda Dam)	Copper			
			Lead			
		Reach 5 (Within Sepulveda Basin)	Copper			
			Lead			
		Reach 6	Selenium			
	Los Angeles River Trash TMDL	All Reaches	Trash	2001-013	2007-012	Original: 8/28/2002 Revised: 9/23/2008

Table 5-2 (Continued)
List of Impaired Waters Being Addressed by EPA Approved TMDLs[1]

Watershed	TMDL	Waterbody	303(d) Impairment	Original LARWQCB Adoption Order[2]	TMDL Revisions - LARWQCB Orders[3]	Effective Date[4]
Santa Monica Bay	Marina del Rey Back Basins Bacteria TMDL	Marina del Rey Harbor – Back Basins	Indicator Bacteria	2003-012	N/A	3/18/2004
	Marina del Rey Harbor Toxics TMDL	Marina del Rey Harbor-Back Basins	Chlordane (tissue & sediment)	2005-012	N/A	3/22/2006
			Copper (sediment)			
			Fish Consumption Advisory			
			Lead (sediment)			
			PCBs (tissue & sediment)			
			Sediment Toxicity			
			Zinc (sediment)			
	Santa Monica Bay Beaches Dry Weather Bacteria TMDL	Santa Monica Bay Beaches	Indicator Bacteria	2002-004	N/A	7/15/2003
	Santa Monica Bay Beaches Wet Weather Bacteria TMDL	Santa Monica Bay Beaches	Indicator Bacteria	2002-022	N/A	7/15/2003
Dominguez Channel	Machado Lake Nutrients TMDL[5]	Machado Lake	Eutrophic	2008-006	NA	NA
			Algae			
			Ammonia			
			Odor			
	Machado Lake Trash TMDL	Machado Lake	Trash	2007-006	N/A	3/6/2008
	Los Angeles Harbor TMDL	Los Angeles Harbor – Inner Cabrillo Beach Area	Indicator Bacteria	2004-011	N/A	3/10/2005

(1) ***Ref. 5-2***.
(2) Date LARWQCB adopted original TMDL, ***Ref. 5-8***.
(3) Date of most recent LARWQCB activity to revise TMDL, ***Ref. 5-8***.
(4) Several TMDLs have been revised through new resolutions with new effective dates; however, dates for compliance milestones have remained the same, ***Ref. 5-8***.
(5) Machado Lake Nutrients TMDLs was adopted by the LARWQCB in May 2008; approval by SWRCB , AOL, and EPA is pending (December 2008).

summarized in *Appendix 5-1*. Additional details regarding TMDL implementation requirements and the status of these requirements are presented in *Chapter 6*.

Per the 2006 303(d) list (*Ref. 5-9*), additional TMDLs are planned for development in the Los Angeles area. The current list of these TMDLs is provided in *Appendix 5-2*. Several of these TMDLs, e.g., the Machado Lake trash TMDL will become effective soon (*Ref. 5-8)*.

5.4.4 TMDLs and NPDES Permits

A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. Depending on the nature of the pollutant, TMDL implementation requires a cap on pollutant contributions from point sources (wasteload allocation), nonpoint sources (load allocation), or both. If an adopted TMDL includes wasteload allocations for point sources, then the NPDES permits issued for affected point sources are modified by the LARWQCB to incorporate the wasteload allocation. Therefore, it may be expected that future NPDES MS4 Permits will include requirements for compliance with TMDL wasteload allocations.

5.5 Summary

- The federal Clean Water Act and State Porter-Cologne Act provide the basis for water quality requirements applicable to waters in the Los Angeles area; the LARWQCB is the agency primarily responsible for implementation of these requirements.

- Many waters in the Los Angeles area have been designated as impaired because of poor stormwater quality. TMDL development is required for waters designated as impaired.

- Controls on urban runoff quality are implemented primarily through NPDES MS4 Permits, which in the future will likely include requirements for compliance with TMDL wasteload allocations.

References

5-1. Los Angeles Regional Water Quality Control Board. November 10, 2007. (http://www.swrcb.ca.gov/rwqcb4/html/permits/general_permits.html)

5-2. State Water Resources Control Board. 2007. 2006 CWA Section 303(d) List of Water Quality Limited Segments Being Addressed by USEPA Approved TMDLs. (http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/state_06_wtmdl.pdf)

5-3. Los Angeles Regional Water Quality Control Board, Order No. 01-182; NPDES Permit No. CAS004001. 2001. Waste Discharge Requirements for Municipal Storm Water and Urban Runoff Discharges within the County Of Los Angeles, and the Incorporated Cities therein, except the City Of Long Beach; December 13, 2001).
(http://www.swrcb.ca.gov/rwqcb4/html/permits/general_permits.html)

5-4. City of Los Angeles Stormwater Program. November 10, 2007. Standard Urban Stormwater Mitigation Plans (SUSMP)
(http://www.lastormwater.org/Siteorg/businesses/susmp/susmpintro.htm).

5-5. State Water Resources Control Board. 2006, and subsequent amendments. California Ocean Plan (http://www.swrcb.ca.gov/plnspols/oplans.html)

5-6. Los Angeles Regional Water Quality Control Board. Los Angeles Regional Water Quality Control Board Basin Plan. 1995, and subsequent amendments. (http://www.swrcb.ca.gov/rwqcb4/html/meetings/tmdl/Basin_plan/basin_plan.html)

5-7. State Water Resources Control Board. 2006, and subsequent amendments. Impaired Waters Guidance and Policy,
(http://www.waterboards.ca.gov/tmdl/tmdl.html)

5-8. Los Angeles Regional Water Quality Control Board Plan Amendments/TMDLs
(http://www.swrcb.ca.gov/rwqcb4/water_issues/programs/tmdl/tmdl_list.shtml; last accessed 12/8/2008).

5-9. State Water Resources Control Board. 2006. 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs.
(http://www.waterboards.ca.gov/tmdl/303d_lists2006approved.html)

Chapter 6
Best Management Practices

6.1 Introduction

The NPDES MS4 Permit and TMDLs require the City of Los Angeles to implement a variety of activities or measures for reducing the amount of pollutants entering the receiving water bodies from urban runoff. These activities or measures are collectively known as Best Management Practices (BMPs). They range from programs to prevent the release of pollutants in the environment to the implementation of structural technologies for removing pollutants from urban runoff. Since the start of the Stormwater Program in 1990, the City of Los Angeles has implemented many BMPs to reduce pollution from urban runoff. In addition, major point sources in our watersheds that discharge to receiving waters are required by the NPDES program to implement pollution reduction measures.

Urban runoff management is a relatively new area. Research at universities and technological developments in the industry are rapidly gaining momentum and new technologies are brought to market almost every day. However, there still are many unknowns and uncertainties related to the use of BMPs. This chapter provides an overview of currently available BMPs and evaluates their selection, implementation and performances. Wherever applicable, references are also made to BMPs that have been implemented in the City of Los Angeles. Additional information on BMPs as part of TMDL Implementation Plans is discussed in *Chapter 7*.

6.2 Overview of Best Management Practices

Urban runoff pollutants can be targeted at the source where they are released or before they are released into the environment, during transport through the storm drain system and at the location of discharge from the storm drain system to the receiving water body. Over the past two decades, the number of available BMPs has greatly increased. Several organizations have developed databases that summarize available BMPs (*Ref. 6-1, 6-2, 6-3, 6-4*). *Appendix 6-1* provides a listing of over 100 BMPs and summarizes other pertinent information, which was mostly obtained from the California Stormwater BMP Handbooks (*Ref. 6-1*). The links in *Appendix 6-1* provide detailed descriptions of the individual BMPs. As can be observed in *Appendix 6-1*, there are large data gaps concerning the applicability and costs of BMPs.

BMPs are often categorized into non-structural and structural practices. Non-structural practices are usually associated with source control or institutional programs that do not require the application or construction of engineered solutions, *Table 6-1* and *Section 6.2.1*. Street sweeping, public education / outreach, regulatory management practices, inspection and other pollution prevention strategies are

Table 6-1
Applicability of Non-Structural Best Management Practices

Pollutant	Best Management Practice
Metals	Regulating the metal-based products' formulation (Brake Pads, tires, etc) Public/business/industry education & outreach Erosion/sediment transport control strategies Target critical sources/activities such as streets, building roofs and gutters, salvage yards, railroad yards, vehicle service yards, and catch basins
Pathogens	Public/business education & outreach Erosion/sediment transport control strategies Target critical sources/activities such as: - Sewage spills and septic tanks - Pets/animals facilities - Commercial composting - Landscaping activities
Nutrients	Public/business/industry education & outreach Erosion/sediment transport control strategies Prioritizing the following Sources/Activities Best Management Practices: Commercial animal handling areas Commercial composting Landscaping and lawn/vegetation
Contaminated Sediments	Removal and off-site disposal of contaminated sediments
Trash	Anti-littering statutes such as Sections 56.08, 57.21.06, 62.54, 66.04, 66.25, and 64.70.02 of the Los Angeles Municipal Code (LAMC) Enhanced street sweeping with more sweeping frequencies scheduled at high trash generation zones. Enhanced catch basin cleaning with more cleaning frequencies scheduled for those located in trash generation hotspots. Also, more cleaning frequencies prior to wet weather Abandoned trash reporting hotlines Placement of adequate trash receptacles Formation of Business Improvement Districts (BIDs) along commercial strips that incorporate sidewalk sweeping, litter pick-up, and maintenance of trash receptacles. Educational antilittering outreach efforts through postings, signs, and billboard, television and radio advertisement. Community clean-up programs that involve partnerships between the City, community activists and volunteers for joint effort to beautify the most affected communities.

typical examples of non-structural BMPs. Structural BMPs can be defined as engineered and constructed systems to remove or manage pollutant loadings to the receiving waters. As such, BMPs for urban runoff volume reduction (*Section 6.2.2*) and treatment control (*Section 6.2.3*) are structural. Green solutions or technologies are structural BMPs that can be vegetative or non-vegetative. Biofilters, constructed wetlands and vegetative swales are a few of the examples of vegetative structural practices that can reduce urban runoff pollution and contribute to the greening of urban environments. In contrast, sand filters, infiltration basins and hydrodynamic separators are examples of non-vegetative structural practices, although some of these BMPs can be part of projects to green the environment (for instance, infiltration basins can typically be located in parks, or detention basins or tanks can be used for storing urban runoff as a source of irrigation water). *Table 6-2* summarizes a few of the structural BMPs and the pollutants that they target.

Table 6-2
Applicability of Structural Best Management Practices(1)

Best Management Practice	Metals	Pathogens	Nutrients	Trash
Low Flow Diversion/Outfall Interception	X	X	X	
Infiltration	X	X	X	
Bioretention	X	X	X	
Wetland	X	X	X	
Detention	X	X	X	
Disinfection		X		
Hydrodynamic Separator				X
Catch Basin Cover/Insert				X
Catch Basin Filter	X			
Stormdrain Netting System				X

(1) ***Ref. 6-5***.

6.2.1 Source Control

Source control BMPs include all non-engineering BMPs that aim at preventing the generation of urban runoff pollutants at the source. Driven in large part by the NPDES MS4 Permit, the City of Los Angeles has implemented a wide range of source control programs. The Watershed Protection Division is responsible for many of these source control programs through the Stormwater Program:

- **Public Outreach**: The Public Education Section implements the Public Information Participation Program by targeting the general public, home owners, school children, business owners and city employees to increase public awareness about urban runoff pollution and to change behaviors that impact the quality of receiving waters. Outreach activities include mass media advertising campaigns, distribution of educational materials, visits to schools, festivals and other public events.

- **Inspection and Enforcement**: The Inspection and Enforcement Section implements the Industrial/Commercial Facilities Control Program and the Illicit Connections and Illicit Discharges Elimination Program.

- **Development Construction Program**: This program is to mitigate pollutants, mostly sediment, from construction sites larger than 1 acre.

- **Public Agencies Activities Program**: This program is to mitigate pollutants from City facilities such as fire stations and vehicle maintenance yards.

- **Other Source Control Activities**: include enforcement of anti-littering statutes, street sweeping, catch basin cleaning, abandoned trash pick-up, the placement of trash receptacles and community clean-up programs. Many of these activities are coordinated efforts by several City Bureaus and Departments.

Source control is an important element in sustainable urban runoff management and, accordingly, it is part of one of the three initiatives in the Implementation Strategy (*Chapter 9*).

Public outreach is an important source control BMP focusing on reducing urban runoff pollution through behavioral changes, and is one of the three initiatives in the Implementation Strategy (*Section 9.3).* Several studies by the City of Los Angeles have shown that the Stormwater Program has significantly increased public awareness of water quality and urban runoff pollution. However, the effectiveness of public outreach in reducing urban runoff pollution through behavioral changes is difficult to measure. A few studies have shown that the effectiveness usually is in the range of 10 to 40% (*Ref. 6-6*), depending on the program and the pollutants and audiences that are targeted. Even though many pollutants require a greater reduction, public outreach remains a critical element because pollutant reduction at the source is much less costly than removing pollutants after their release into the environment.

6.2.2 Urban Runoff Volume Reduction

The objective of these BMPs is to reduce the pollutant loading by reducing the volume of urban runoff that is ultimately discharged into the receiving waters. This can be done at the source where the runoff is generated (for example, the capture of roof water and use of stormwater in garden irrigation), anywhere along the storm drain system (for example, the diversion of urban runoff from storm drains to public parks for irrigation and/or infiltration), or at the receiving water body (for example, regional wetlands for urban runoff treatment and infiltration). An example of successful urban runoff reduction in the City of Los Angeles is the use of Low-Flow Diversions (LFDs) that divert urban runoff from the storm drains at Santa Monica Bay to the sewer system for treatment at the Hyperion Treatment Plant. These are further discussed in *Section 7.3.1.* Also the Standard Urban Stormwater Mitigation Plans (SUSMPs) for new development and redevelopment are an example of urban runoff volume reduction, but at the source. SUSMP requirements include either on-site infiltration of runoff or on-site treatment of the first flush (0.75") of the storm (Note: new directions for SUSMP from the LARWQCB put a larger focus on volume reduction, whereas the focus before was more on removal of pollutants. Hence, SUSMP is listed in this section). The SUSMP categories include restaurants, retail gasoline outlets, parking lots 5,000 square feet or larger or with 25 or more parking spaces, housing developments of ten or more units among others. Likewise, various business categories are required to develop Site Specific Mitigation Plans when they do not fall under the SUSMP category.

Compared to BMPs for removing pollutants from urban runoff (treatment control BMPs, *Section 6.2.3*), the advantages of reducing the volume of urban runoff include the following:

- Targets all pollutants that are present in urban runoff;
- Can be implemented throughout the City (watershed-wide approach);
- Can be combined with other City policies in multi-benefit projects;
- Assists with flood control; and
- Provides a new source of water for beneficial use (irrigation, groundwater recharge).

BMPs for urban runoff volume reduction have the highest impact on the water quality of receiving waters if highly polluted urban runoff is targeted. This first requires extensive monitoring of urban runoff to prioritize the high pollution areas in the City. Nevertheless, reducing the volume of urban runoff from relatively clean areas in the City will benefit the water quality and reduce the need for or size of BMPs for pollutant removal.

One of the issues of reducing the volume of urban runoff is that a suitable destination or use for the water must be found. This can be a major challenge for urbanized areas with a high percentage of highly impervious areas. In addition, large areas such as parks and other open areas will be needed to collect and temporarily store the urban runoff from larger storm events until the runoff has been transferred to its final destination, which should be done in a way that is compatible with other uses of these open areas.

6.2.3 Removal of Urban Runoff Pollutants

Treatment control BMPs can often be considered as the “last line of defense”. Treatment control BMPs remove pollutants from urban runoff by physical, chemical or biological processes or a combination of these processes. These practices improve the water quality of urban runoff before discharge into the receiving waters, but they may also be needed as a cleaning step prior to the use of stormwater runoff in irrigation, infiltration or groundwater recharge. Often, a series of BMPs is used so that they work in series to achieve a higher degree of treatment or to remove different classes of pollutants. Treatment control BMPs can be implemented at the source where the pollutants are generated (e.g., residential homes, businesses, etc.). However, treatment control BMPs are more often implemented as larger scale projects to remove runoff pollutants from the storm drain system. Typical examples of treatment control BMPs already implemented in the City of Los Angeles are the hydrodynamic separators, Fresh Creek and P.J. Hannah netting systems and catch basin inserts and covers for the removal of trash (*Section 7.4*).

6.3 Selection of Structural Best Management Practices

Selection of structural BMPs for implementation depends on many considerations, a process discussed in more detail in *Section 9.2* and *Appendix 9-4*. An important tool for the Southern California area is the Los Angeles County-wide Structural BMP Prioritization Methodology, which is developed by Los Angeles County, City of Los Angeles, Heal the Bay and Geosyntec with the main purpose of identifying structural BMPs for management of wet weather urban runoff in Los Angeles County.

Selection and prioritization of structural BMPs for implementation should primarily be based on BMP performance criteria. However, there still is much uncertainty about the effectiveness of BMPs in removing pollutants, as illustrated by the wide range of pollutant effluent concentrations from detention basins in *Appendix 6-2*. The International Stormwater BMP Database (*Ref. 6-2*) collects and summarizes BMP performance data for a wide range of structural BMPs and pollutants with the objective to provide a better understanding of factors influencing BMP performance and help to promote improvements in BMP design, selection and implementation.

In addition to pollutant removal efficiencies, other considerations for selecting structural BMPs include:

- How much runoff volume the BMP reduces.
- How much runoff is treated (versus bypassed).
- Whether the BMP can demonstrate a statistical difference in effluent quality compared to influent quality.
- What distribution of effluent quality is achieved.
- How well the BMP reduces peak runoff rates, especially for smaller, frequent storms.
- Operational and/or maintenance frequencies and the effect on the BMP performance.

References

6-1. California Stormwater Quality Association (2003). California Stormwater Best Management Practice Handbooks (www.cabmphandbooks.com).

6-2. International Stormwater BMP Database (www.bmpdatabase.org).

6-3. US EPA (2005). Draft Handbook for Developing Watershed Plans to Restore and Protect Our Waters; EPA 841-B-05-005.

6-4. Center for Watershed Protection (www.cwp.org).

6-5. Donald Bren School of Environmental Sciences & Management (2003). Analysis of Management Strategies for Stormwater Conveyance Systems to Control Input of PCB-Contaminated Sediments to San Francisco Bay (www.bren.ucsb.edu/research/2003Group_Projects/bay/Final/bay_brief.pdf).

6-6. Division of Public Works, Frederick County, Maryland (2003). Strategic plan to improve water quality through public outreach in Frederick County, Maryland (http://64.233.179.104/scholar?hl=en&lr=&q=cache:MXomnG2ORPcJ:www.co.frederick.md.us/NPDES/files%255CPublicOutreach.doc+Maximum+expected+magnitude+of+change+from+education+and+participation+programs+over+6-12+months+by+Taylor+and+Wong+2002).

Chapter 7
TMDL Implementation Plans

7.1 Introduction

This section provides an overview of the compliance requirements and ongoing implementation activities associated with each of the TMDLs adopted in watersheds encompassing the City.

7.2 Existing TMDL Requirements

As of December 2008, the LARWQCB has adopted 14 TMDLs in the Los Angeles area (*Table 5-1*). The schedule for TMDL development established by the Consent Decree between Heal the Bay and US EPA (*Chapter 5, Appendix 5-2*) will probably result in over 60 TMDLs in the Los Angeles area by 2012. Each TMDL, which includes an implementation schedule, is incorporated into the Basin Plan as an amendment. Key milestones in this schedule typically include:

- **Coordinated Monitoring Plan (CMP)** – a CMP is developed and implemented jointly by responsible jurisdictions. The CMP is developed to demonstrate compliance with TMDL monitoring requirements.

- **Implementation Plan** – Many, but not all, TMDLs require that the responsible jurisdictions develop a joint Implementation Plan. This plan outlines the drainage areas to be addressed and how compliance with wasteload allocations will be achieved.

- **Compliance Dates** – TMDL compliance is typically expected to occur in a phased manner over a specified number of years. Compliance milestones are often expressed as a percent reduction of exceedance days or pollutant loads.

To streamline the TMDL development process, some of the TMDLs adopted in the Los Angeles area address multiple pollutants. For example, the Marina Del Rey Harbor Toxic Pollutants TMDL addresses five pollutants: Chlordane, total PCBs, copper, lead, and zinc; and the Ballona Creek Metals TMDL addresses seven pollutant concerns: arsenic, cadmium, copper, lead, silver, zinc, and water column toxicity.

Thirteen of the TMDLs adopted by the Regional Board have been approved by EPA and are in effect. The Machado Lake (Dominguez Channel watershed) Nutrients TMDL has not yet received EPA approval and thus is not effective at this time. *Table 7-1* summarizes the requirements associated with each of these TMDLs in the Los Angeles area. It is important to note that currently the City complies with all TMDL implementation requirements.

Table 7-1
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Ballona Creek	Ballona Creek	Trash	8/11/05	Original trash TMDL effective 8/1/02; TMDL was revised by the Regional Board in 2004 Compliance with final waste load allocation achieved through full capture system (defined in TMDL) Phased reductions of trash from existing baseline loads to zero over a 10-year period (projected to end in 2015)
	Ballona Creek, Ballona Estuary and Sepulveda Channel	Bacteria	4/27/07	4/08 – Coordinated Monitoring Plan – In Progress 10/09 – Submit Implementation Plan 4/13 – Comply with allowable exceedance days and rolling geometric mean targets for summer and winter dry weather (DW) 7/21 – Comply with allowable exceedance days and rolling geometric mean targets for wet weather (WW)
	Ballona Creek	Metals (copper, lead, selenium, zinc)	1/11/06	1/07 – Coordinated Monitoring Plan – Completed/Pending approval by LARWQCB 1/10 – Submit Implementation Plan 1/12 – 50% drainage area (DA) in compliance, dry weather (DW); 25% DA in compliance, wet weather (WW) 1/14 – 75% DA in compliance, DW 1/16 – 100% DA in compliance, DW; 50% DA in compliance, WW 1/21 – 100% DA in compliance, WW
	Ballona Creek Estuary	Toxic Pollutants[3] (sediment/fish tissue/mussels – cadmium, copper, lead, silver, zinc, chlordane, DDT, total PCBs, total PAHs)	1/11/06	1/07 – Coordinated Monitoring Plan – Completed/Pending approval by LARWQCB 1/11 – Submit Implementation Plan 1/13 – 25% DA in compliance 1/15 – 50% DA in compliance 1/17 – 75% DA in compliance 1/21 – 100% DA in compliance

Table 7-1 (Continued)
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Dominguez Channel	Los Angeles Harbor	Bacteria	3/10/05	9/05 – Submit workplan to implement Tier 1 BMPs at Inner Cabrillo Beach (ICB) - Completed 9/05 – Implement BMPs at ICB including trash receptacles and educational signage - Completed 9/05 – Submit workplan for Tier 2 BMPs at ICB - Completed 9/05 – Submit workplan to assess water quality in the Inner Harbor of the Main Ship Channel (MSC) - Completed 3/06 – Complete implementation of source control BMPs at ICB - Completed 3/07 – Evaluate compliance based on implementation of Tier 1 & 2 BMPs 9/07 – Based on results of MSC water quality studies, submit workplan for source control or diversion BMPs – Completed/Pending approval 3/08 – If southern portion of ICB not in compliance, submit report for Tier 3 actions to be taken 3/10 – All tier 3 actions completed at ICB 3/10 – 100% compliance achieved To date, all compliance requirements have been met with submissions but some are still pending approval by the Regional Board
	Machado Lake	Trash	3/6/08	TMDL was adopted by the Regional Board 6/7/07 6 months from effective date (ED) – submit Trash Monitoring and Reporting Plan Implement monitoring plan within 6 months of approval Submit monitoring results; recommend trash baseline WLA and propose full capture system prioritization 2 years from monitoring plan approval date Years 4 to 8 from TMDL effective date, implement installation of full capture system to ultimately achieve 100% reduction of trash from WLA baseline
	Machado Lake	Nutrients	3/11/09	Adopted by LA Regional Board: 5/1/08 Caltrans and MS4 Permittees: Submit Monitoring and Reporting Program Plan (1 year after ED); submit TMDL Implementation Plan (2 years after ED); meet interim total nitrogen WLA (5 years after ED); meet final WLAs and LAs (9.5 years after ED)

Table 7-1 (Continued)
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Los Angeles River	Los Angeles River	Trash	9/23/08	Original trash TMDL effective 8/1/02; a revised TMDL was adopted by the Regional Board 8/9/07 Compliance with final waste load allocation achieved through full capture system (defined in TMDL) Phased reductions of trash from existing baseline loads to zero over a 9 year period (projected to end in 2016)
	Los Angeles River & Tributaries	Metals (cadmium, copper, lead, selenium, zinc)	1/11/06	4/07 – Submit CMP - Completed 1/10 – Submit Implementation Plan 1/12 – 50% drainage area (DA) in compliance in DW; 25% DA in compliance in WW 1/20 - 75% DA in compliance, DW 1/24 - 100% DA in compliance, DW; 50%in compliance, WW 1/28 - 100% DA in compliance, WW
	Los Angeles River Watershed	Nitrogen Compounds and Related Effects (algae, pH, odor, scum)	9/27/04	9/04 – Apply interim NH3-N, NO3-N, NO2-N limits to POTWs; apply wasteload allocations (WLA) to minor point source dischargers - Completed 9/05 – Submit monitoring workplan to estimate ammonia and nitrogen loadings from storm drains - Completed 9/05 – Submit workplan for evaluating effectiveness of nitrogen reductions on removing impairments from algae, odor, scum and pH – Completed/pending 9/05 – Submit workplan to evaluate site-specific objectives for ammonia, nitrate and nitrite - Completed 3/07 – Submit results of Water Effect Ratio study for ammonia downstream of Tillman WWTP - Completed 3/08 – Regional Board considers site-specific objectives and revision of WLAs - Site-specific objectives for ammonia were adopted by Regional Board 6/7/07 - Completed 3/08 – interim limits expire; WLAs apply to POTWs - New permit requirements for Los Angeles Glendale and Donald C. Tillman treatment facilities, July and October 2007, respectively - Completed 9/08 – Evaluate monitoring data and determine need for revising WLAs 3/09 – TMDL revised as needed based on findings of studies

Table 7-1 (Continued)
LARWQCB-Adopted TMDLs for the Los Angeles Area

Watershed	Applicable Waterbodies	TMDL	Effective Date[1]	Requirements & Accomplishments[2]
Santa Monica Bay	Santa Monica Bay Beaches	Wet Weather Bacteria	7/15/03	11/03 – Submit Coordinated Shoreline Monitoring Plan (CSMP) - Completed 7/04 – Submit jurisdictional implementation plans – Completed 7/09 – 10% reduction in applicable total exceedance days 7/13 – 25% reduction in applicable total exceedance days 7/18 – 50% reduction in applicable total exceedance days 7/21 – 100% reduction in applicable total exceedance days; target geometric mean met
	Santa Monica Bay Beaches	Dry Weather Bacteria	7/15/03	Implement monitoring program as described in CSMP - Ongoing 11/03 – Identify and eliminate illegal discharges – Identified, elimination ongoing 7/06 – Summer dry weather allowable exceedance days and rolling geometric mean target must be met 7/09 – Winter dry weather allowable exceedance days and rolling geometric mean target must be met
	Marina Del Rey Harbor Mothers' Beach and Back Basins	Bacteria	3/18/04	7/04 – CMP, List of small drains discharging to waterbody - Completed 3/05 – Submit Implementation Plan - Completed 3/07 – Comply with DW requirements 3/21 – Comply with WW requirements
	Marina Del Rey Harbor Back Basins	Toxic Pollutants (sediment - chlordane, total PCBs, copper, lead, zinc)	3/22/06	3/07 – Coordinated Monitoring Plan - Completed 3/11 – Submit Implementation Plan 3/13 – 25% DA in compliance 3/15 – 50% DA in compliance 3/17 – 75% DA in compliance 3/21 – 100% DA in compliance

(1) Effective Date = Date of EPA Region 9 approval; dates obtained from LARWQCB web site that provides links to all TMDLs adopted by Regional Board resolution: http://www.swrcb.ca.gov/rwqcb4/html/bpaRes/bpa.html (last assessed March 2009).
(2) Most compliance schedules also include opportunity for special studies to support scheduled TMDL re-openers. Any deadlines for completion of special studies or schedules for re-openers were not included in the information in this table.
(3) Ballona Creek Toxic Pollutants TMDL may be revised based on developing State sediment quality objectives.

7.3 TMDL Implementation Plans

For the effective TMDLs, the following Implementation Plans have been submitted to the LARWQCB (see *Table 7-1*): (1) Santa Monica Bay Wet and Dry and Wet Weather Bacteria TMDLs and (2) Marina Del Rey Harbor Mother's Beach and Back Basin Bacteria TMDL. Other TMDLs still requiring the development of implementation plans as a TMDL compliance requirement include:

- Ballona Creek, Ballona Estuary and Sepulveda Channel – Bacteria (October 2009)
- Ballona Creek - Metals (January 2010)
- Los Angeles River & Tributaries – Metals (January 2010)
- Ballona Creek Estuary – Toxic Pollutants (January 2011)
- Marina Del Rey Harbor and Back Basins – Toxic Pollutants (March 2011)

It is too soon to assess the effectiveness of the two Implementation Plans that have been completed. Instead, the following sections describe the implementation plan established for each TMDL and the implementation activities completed or ongoing.

7.3.1 Santa Monica Bay Dry and Wet Weather Bacteria TMDLs

An Implementation Plan has been submitted to the LARWQCB for Santa Monica Bay to address water quality impairments caused by elevated bacteria: (1) Santa Monica Bay Beaches Dry Weather Bacteria TMDL; and (2) Santa Monica Bay Beaches Wet Weather Bacteria TMDL. These TMDLs became effective on July 15, 2003.

The area draining to Santa Monica Bay includes 27 subwatersheds covering many governmental jurisdictions. For the purposes of TMDL implementation, this area was divided into several Jurisdictional Groups. The City of Los Angeles is the lead agency for Jurisdictional Group 2 and is a participating agency in Jurisdictional Groups 3 and 7.

Jurisdictional Groups 2 and 3 (J2/3) submitted a joint plan to the RWQCB in 2005 (*Ref. 7-1*).

7.3.1.1 Implementation Plan Strategy

The following sections briefly summarize the overall strategy for runoff management and pollution reduction. *Appendix 7-1, Tables 1 and 2* summarize the recommended BMP types and policy changes incorporated into the J2/3 Implementation Plan.

Wet Weather Runoff Implementation
The Wet Weather Implementation Plan was developed using an "integrated resources approach," which has the following attributes:

- Integrates urban runoff planning with planning for other water system needs, such as recycled water and potable water;

- Focuses on beneficial use of stormwater runoff, including groundwater infiltration at multiple points throughout a watershed;

- Addresses multiple pollutants; and

- Incorporates enhancement of other public goals, such as water supply, recycling and storage, environmental justice, parks, greenways, open space, and active and passive recreational and environmental education opportunities.

The plan relies on phased TMDL compliance and is being implemented in two overlapping stages:

Stage 1 (2013 – 2015) – This stage emphasizes institutional (nonstructural BMPs) and subregional structural runoff management solutions that can be quickly implemented and monitored for effectiveness. Non-structural BMPs include revision and development of City policies, ordinances, and guidelines for urban development and redevelopment that focus on using green solutions to manage urban runoff, developing ordinances to promote low impact development (LID) and stormwater use, and coordinating activities Citywide, as well as expansion of the outreach program. Subregional structural runoff management solutions to reduce the volume of wet weather runoff that reaches the receiving waters include the installation of decentralized, small-scale, local storage, and stormwater use or infiltration projects at public facilities, as well as consideration of residential options, such as cisterns / rain barrels and redirected downspouts.

Stage 2 (2013 – 2021) – This stage will consider the need to implement regional, end-of-pipe solutions, such as diversion of wet weather runoff to the wastewater treatment system or the construction of storage and runoff treatment plants. These are generally single-purpose facilities that offer little benefit beyond pollution reduction and represent a less holistic approach to runoff management. For this reason, the need to pursue these options is deferred until the effectiveness of a concerted effort to implement institutional and subregional structural solutions can be evaluated.

Dry Weather Runoff Implementation
Dry weather flows are controlled through the construction of low-flow diversions (LFDs) in storm drains to prevent these dry weather flows from reaching beach areas. Diverted flows are directed to the sanitary sewer system via the Coastal Interceptor Sewer, which then sends the flows to the Hyperion Treatment Plant. LFDs are currently operated only from April through October for diversion of summer dry weather runoff, but planned upgrades will allow for year-round operation (except during wet weather) to include diversion of winter dry weather runoff. This will require an amendment to the wastewater service agreements with the 29 contract agencies in areas adjoining the City.

7.3.1.2 Implementation Activities

The following sections summarize the status of implementation activities to control wet and dry weather sources of pollutants.

Wet Weather Pollution Reduction Implementation

The Cities of Los Angeles and Santa Monica have been working together to develop and implement wet weather BMP projects to reduce urban runoff pollution (and reduce runoff) impacts to Santa Monica Bay, *Appendix 7-1, Table 3*. To date, six wet weather BMP projects have been completed in J2 and J3 of the Santa Monica Bay watershed. An additional 13 projects are in various stages of implementation. *Figure 7-1* illustrates various project locations.

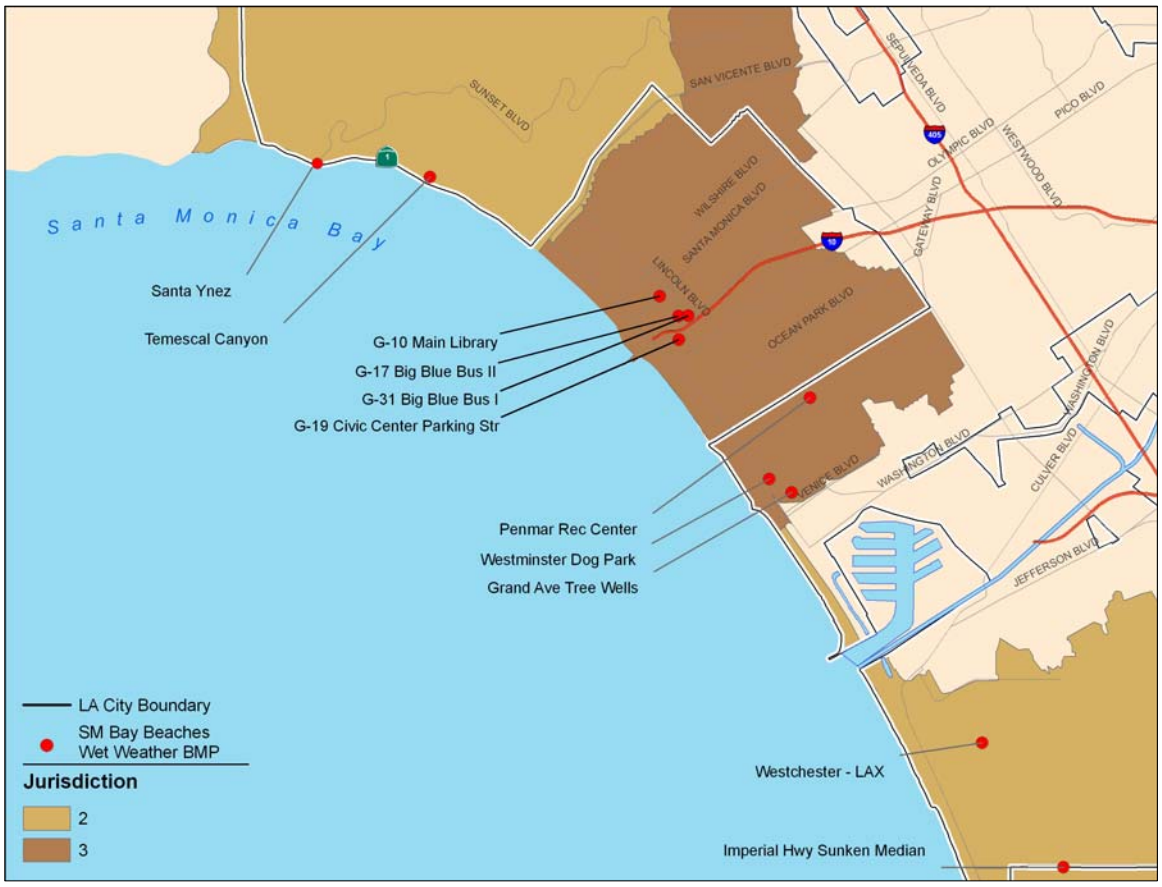

Figure 7-1
Locations of BMPs for Santa Monica Bay Beaches Wet Weather Bacteria TMDL

Dry Weather Pollution Reduction Implementation

The Cities of Los Angeles and Santa Monica and the County of Los Angeles have constructed 23 LFDs along Santa Monica Bay to divert dry weather flow into the wastewater system for treatment at Hyperion Treatment Plant and the Santa Monica Urban Runoff Recycling facility, *Appendix 7-1, Table 4*. *Figure 7-2* shows the locations of diversion projects. Monitoring locations have been established near most of the locations of these LFDs to help evaluate the water quality benefits achieved in the bay.

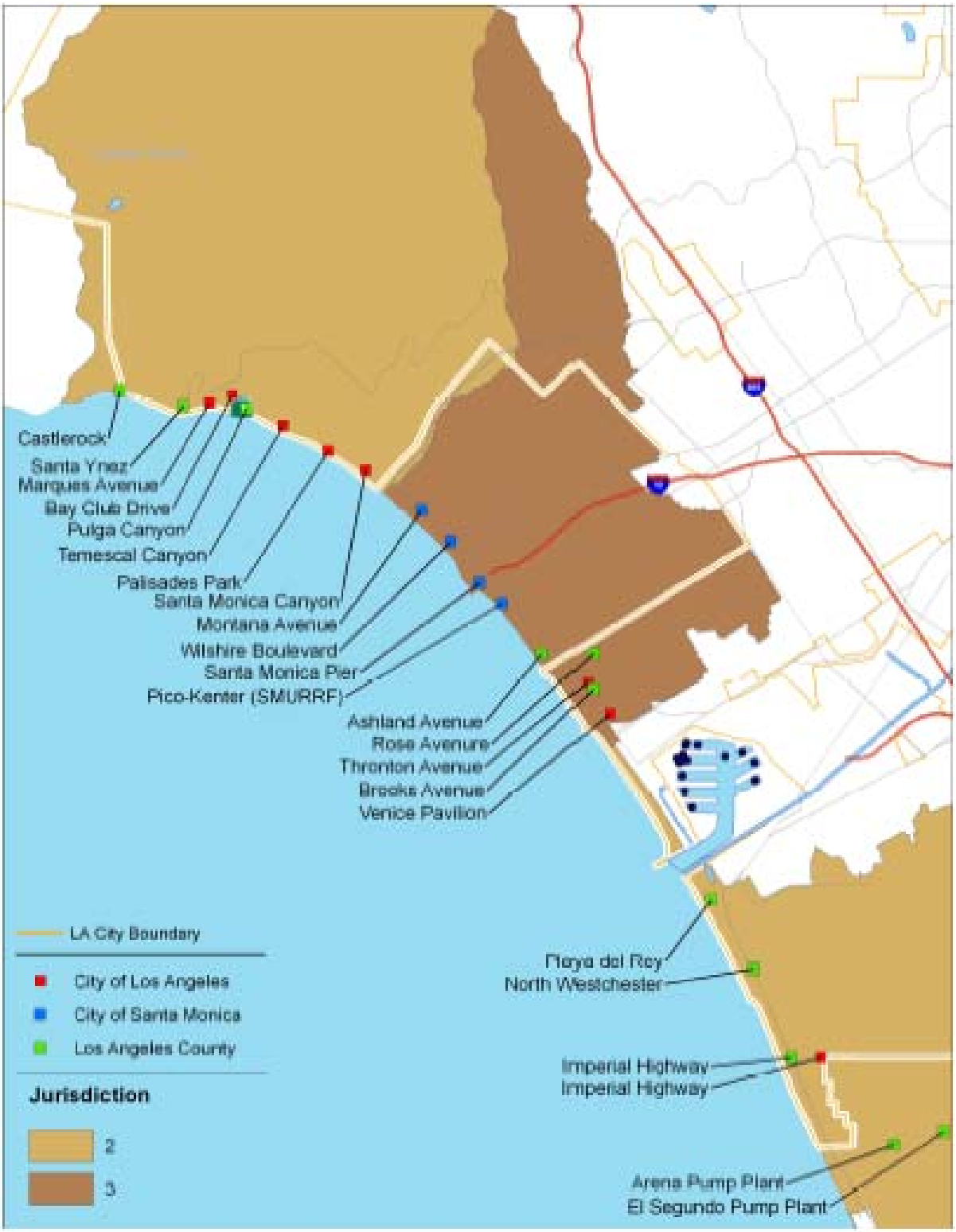

Figure 7-2
Locations of Low Flow Diversions for Santa Monica Bay Beaches Dry Weather Bacteria TMDL

7.3.2 Marina Del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL

The Implementation Plan for the Marina Del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL was submitted to the LARWQCB on October 31, 2005 (*Ref. 7-2*). The Plan was prepared cooperatively by the four responsible agencies in the watershed, Los Angeles County, the Cities of Los Angeles and Culver City, and the California Department of Transportation, through a collaborative effort with interested stakeholders, including the LARWQCB and the Santa Monica BayKeeper organization.

7.3.2.1 Implementation Plan Strategy

The responsible agencies developed a "Hybrid Approach" strategy that considers the following elements when selecting BMPs for a particular site:

Cost – builds in a cost / benefit / effectiveness analysis as part of the BMP selection process.

Low Risk – considers the use of multiple control programs to reduce the risk associated with reliance on a single approach.

Maximum Beneficial Use of Stormwater - incorporates stormwater use as an element into subregional controls where possible.

The Marina del Rey Harbor, Mother's Beach and Back Basins Bacteria TMDL Implementation Plan relies on the use of the following three BMP categories:

Public Information and Participation Program (PIPP) - The Plan recommends that all PIPP efforts associated with the TMDL, which includes public education, be coordinated with the existing PIPP efforts associated with the NPDES MS4 Permit.

Nonstructural BMP Program – Program consists of non-structural BMPs designed to prevent or minimize pollutant loads in stormwater runoff. Program activities typically involve transforming or modifying behaviors or practices through regulations, programs and public outreach. They are implemented by improving management of a variety of systems or facilities, e.g., storm drain systems, sanitary systems, street maintenance activities, recreational and public facilities, public parking facilities, boating activities, industrial and commercial facilities, illicit connections and discharges and development planning activities.

Structural BMPs Program – Program includes both non-stormwater controls, e.g., dry weather LFD, and stormwater discharge controls. Implementation of any future structural BMPs will need to consider the existing high groundwater table, tidal influences, flooding concerns, limited publicly owned lands, and planned marina redevelopment activities.

Details regarding each of the above programs are provided in the Implementation Plan (*Ref. 7-2*). *Appendix 7-1, Tables 1 and 2*, summarizes the recommended non-structural and structural BMPs and policy changes contained in the plan. The status of BMP activities implemented to date is summarized in *Appendix 7-1, Table 5*. These activities range from installation of LFDs to source identification / control and efforts to increase circulation in one of the Marina basins. *Figure 7-3* illustrates proposed LFDs for the Marina area.

7.3.2.2 Implementation Activities

The City of Los Angeles has been working closely with County of Los Angeles (lead agency for this TMDL) to implement the Plan described above.

7.4 Other TMDL Implementation Activities

As noted in *Section 7.3.*, only two TMDL Implementation Plans are currently being implemented. Other TMDL Implementation Plans will be prepared at a later date. Regardless, numerous activities designed to improve water quality are already underway in the Los Angeles region without a formal implementation plan.

One area where considerable work is underway is compliance with trash TMDLs for the Los Angeles River and Ballona Creek. These waters require a regular reduction of trash per year such that 100 percent reduction is achieved over a 10-year period. For the Ballona Creek Trash TMDL, the City successfully met the first compliance milestone established for September 2006 when a 20 percent trash reduction was to be achieved. To support this effort:

WPD conducted a study in 2001 to determine the different trash generation areas within the City of Los Angeles. The study took available datasets for trash collected from City-owned catch basins and projected the data spatially to identify geographically the areas of the City that generated proportionately more trash (*Figure 7-4*).

WPD developed a compliance strategy for the trash TMDL utilizing a two-pronged approach to protect the beneficial uses of the City's receiving waterbodies: (1) Implementation of institutional type controls (i.e., public education, street sweeping, enforcement, etc.); and (2) installation of structural trash control devices (i.e., catch basin inserts, catch basin opening screen covers, netting systems, hydrodynamic devices, etc.). To date, over 7,400 catch basins have been retrofitted with catch basins inserts (August 2007 count) and over 14,300 catch basins have been retrofitted with screen covers (October 2007 count).

On November 2, 2004, Los Angeles voters passed Proposition O with an overwhelming majority of 76% to provide funding for water quality improvements including TMDLs. The $500 million bond authorized the City of Los Angeles to fund projects that protect public health, capture stormwater for beneficial uses, and meet the Federal CWA through removal and prevention of pollutants entering City creeks, rivers, and beaches.

Figure 7-3
Proposed Locations of Low Flow Diversions for Marina del Rey Harbor Mothers' Beach and Back Basins Bacteria TMDL

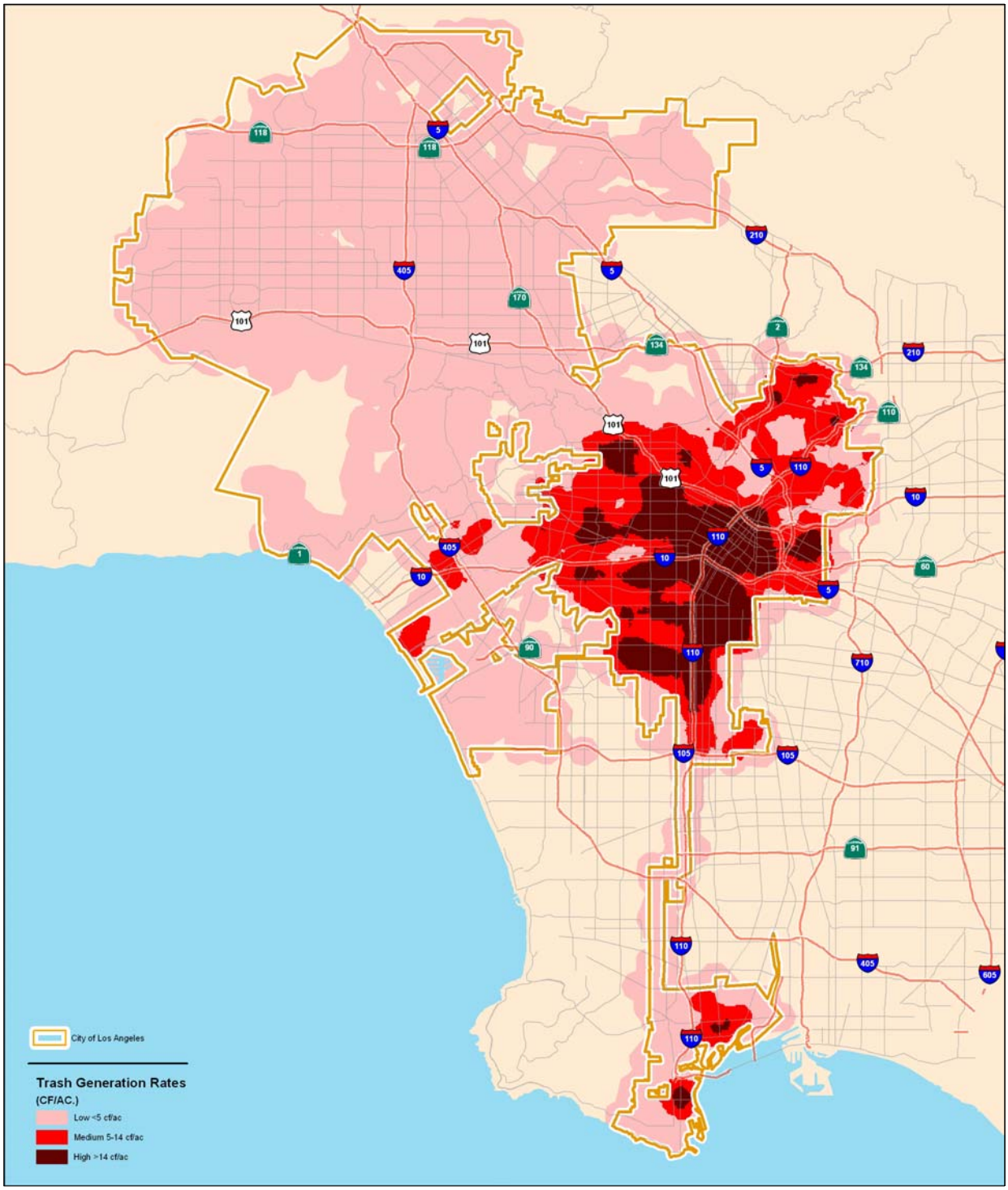

Figure 7-4
Prioritization of High Trash Generation Areas

Some 26 multi-benefit projects have been approved that address water quality, habitats, groundwater recharge, stormwater beneficial use and open space (*Figure 7-5* and *Appendix 7-1, Table 6*). Such projects include the Machado Lake Ecosystem Rehabilitation, Echo Park Lake Restoration, Santa Monica Bay Beaches Low-Flow Diversions Expansion, South Los Angeles Wetland, Cabrillo Beach Water Quality Improvement, Catch Basin Screens and Insert, and Strathern Pit Multi-Use and Water Recharge. In April 2007, ground was broken for the first of the approved projects, the Cesar Chavez Recreation Complex. Updates on the status of all Proposition O clean water bond projects may be found at: http://www.lapropo.org. *Appendix 7-2* details the Proposition O Project Selection Criteria, approved by the Boards of Public Works and used for selecting the projects listed in *Appendix 7-1, Table 6*. Since then, the selection criteria have been revised (*Appendix 7-3*) for possible use in the future.

7.5 Summary

Two TMDL Implementation Plans have been developed and a number of others must soon be developed to meet existing TMDL compliance requirements. The City is also actively implementing projects to support anticipated TMDL requirements, especially through Proposition O. Three common elements in these plans include:

- Use of an iterative approach to provide opportunity to adapt the plan to changing conditions or priorities;
- Use of a combination of non-structural and non-structural BMPs depending on local conditions; and
- Use of an integrated water resource approach that considers the water conservation benefits of stormwater use.

The Implementation Strategy for the WQCMPUR incorporates these common elements as part of a strategy for all Los Angeles area watersheds.

Figure 7-5
Proposed Locations and Drainage Areas of Proposition O Clean Water Bond Projects

References

7-1. City of Los Angeles and City of Santa Monica. 2005. Santa Monica Bay Beaches Bacteria Total Maximum Daily Load Implementation Plan for Jurisdictional Groups 2 and 3. June 16, 2005.

7-2. County of Los Angeles, City of Los Angeles, City of Culver City, and California Department of Transportation. 2005. Los Angeles County Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL Implementation Plan. October 31, 2005

Chapter 8
Watershed Management Plans

8.1 Introduction

According to the U.S. EPA (*Ref. 8-1*):

> "A watershed plan is a strategy and a work plan for achieving water resource goals that provides assessment and management information for a geographically defined watershed. It includes the analyses, actions, participants, and resources related to development and implementation of the plan. The watershed planning process uses a series of cooperative, iterative steps to characterize existing conditions, identify and prioritize problems, define management objectives, and develop and implement protection or remediation strategies as necessary."

Within the four watersheds of the Los Angeles region, there have been many watershed management plans developed. As such, it is important to understand what has been previously written to identify common goals and opportunity for synergy between these plans and the WQCMPUR. These plans, regardless of the stakeholder input and geographic areas, have common threads, which are to improve water quality and restore and create aquatic habitat. Accordingly, a selected list of these plans was reviewed and has been summarized to identify elements that support the purposes of the WQCMPUR and therefore should be incorporated into the WQCMPUR's Implementation Strategy.

Many of these plans have similar goals as the WQCMPUR, suggest appropriate multi-use BMPs, identify potential policy changes and identify funding possibilities. The WQCMPUR addresses new requirements, but builds on these other documents in order to take advantage of what has already been done in the region.

As stated in the above quote, a watershed management plan has many components that are applicable to the WQCMPUR. However, the following summary ultimately focuses on the action items and projects that will come out of each plan that are applicable to managing urban runoff, as these will ultimately assist in achieving water quality compliance.

8.2 Water Quality Components of Existing Watershed Management Plans

As one of the goals of the WQCMPUR is to create a consistent plan for water quality improvement throughout the watersheds, many of these common items will become recommendations in the Implementation Strategy. As can be seen in *Table 8-1*, the number of "implementation actions" or BMPs that are common elements between the plans are extensive. The plans, as a whole, provide a good starting point for useful technologies and effective BMPs.

Table 8-1
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Green Solutions												
Infiltration/Reduction of Runoff												
Infiltration BMPs (inf. basin, inf. trench, culvert, porous pavement, grass/gravel pavers, dry well, mulching, planters, rain gardens, retention grading, tree wells, permeable catch basin bottoms, etc.)	V	V	V		V	V	V	V	V	V	V	
Vegetated swale/basin or bioswale		V	V	V	V	V	V	V		V	V	V
Increase/protect public open space	V	V	V	V	V	V	V	V	V	V	V	V
Water quality components at golf courses											V	
Concrete removal in channels and restoration			V	V	V	V	V	V			V	V
Restore a Functional Riparian Ecosystem		V	V	V	V	V	V	V		V	V	V
Restore sensitive habitat			V	V	V	V	V	V			V	V
Tree Planting	V		V	V	V	V	V	V	V		V	V
Minimize disturbance of soils and vegetation			V	V	V	V	V		V		V	V
Green roofs			V	V	V	V	V		V		V	V
Minimize dry weather urban runoff discharges	V	V	V	V	V	V	V	V	V	V	V	V
Smart Irrigation	V	V	V		V		V	V	V	V		
Green Belt along power line transmission corridor	V	V	V		V		V	V	V	V		
Stormwater Use												
Cisterns/Rain Barrels	V	V	V	V	V	V	V	V	V	V		V
Onsite Storage and Use of Stormwater	V	V	V	V	V	V	V	V	V	V	V	V
Source Control												
Source control	V	V	V	V	V	V	V	V	V	V	V	V
Change to use non-toxic fertilizer, herbicide and pesticide	V		V	V	V			V		V		V

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Reduce runoff from animal holding areas	V		V	V	V	V		V	V			V
Localized Treatment												
Constructed Wetlands and bioretention	V	V	V	V	V	V	V	V	V	V	V	V
Dry Weather Diversions (or wet)	V		V			V	V		V			
Media Filtration	V	V	V	V	V	V	V		V		V	V
Local storage, treatment (chlorination) and use of stormwater	V	V	V	V	V	V	V		V		V	V
Surface runoff treatment for equestrian trails											V	
Implement water quality treatment at multiple scales to maximize efficiency	V		V	V	V	V	V	V	V	V	V	V
Develop "treatment terraces" within the channel to treat stormwater flows that "daylight" or surface in the River.	V	V	V	V	V	V	V		V		V	V
Provide buffers along sensitive water bodies	V	V	V	V	V	V	V		V		V	V
Daylight historic streams to restore wetlands	V	V	V	V	V	V	V		V		V	V
Increase planting within the LA River and Compton Creek	V	V	V	V	V	V	V		V		V	V
Regional Solutions												
Regional Groundwater Recharge (at Spreading Basins)	V	V	V	V		V	V				V	
Treatment and Discharge at Urban Runoff Plants; End of Pipe Treatment	V	V		V						V		
Treatment and Reuse at Urban Runoff Plants	V	V		V	V			V		V		
Storage (multi-use retention basin, extended detention basin, underground retention/infiltration, and underground detention)	V	V	V	V	V	V	V	V	V	V	V	V

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Properly conduct "controlled burns" in open space areas to reduce large fires.	V	V	V	V	V	V	V		V	V	V	V
Safe Drinking Water Association Projects	V	V	V	V	V	V	V		V	V	V	V
Groundwater Remediation	V	V	V	V	V	V	V		V	V	V	V
Treatment Options												
In-line treatment systems in storm drains and channels	V	V	V	V	V	V	V	V	V		V	V
Trash and debris capture, either Inline or End of Pipe (vortex separators, trash nets, Continuous Deflection Separator (CDS) units, etc)	V	V	V	V	V	V	V		V		V	V
Catch basin inserts	V	V	V	V	V	V	V		V	V	V	V
Biological treatment of stormwater	V			V	V	V		V	V			V
Oil absorbing bilge pads to capture and recycle used oil from boats	V			V	V	V		V	V			V
Onsite treatment facilities at industrial sites	V			V	V	V		V	V			V
Education and Outreach												
General Public Education												
Public Education and Outreach (k-12, coordinated between jurisdictions)	V	V	V	V	V	V	V	V	V	V	V	V
Reduce non-point source pollutants through public education	V	V	V	V	V	V	V	V	V	V	V	V

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Develop and implement 5-year urban runoff public education strategy	V	V		V	V	V	V		V		V	V
Catch basin/storm drain stenciling program	V	V	V	V	V	V	V		V		V	V
Public signage	V			V		V	V	V		V	V	V
Industry Education												
Implement general good housekeeping practices by commercial and industrial facilities and construction activities.			V	V	V	V	V	V	V	V	V	V
Industry/BMP/Activity/Pollutant/Community specific BMP outreach	V		V	V	V	V		V			V	V
Planning and Design BMPs												
Street Planning and Design												
Green the Neighborhoods	V	V	V	V	V	V	V		V		V	V
Modification of streets to reduce paved areas and retain stormwater	V	V	V	V	V	V	V		V		V	V
Incorporate green streetscapes and public landscapes	V	V	V	V	V			V	V		V	
Minimize impervious areas and directly connected impervious surfaces	V	V	V	V	V	V	V	V	V	V	V	V
Street Cleaning												
Street and storm drain maintenance	V	V	V	V	V	V	V		V		V	V
High-tech or more efficient street cleaners	V	V	V	V	V	V		V				V
Other												
Place rail lines underground for more river parks	V	V	V	V	V	V	V	V	V			V

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Non-motorized crossings of the LA River	V	V	V	V	V		V	V			V	V
Conjunctive use of groundwater basin for enhanced storage during wet periods for use during dry periods.	V	V	V	V	V	V		V				V
Expand reclaimed water infrastructure	V	V	V	V	V	V		V				V
Sediment Management												
Improve sediment management - slow & filter runoff, erosion control measures	V	V	V	V	V	V	V		V		V	V
Evaluate and establish priorities for erosion control and remediation projects to remove legacy pollutants and implement priority projects.	V	V	V	V	V	V	V		V		V	V
Encourage infill development	V	V	V	V	V	V	V		V		V	V
Waste Collection												
Trash Collection												
Increase number of public receptacles in high priority areas (trash, cigarette, recyclable containers)	V	V	V	V	V	V	V		V		V	V
Increase trash removal prior to forecast of large storms	V	V	V	V	V	V	V		V		V	V
Expand on green waste (yard waste, etc) collection	V	V	V	V	V	V	V		V		V	V
Litter and Pet Waste												
Increased litter removal	V	V	V	V	V	V	V		V		V	V

Table 8-1 (Continued)
Implementation Actions in Existing Plans

Implementation Actions Description of Recommendations	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Provide pet waste collection along parks and trails	V	V	V	V	V	V	V		V		V	V
Other												
Ensure that sufficient pump out facilities are available, maintained, and used at existing or new moorage facilities.	V		V	V	V	V	V				V	V
Training												
Employees												
Ensure adequate staffing and training in local municipalities and agencies for implementation of storm water/urban runoff management.			V	V	V	V	V	V	V		V	V
Support NPDES program - inspections, training of staff/number of staff, legal support, etc.			V	V	V	V	V	V	V		V	V
Public												
Septic systems- inspections, correct malfunctioning tanks, provide alternatives/guides to owners, look at groundwater movement	V			V								
Maintenance												
Monitor and clean out pollutants that accumulate in structural and non-structural BMPs	V		V	V	V	V		V	V			V

Table 8-2 summarizes recommended policy changes. Several plans have similar recommended policy changes. The plans, as a whole, provide a road map for policy change, which the WQCMPUR will enhance through additional specific policy changes. The following are the key common elements between plans:

- Change zoning and land use to accommodate runoff management options;
- Improve communication between jurisdictions;
- Integrate watershed planning with water supply, natural resources, land use, and transportation plans;
- Expand the SUSMP program requirements; and
- Change roadway improvements to include vegetated medians, buffers and / or parkways, and porous pavement.

Table 8-3 summarizes the funding recommendations that were identified in the plans. As with the recommended implementation actions and policy changes, there are several proposed funding sources that are common in the plans:

- Bonds / Propositions;
- Taxes;
- Federal funding sources;
- Grants from federal, state, and nongovernmental agencies;
- Reallocation of jurisdictional budgets; and
- SWRCB and RWQCB funds.

While the plans as a whole discuss a great deal of capital funding options, they do not fully address operation and maintenance costs. Ensuring that the implemented water quality improvement projects receive consistent operation and maintenance funds is crucial to the success of the program.

8.3 Description of Existing Watershed Management Plans

8.3.1 Bay Restoration Plan, Santa Monica Bay Restoration Project, 1994

The Bay Restoration Plan was prepared by the Santa Monica Bay Restoration Project (SMBRP), and it is a comprehensive plan of action for Bay protection and management that address critical environmental problems facing the Bay such as stormwater and urban runoff pollution, habitat loss and degradation, and public health risks associated with seafood consumption and swimming near storm drain

outlets. It also outlines specific programs to address the environmental problems facing the Bay and identifies implementers, timelines, and funding needs.

The Plan lists more than 30 priority actions to control major sources of pollution to the Bay. Since 1992, the Project has secured $8 million in bond funding for pollution control projects such as dry-weather runoff diversions from seven storm drain outlets along Santa Monica Bay beaches, a state-of-the-art urban runoff treatment and reclamation facility in Santa Monica (Santa Monica Urban Runoff Recycling Facility (SMURRF)), and many devices to capture trash, oil, grease, and sediments in storm drains throughout the watershed.

In March of 2000, California voters passed Proposition 12, the Safe Neighborhood Parks, Clean Water, Clean Air, and Coastal Protection Bond Act. Included in the bond measure was $25 million specifically for projects within Santa Monica Bay. To date, the Project has funded almost $3 million for projects that reduce pollutants entering the Bay (*Ref. 8-2*).

8.3.2 Los Angeles River Master Plan, 1996

In 1996, the Los Angeles River Master Plan was prepared by the County of Los Angeles, Department of Public Works and adopted by the Los Angeles County Board of Supervisors with help from a consortium of agencies, municipalities, environmental groups, and individuals. The plan examined the mainstem of the river, reach by reach, and Tujunga Wash tributary to identify ways to revitalize the publicly-owned rights-of-way.

As of October 2007, the Los Angeles River Master Plan is in implementation phase. The Master Plan Advisory group continues to meet periodically and subsequent guidelines are being issued for signage and landscaping. More than one hundred projects are listed on Los Angeles County Department of Public Works. Majority of the projects are addition of new bikeways, construction of greenways, improving river access roads, and general aesthetic enhancement projects (*Ref. 8-3*).

8.3.3 Common Ground: from the Mountains to the Sea: Watershed and Open Space Plan: San Gabriel and Los Angeles Rivers, 2001 & 2002

The San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy (RMC) and the Santa Monica Mountains Conservancy (SMMC) joined together to create "Common Ground: From the Mountains to the Sea: San Gabriel and Los Angeles Rivers Watershed and Open Space Plan." The plan sets forth a detailed list of guiding principles, provides general characteristics of the watershed, and includes project selection criteria from the SMMC's work program. It falls short of identifying actual project selection criteria, specific projects to be implemented or budgets (*Ref. 8-4*).

8.3.4 Santa Monica Sustainable City Plan, 2001

A comprehensive update process was begun in 2001 to improve and expand the Sustainable City Program and to begin addressing issues related to sustainability in the community. The program set new goals for the future. The Sustainable City Plan (SCP) adopted by City Council in February 2003, and updated in October 2006 includes goals for the City government and all sectors of the community, to conserve and enhance the local resources, safeguard human health and the environment, maintain a healthy and diverse economy, and improve the livability and quality of life for all community members in Santa Monica (Santa Monica, 2006).

SCP is broad in concept, and only a portion of goals directly relate to watershed protection: (1) SM Bay beach closures – 0 days target for dry weather, 3 days target for wet weather, and(2) Urban runoff – upward trend of permeable land (*Ref. 8-5*).

8.3.5 Arroyo Seco Watershed Restoration Feasibility Study, 2002

The California Coastal Conservancy and Mountains Recreation and Conservation Authority funded the "Arroyo Seco Watershed Restoration Feasibility Study" that was prepared by North east Trees and the Arroyo Seco Foundation. This study characterizes the ecosystem health, physical and cultural characteristics of the watershed; makes recommendations for future studies and technical analyses. Proposed projects are sorted by stream reach and identify the watershed goals to be fulfilled, years to complete, and across a large range of costs. The plan deals with economics and governance structures (*Ref. 8-6*).

8.3.6 Ballona Creek Watershed Management Master Plan, 2004

In May 2001, the State Water Resources Control Board awarded a grant of $200,000 for the development of a Ballona Creek Watershed Management Plan (BCWMP) to a partnership consisting of Ballona Creek Renaissance (BCR), the Watershed Management Division of the Los Angeles County Department of Public Works, and the Santa Monica Bay Restoration Project. The BCWMP was completed in September 2004. The broad goal of the Plan was to: "Set forth pollution control and habitat restoration actions to achieve ecological health." The plan:

- Identified target areas for source control of pollutants;
- Identified habitat / open space restoration potential in the watershed and potential benefits for improving water quality if implemented;
- Developed measurable water quality improvement and habitat restoration goals;
- Selected and prioritized best management practices (BMPs) that are most cost-effective for achieving the goals;
- Developed a community-based watershed monitoring plan to track environmental conditions and evaluate plan implementation; and

- Identified and obtained commitment from responsible parties for implementation of the plan.

The BCWMP served to coordinate across jurisdictions efforts to improve water quality, habitat and open space in the Ballona Creek Watershed and identify a series of actions to be implemented by individuals, neighborhoods, organizations, cities, and local, state, and federal agencies. Twenty-three water quality improvement projects are listed as complete or under construction (*Ref. 8-7*).

8.3.7 Dominguez Watershed Management Master Plan, 2004

The Dominguez Watershed Management Master Plan (DWMMP), completed in April 2004, was prepared by County of Los Angeles Department of Public Works Watershed Management Division. The DWMMP is a comprehensive document to assist stakeholders in the protection, enhancement, and restoration of the environment and beneficial uses of the Dominguez Watershed. The plans goals include:

- Assess, identify, and addresses watershed issues;
- Involve public by identifying their issues of importance;
- Protect, preserve, restore, and enhance the watersheds beneficial uses and ecological health;
- Identify funding opportunities; and
- Develop an effective approach to meeting water quality regulations for the watershed.

The document does not specify any implementation projects to be completed. The document serves more as an action plan that calls for use of structural and source control BMPs along with operation and maintenance and habitat enhancement.

Eighteen projects are listed as action items associated with the goal to protect and enhance water quality. The projects range from creating wetlands to treating urban water runoff to public outreach programs. The projects reduce/eliminate impairments and impairment contributing factors (*Ref. 8-8*).

8.3.8 City of Los Angeles Water Integrated Resources Plan, 2004

The Water Integrated Resources Plan (Water IRP) was prepared by the City of Los Angeles Department of Public Works Bureau of Sanitation and Department of Water and Power in order to meet the Clean Water Act (CWA) requirements that cities update their facility plans. The purpose of the Water IRP was to develop and implement an integrated resource planning process that addresses the City's water resources and wastewater/ biosolids collection, treatment, recycling, and disposal practices though

the year 2020 that explicitly recognizes the complex relationships that exist among all of the City's water resources activities and functions.

With respect to stormwater element of the Water IRP, the preferred alternative establishes a target of treating and discharging, diverting, or infiltrating a portion of the runoff. The goals for managing runoff (managing refers to both reducing the volume of runoff and / or reducing the amount of pollutants in the runoff) includes:

- **Dry weather**: Manage 42% of the dry-weather (41 mgd).

- **Wet weather**: Manage 47% of the wet weather urban runoff (791 mg per storm event)

In response to this plan, the City Council adopted a resolution calling for City Departments to implement a number of measures to manage urban runoff:

- Direct Public Works to review SUSMP requirements to determine ways to require where feasible on-site infiltration and / or treat / beneficial use, rather than treat and discharge, including in-lieu fees for projects where infiltration is infeasible (e.g., similar programs developed by City of Santa Monica).

- Direct Building and Safety to evaluate and modify applicable codes to encourage all feasible BMPs for maximizing on-site capture and retention and / or infiltration of stormwater instead of discharge to the street and storm drain, including porous pavement.

- Direct Public Works and Department of Planning to evaluate the possibility of requiring porous pavements in all new public facilities in coordination with LA River Revitalization Master Plan, and large developments greater than 1 acre. Program feasibility should consider slope and soil conditions.

- Direct Department of Planning to evaluate ordinances that would need to be changed to reduce the area on private properties that can be paved with non-permeable pavement (i.e., change / support landscape ordinance and encourage the use of permeable pavement).

- Direct Public Works to evaluate and implement integration of porous pavements into the sidewalks and street programs where feasible. For example, conduct pilot program in East Valley, taking into consideration soil conditions and Proposition project criteria, as well as along the future LA River Revitalization Master Plan.

- Direct Public Works and DWP and Department of Recreation and Parks to prepare a concept report and determine the feasibility of developing a power line easement demonstration project (for greening, public access, stormwater management, and groundwater replenishment).

- Direct Public Works and DWP to work with LAUSD to determine the feasibility of developing projects for both new schools and for retrofitted schools, as well as IRP

Implementation Strategy government/city-owned facilities with stormwater management BMPs. [Provide wet weather runoff storage (cisterns) to beneficially use wet weather runoff for irrigation. Also, schools and government properties to reduce paving and hardscape and add infiltration basins to allow percolation of wet weather runoff into the ground where feasible.] As appropriate, integrate with LAUSD's new schools development program.

- Direct Public Works, General Services, and Recreation and Parks to identify sites that can provide onsite percolation of wet weather runoff in surplus properties, vacant lots, parks/open space, abandoned alleys in East Valley, and along the LA River in the East Valley where feasible. Program feasibility should consider slope and soil conditions.

- Direct Public Works and General Services and the Department of Transportation (DOT) to maximize unpaved open space in City-owned properties and parking medians through using all feasible BMPs and by removing all unnecessary pavement.

- Direct Public Works to include all feasible BMPs in the construction or reconstruction of highway medians under its jurisdiction.

- Direct Public Works to coordinate with the Million Trees LA team on identifying potential locations of tree plantings that would provide stormwater benefit, with consideration of slope and soil conditions

- In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system, or urban runoff plant for treatment and/or beneficial use. Coordinate with the Department of Recreation and Parks. Coordinate and evaluate the impact with the LA River Master Plan.

- In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from inland creeks and storm drains that are tributary to the Los Angeles River to wastewater system or constructed wetlands or treatment/retention/infiltration basins with consideration for slope and topography.

The City Departments identified in these measures are currently working to conduct the required evaluation studies and execute the required projects. These efforts are led by the Wastewater Engineering Services Division of the Bureau of Sanitation (*Ref. 8-9 and 8-10*).

8.3.9 Compton Creek Watershed Management Plan, 2005

The Compton Creek Watershed Management Plan (CCWMP) was completed in July 2005, and prepared by the Los Angeles & San Gabriel Rivers Watershed Council with the assistance of EIP Associates and Heal the Bay (*Ref. 8-11*). The CCWMP introduces the watershed concept to the people that reside, do business, and provide services within the Compton Creek Watershed. The Compton Creek WMP was developed to accomplish the following goals that relate to water quality:

- Improve water quality;
- Improve wetland and riparian habitat quality and quantity;
- Maintain flood protection; and
- Optimize water resources to reduce dependence on imported water.

Outlined in the CCWMP is a table of potential projects that, upon completion, could help achieve the overall objectives of the CCWMP.

8.3.10 Greater Los Angeles County Integrated Regional Water Management Plan, 2006

The Integrated Regional Water Management Plan (IRWMP) is a regional planning effort that was a product of Proposition 50, Chapter 8, which is general State bond, which required the IRWMP as a condition to state funding. The IRWMP creates a blueprint for achieving quantifiable targets for improving water quality and water supply, enhancing habitat and open space / recreation, and sustaining infrastructure for local communities in the Greater Los Angeles County Region.

One of the objectives of the IRWMP is to coordinate the prioritization of regional projects with multi benefits. Included in the plan are projects submitted by stakeholders; these projects address water supply, water quality, and open space / habitat / recreation benefits. Most of the projects that IRWMP supports provide multiple benefits in line with the plan's goal to "implement multiple objective planning and projects."

For the first stage of IRWMP implementation funding, 13 projects were submitted for Proposition 50 grant funding including three City of Los Angeles projects that are now in the implementation phase. In April 2007, the state awarded $25 million for these projects. Of this amount, $10 million was awarded to the City of Los Angeles for three projects that are currently being implemented. Urban runoff and stormwater quality improvements are a goal of many of these projects (*Ref. 8-12*). Under Proposition 84, $1 billion in additional state funds is anticipated for IRWMP projects.

8.3.11 LA River Revitalization Master Plan, 2007

The Los Angeles River Revitalization Master Plan (LARRMP) was prepared by the City of Los Angeles, Department of Public Works-Bureau of Engineering and the Department of Water and Power. The goal of the LARRMP is to create a 20-year plan for development and management of the Los Angeles River. The final plan, which was completed in April 2007, includes the following goals:

- Improve the environment, enhance water quality, improve water resources, and improve the ecological functioning of the River.
- Provide public access to the River.

- Provide significant recreation space and open space, new trails, and improve natural habitats to support wildlife.

- Preserve and enhance the flood control features of the River.

- Foster a growth in community awareness of the Los Angeles River, and pride in the Los Angeles River.

- Establish a River Improvement Overlay (RIO), which is a district that requires certain design standards for all new developments within that district, specifically addressing environmentally sensitive urban design, land use and development guidelines such as building orientation, parking location, landscape design, and stormwater mitigation. This RIO will create economic development opportunities to enhance and improve River-adjacent communities by providing open space, housing, retail spaces such as restaurants and cafes, educational facilities, and places for other public institutions.

The plan involves an adaptive, phased approach with near (10-15 years) and long-term goals (20-50 years) (*Ref. 8-13*).

8.3.12 Green Visions for 21st Century Southern California (Ongoing)

In 2003, a partnership between Southern California's state land conservancies and the University of Southern California's Center for Sustainable Cities and GIS Research Laboratory, was forged to create a visionary plan and practical planning tools to promote habitat conservation, watershed health, and recreational open space. The plans decision support tools will help to nurture a living green matrix for southern California. The goals of the Plan are to:

- Protect and restore natural areas;

- Restore natural hydrological functions;

- Promote equitable access to open space; and

- Maximize community support via multiple-use facilities.

The online planning tools are available to anyone in the region. The program has funds from state bonds for disbursement to local projects (*Ref. 8-14*).

Table 8-2
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Compton Creek Watershed Mgmt Plan (2005)	Water IRP (2004)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Green Solutions												
Include stormwater BMPs in all new parks									V	V		
Pubic agencies and districts should implement asset management programs which will preserve and protect the environment.												
Modify General Plans to include water quality elements.								V				
Adopt a watershed-wide approach to water quality treatment that emphasizes treatment "at the source" and incorporates permeable surfaces.												
Support annual Coastal Cleanup Day and Adopt-a-Beach	V											
Develop sediment quality objectives and site-specific cleanup levels necessary to support beneficial uses of Santa Monica Bay.	V											
Create sponsorship program for natural resources								V				
Planning and Design												
Street Planning and Design												
Changes to design of pedestrian segment of roadways to include green solutions						V						
Changes to roadway improvements - include vegetated medians, buffers and/or parkways, porous pavement						V	V		V	V		

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Compton Creek Watershed Mgmt Plan (2005)	Water IRP (2004)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Plans and Guidelines												
Develop sub-watershed plans that are consistent with watershed based plans						V						
Develop guidelines specific to Ballona Creek Watershed						V						
Promote incorporation of storm water/urban runoff management into the Local Coastal Plan.	V											
Implementation												
Have the Dept. of City Planning oversee implementation of the RIO and Community Plan Updates												
Determine the best ways to implement plans - create new entities vs. existing agencies												
Projects should be prioritized and implemented based on developed project selection criteria												
Utilize applied scientific research to guide public policy						V						
Target specific industries such as metal fabrication, auto, metal scrap yards for specific TMDLS								V				
Coordination												
Jurisdictions and Agency Coordination												
Improve communication between jurisdictions		V				V		V				

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Coordinate open space planning, land acquisition and management among jurisdictions						V						
Coordination with Federal and State Agencies												
Need for partnerships									V			
Establish entity to promote restoration and provide public education forum									V			
Inter-Discipline Coordination												
Integrate watershed planning with water supply, natural resources, land use, and transportation plans						V		V		V		
Develop guidelines for coordinating water quality regulations with land use, resource protection and management, and other regulatory functions on a watershed basis.	V											
Information Coordination												
Have GIS database that includes multiple agencies data (state and local)						V						
Create clearinghouse for Ballona Creek Watershed information						V						
Implementation Coordination												
Joint Powers Authority (JPA) or Council of Governments (COG) - City, County and Corps working together to Implement the regional and subregional plans/projects												

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Sign a MOU between LAC-DPW and the City of Los Angeles authorizing cross-jurisdictional entry into storm drains to investigate spill incidents.	V											
Develop committee to track progress of projects and policies								V		V		
Ordinances and Codes												
Land Use												
Land use ordinances.	V											
Land use ordinances to require native landscaping												
Changes to zoning/land use to accommodate runoff management options		V	V					V		V		
Develop and adopt policies to redo the impacts of transportation activities on pollutant loading in storm water runoff.	V											
Infiltration, Conservation, Habitat												
Evaluate and modify codes to encourage on-site capture and retention and /or infiltration								V		V		
Ordinances to reduce area on private properties that can be paved with impervious pavement								V		V		
Ordinances to promote water conservation and efficiency	V											
Increase policies and ordinances to protect wetlands and riparian areas						V						
Develop "Model City Codes and Ordinances"							V					

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Pet Waste												
"Pooper-scooper" ordinance strengthening									V			
Implement measures that prevent discharges of pollutants into marina waters.	V											
Establish ordinance against pigeon feeding									V			
Incentives												
Rewards												
Implement incentives to encourage new and existing developments to detain stormwater onsite to reduce runoff			V			V						
Provide incentives for on-site treatment and reuse of runoff						V						
Economic incentives to reduce toxic discharges to sewer and storm drain systems.	V											
Economic incentives or rebates to promote native landscaping and conservation measures (smart irrigation)												
Pursue policies or incentives to reduce the spillable inventory of hazardous materials in the Santa Monica Bay watershed.	V											
Develop a monitoring and credit program with Raymond Basin Management Board and regulatory agencies.					V							
Incentives for product substitution (e.g. alternative packaging materials)									V			

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Encourage native planting in all public sector projects (drought tolerant)									V			
Public recognition for conservation efforts									V			
Fines												
Create fines for runoff									V			
Enforcement actions	V								V			
Existing Program Expansion												
SUSMP												
Expand the SUSMP Program Requirements						V		V	V	V		
CEQA												
Expand CEQA: to look at cumulative effects of all projects in the proposed project area						V			V			
Develop and adopt policies which require all California CEQA compliance documents and site drainage designs to address potential impacts.	V		V									
NPDES												
Have NPDES permits issued on a watershed basis						V			V			
Revise current NPDES permits and incorporate new program elements.	V											
Coordinate all components of NPDES with other regulatory functions on a watershed basis.	V											

Table 8-2 (Continued)
Recommended Policy Changes in Existing Plans

Policy Changes Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	the Mountains to the Sea (2001)	Sustainable City Plan (2001)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Baldwin Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	Los Angeles River Revitalization Master Plan (2007)	Green Visions for 21st Century Southern California (ongoing)
Other												
Oversee development/implementation of mass emissions approach.	V											
Establish initial mass loading discharge performance goals for a set of pollutants of concern	V											
Support the cooperative efforts led by EPA and participated in by the State Storm Water Task Force and environmental groups on investigating the necessity for and feasibility of developing effluent limits for storm water runoff. Create a local working group.	V											
Adapt LA River Landscape Guidance to Compton Creek	V											
Monitoring/Inspection												
Monitor compliance of point-sources of pollution regularly					V							
O&M												
Create provisions for long term O&M					V							

Table 8-3
Funding Recommendations in Existing Plans

Funding Recommendation Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001d)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Vision for 21st Century Southern California (Ongoing)
Awarded Funds												
Grants from federal, state, and nongovernmental agencies	V		V		V	V	V	V	V	V	V	
Propositions	V		V		V	V	V	V		V	V	
Bonds			V				V	V		V	V	
Budget Funds												
Reallocation of jurisdictional budgets							V				V	
Disbursements from taxes							V			V	V	
Fees							V	V		V		
Benefit assessments										V		
Trust accounts and/or funds.			V				V					
Loans												
Low interest loans from federal and state agencies.							V		V			
Section 108 loan guarantees											V	
Programs												
Implement "Adopt a Waterway Program"							V					
Adopt a mitigation banking policy							V					

Table 8-3 (Continued)
Funding Recommendations in Existing Plans

Funding Recommendation Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001d)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Vision for 21st Century Southern California (Ongoing)
Other Agencies Funds												
SWRCB and RWQCB funds							V		V		V	
Federal funding sources						V			V	V	V	
California Resources Agency						V			V			
Department of Conservation						V			V			
Metropolitan Water District (MWD)									V		V	
State Funding Sources									V	V		
US Army Corps of Engineers					V							
Wildlife Conservation Board									V			
Department of Transportation									V			
Environmental Enhancement and Mitigation Program									V			
Southern California Wetlands Recovery Project									V			
Integrated Waste Management Board									V			
Bay-Delta Authority (CALFED)									V			
Private Sources			V		V	V						
Redlodge clearinghouse						V			V			
National Fish and Wildlife Foundation						V			V			
Urban Forests Ecosystem Initiative						V			V			
California Watershed Network						V			V			
Cyber-Sierra						V			V			
Private loans											V	

Table 8-3 (Continued)
Funding Recommendations in Existing Plans

Funding Recommendation Description of Recommendation	The Santa Monica Bay Restoration Plan (1994)	Los Angeles River Master Plan (1996)	Common Ground: from the Mountains to the Sea (2001)	Santa Monica Sustainable City Plan (2001d)	Arroyo Seco Watershed Restoration Feasibility Study (2002)	Ballona Creek Watershed Mgmt Plan (2004)	Dominguez Watershed Mgmt Master Plan (2004)	Water IRP (2004)	Compton Creek Watershed Mgmt Plan (2005)	IRWMP (2006)	LA River Revitalization Master Plan (2007)	Green Vision for 21st Century Southern California (Ongoing)
Private investment											V	
Santa Monica Bay Restoration Foundation	V											
Local sponsors			V		V							
Corporate entities			V									
Partnerships and/or sponsorships.							V					
California Coastal Conservancy												
Santa Monica Bay Restoration Commission												

8.4 Conclusions

The following points are derived from the review of these other watershed management plans:

- Water quality compliance is discussed in several of these plans; however, it has not been the focal point of these plans.
- These existing master plans cover many of the same issues that the WQCMPUR covers.
- It is clear that funding and sources of funding needs to be further addressed, especially when considering operation and maintenance costs.

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Chapter 9
Implementation Strategy

9.1 Introduction

The WQCMPUR Implementation Strategy is the long-term integration of watershed-specific management plans with general guidelines and technical, physical, and procedural methods to achieve water quality goals. The water quality goals for each of the four watersheds in the Los Angeles area are defined by the NPDES MS4 Permit and the many existing TMDLs or ones that will be developed in the near future.

The WQCMPUR Implementation Strategy is divided into three initiatives that are closely related (*Table 9-1*):

- The **Water Quality Management Initiative** describes how Water Quality Management Plans for each of the City's four watersheds and TMDL-specific Implementation Plans will be developed to ensure compliance with water quality regulations. While the WQCMPUR is a high level planning tool providing the strategic guidelines, the Water Quality Management Plans and TMDL-specific Implementation Plans will select and prioritize the BMPs for implementation in the watersheds. BMP selection will include structural BMPs (e.g., green and natural solutions, integrated water resources approach), as well as institutional BMPs.

- The **Citywide Collaboration Initiative** recognizes that urban runoff management and urban (re-)development are closely linked, requiring collaboration of many City agencies. This initiative requires the development of City policies, guidelines and ordinances for green and sustainable approaches for urban runoff management with short and long-term goals:

  - **Short-term**: compliance with water quality regulations in adopted TMDLs through structural BMPs using green and sustainable solutions and institutional BMPs; and

  - **Long-term**: development of a green and sustainable Los Angeles that gradually reduces future pollution of urban runoff.

- The **Outreach Initiative** promotes public education and community engagement with a focus on preventing urban runoff pollution. This initiative also has short and long-term aspects:

  - **Short-term**: outreach that targets specific pollutants and polluted areas to assist with compliance with adopted TMDLs.

- **Long-term**: outreach to promote environmental stewardship among all in the City.

The WQCMPUR Implementation Strategy specifies "recommended activities" for each of these initiatives that will help to achieve or is necessary to achieve water quality goals. In the discussion of each initiative or sub-initiative, recommended activities are prioritized using a two-tiered approach, as follows:

Â "High priority recommended activities" have been included in the Implementation Strategy Action Plan, *Section 9.8*, with the identification of the lead City agency and a proposed timeline for completion.

Â "Other recommended activities" have not been included in the Implementation Strategy Action Plan because they may be less immediately urgent and/or they may need further development and evaluation.

As discussed in *Section 9-8*, implementation of high priority recommended activities depends on the availability of financial resources for the Watershed Protection Program. The WQCMPUR does not need an Environmental Impact Report. California Environmental Quality Act requirements will be evaluated on an individual basis for specific projects.

9.2 Water Quality Management Initiative

The City will continue with the implementation of projects that are already included in the Capital Improvement Program (CIP). *Appendix 9-1* lists the projects that are funded through Proposition O, as well as other projects (mostly related to flood control) that are funded through the Stormwater Pollution Abatement Fund.

As TMDLs will be included in the NPDES MS4 Permit, the Water Quality Management Initiative is to address the implementation of adopted and future TMDLs and other water quality regulations. This initiative consists of the following three subinitiatives, *Figure 9-1*:

Â Subinitiative 1 - Water Quality Management Plans;

Â Subinitiative 2 - Jurisdictional Partnerships; and

Â Subinitiative 3 - Research and Evaluation.

Subinitiative 1 - Water Quality Management Plans

Four Water Quality Management Plans will be developed under this subinitiative - one for each watershed: Ballona Creek, Los Angeles River, Dominguez Channel, and Santa Monica Bay. These plans will address the requirements associated with adopted TMDLs and consider expected future TMDL requirements. Therefore, Water Quality Management Plans will establish a quantitative nexus between the selected combination of BMPs and the attainment of water quality standards and wasteload

allocations that are specified in TMDLs. The development of Water Quality Management Plans will use various tools and resources such as Geographic Information Systems (GIS), water quality modeling, technical reports developed by various organizations, and field and desk-top investigations of potential locations for

Table 9-1
Key Elements of the Implementation Strategy

Initiative	Subinitiative	Purpose
Water Quality Management	Water Quality Management Plans	Establish four Water Quality Management Plans that include NPDES MS4 Permit and TMDL-specific requirements
	Jurisdictional Partnerships	Establish agreements within each watershed to support Water Quality Management Plan implementation
	Research & Evaluation	Continue water quality monitoring, pilot studies and research to support Water Quality Management Plan implementation
Citywide Collaboration	General Plan Update	Guide establishment of citywide policies for urban runoff management towards compliance with NPDES MS4 Permit
	Green Solutions	Implement low impact development activities to promote green landscapes, stormwater use, and multi-benefit projects
	Runoff Management	Implement a runoff management program that increases infiltration and reduces pollutant loading and peak flows
	Source Reduction	Reduce waste and toxics material generation at the source and improve inspection and enforcement activities
Outreach	Pollutant-Specific Outreach	Develop outreach for specific pollutants, but integrate education messages/materials where possible
	Stormwater NPDES and TMDLs Outreach	Inform general public, community, business and environmental leaders and organizations about meeting NPDES MS4 Permit and TMDL requirements
	School Outreach	Continue to enhance school education programs, teacher training and community linkages
	Business Outreach	Target appropriate businesses to address most significant pollutant concerns
	Employee Training Program	Review training materials and evaluate effectiveness of program
	Mass Media Advertising	Continue advertising programs; revise or enhance as needed
	Stakeholder Involvement	Coordinate stakeholder involvement in City activities including Proposition O project implementation
	Collaboration with Other Programs	Continue collaboration with non-profits, government agencies and other organizations to support TMDL implementation efforts

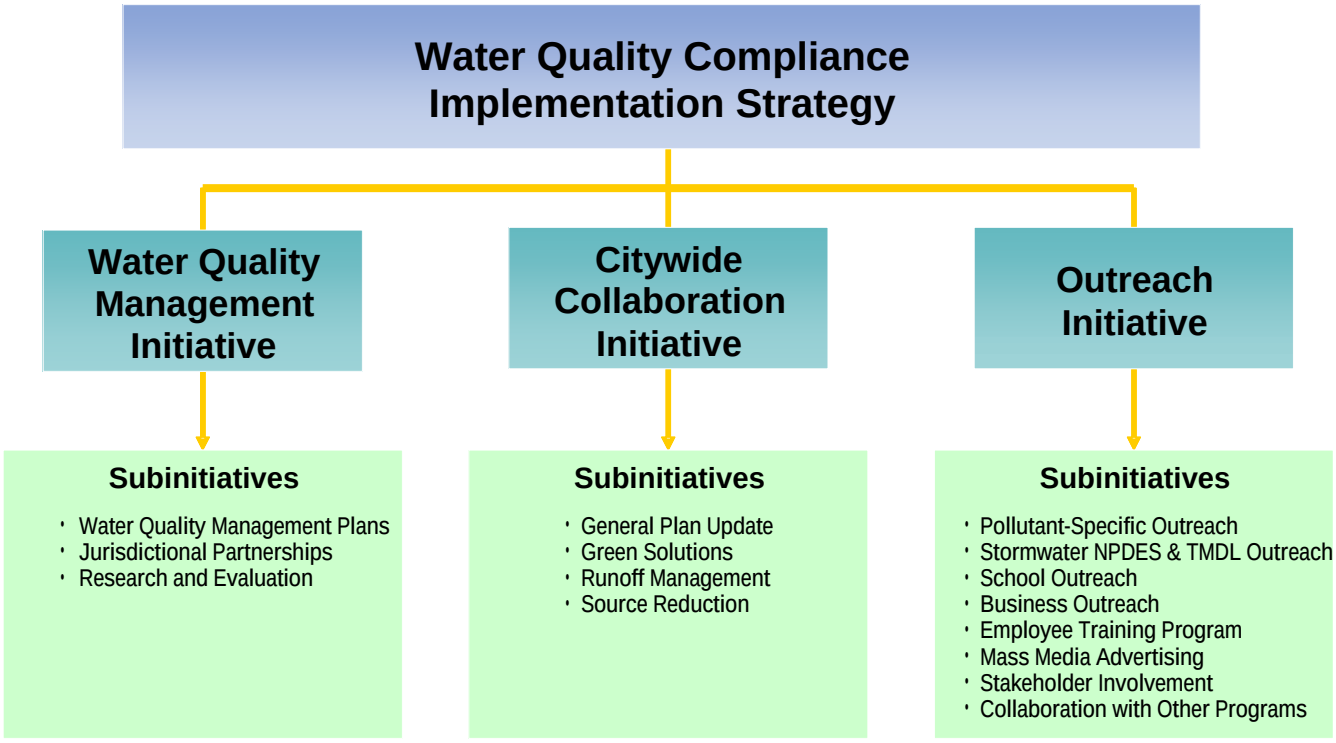

Figure 9-1
Key Strategy Elements

urban runoff management projects (e.g., *Ref. 9-1*). Water Quality Management Plans will be periodically reviewed and, where needed, refined to incorporate new data and information as it becomes available.

Development of each Water Quality Management Plan is a multi-step process that includes the following elements:

Characterization of the Watershed
Each Water Quality Management Plan will characterize the watershed with respect to flow, water quality, land use, soil infiltration capabilities, and jurisdictional and property ownership. Much of this information has already been included in existing watershed management and other regional plans and will be used for developing the Water Quality Management Plans.

Development of Potential Strategies to Manage Urban Runoff
The development of optimal strategies for managing urban runoff will vary among watersheds based on unique watershed characteristics. Key factors that are part of the development of a watershed-specific strategy include:

- **TMDL Requirements** – Determine the reduction of pollutant loadings to impaired waters in the watershed as required for meeting the wasteload allocations specified in the TMDLs.

- **Ongoing Watershed Planning Activities** – Establish a synergy between development of Water Quality Management Plans and other ongoing watershed planning activities through collaboration and partnerships with the organizations that lead these other planning activities.

- **Multiple Benefit Projects** – Identify opportunities for incorporating an integrated water resources approach (such as the Water IRP) and green solutions into each Water Quality Management Plan.

Evaluation of BMP Alternatives to Manage Urban Runoff
Opportunities for BMP implementation will be evaluated to determine if expected pollutant reductions will meet targets in a cost-effective manner. BMP alternatives will be evaluated using the following steps, *Appendix 9-2*:

Step 1 – Prioritization of Catchments with the highest pollutant loads;

Step 2 - Identification of BMP Alternatives;

Step 3 - Screening BMP Alternatives; and

Step 4 - Selection of the Best Alternative.

This process will estimate the resultant changes (the "quantitative nexus") in concentration and flow expected in the receiving waterbody after the implementation of the selected BMPs.

The evaluation of BMP alternatives rests on the framework established in the Los Angeles County-wide Structural BMP Prioritization Methodology (*Ref. 9-2*). This planning tool has recently been developed by WPD, County of Los Angeles and Heal the Bay and focuses on the use of structural BMPs to control wet weather runoff. In addition to this methodology, the evaluation of BMP alternatives will need to consider the following key issues: (1) establishing design storm criteria; (2) establishing BMP performance criteria that affect the sizing and selection of BMP facilities; (3) establishing a methodology that describes the "Quantitative Nexus" between implementation of the prescribed BMPs and attainment of water quality standards (*Appendix 9-3*); (4) review and evaluation of BMP alternatives through field inspections and by stakeholder organizations; and (5) developing guidelines and requirements for operation and maintenance of structural BMPs.

Ultimately, a BMP project will be selected for implementation using the following criteria:

- The primary purpose of the project is urban runoff management-related;

- A quantitative nexus exists between implementation of the BMP(s) and water quality standards attainment (*Appendix 9-3*);

- The BMP design is consistent with the selected design criteria;
- The BMP project would receive a score of at least 75 points from the criteria used to select Proposition O projects (*Appendix 7-2* for selection criteria);
- Flood control is improved or not degraded (through peak flow reduction and infiltration, for example); and
- The project supports, to the extent possible, other beneficial outcomes, including groundwater recharge, on-site stormwater use for infiltration and irrigation, increased open areas for recreation and habitat improvements in local waterways.

Additional opportunities exist by integrating urban runoff management with other plans or projects that do not primarily focus on improving the water quality.

Development of TMDL-specific Implementation Plans
Each Water Quality Management Plan will include needed TMDL-specific Implementation Plans to fulfill TMDL requirements. The implementation activities reported in these plans will be consistent with the overall Water Quality Management Plan and will require coordination with other responsible jurisdictions in the watershed, as discussed under Subinitiative 2.

Each Water Quality Management Plan or TMDL-specific Implementation Plan will:

- Quantify benefits of and expected outcomes of each proposed BMP project;
- Identify responsibility for design, implementation and operations and maintenance of BMP projects;
- Provide a recommended BMP implementation schedule;
- Develop metrics to measure progress towards compliance; and
- Estimate cost of compliance for the watershed and sources of funding.

High Priority Recommended Activity (Section 9.8)

1) Complete projects that have already been included in the CIP, i.e., Proposition O projects and others (Leads: WPD, BOE);
2) Complete Phase II of the Los Angeles County-wide Structural BMP Prioritization Methodology (Leads: WPD, LA County, Heal the Bay);
3) Establish design storm and BMP performance criteria that guide the selection of BMPs in Water Quality Management Plans (Lead: WPD);
4) Develop a methodology for establishing a quantitative nexus between BMP selection and water quality standards attainment, to be used in each Water Quality Management Plan (Lead: WPD);

5) Develop Water Quality Management Plans for the Ballona Creek, Los Angeles River, Santa Monica Bay and Dominguez Channel watersheds, including the development of TMDL-specific Implementation Plans as required by LARWQCB (Lead: WPD); and

6) Implement future CIP projects, as identified in Water Quality Management Plans and TMDL-specific Implementation Plans (Leads: WPD, BOE).

Other Recommended Activities

7) Establish measures of success specific to each watershed's Water Quality Management Plan (Lead: WPD);

8) Review and, if needed, revise each Water Quality Management Plan once every five years (Lead: WPD); and

9) Establish a Water Quality Management Plan web page linked to the WPD Watershed Protection Program website (Lead: WPD).

Subinitiative 2 - Jurisdictional Partnerships

While the WQCMPUR is a document for the City, it is acknowledged that water quality issues go beyond the City boundaries, affecting the entire watershed(s). Therefore, establishing partnerships with key governmental jurisdictions within each watershed is critical, in particular because of the overlapping and shared responsibility for compliance with water quality regulations within each watershed and the necessity to share the costs of achieving compliance. In addition, establishing successful partnerships will facilitate common BMP locations, facilitate regional projects, reduce costs and help to establish standards of data management.

A general partnership already exists through the joint implementation of the NPDES MS4 Permit that regulates stormwater discharges in Los Angeles County. Other partnerships also exist for managing TMDLs that have already been adopted. This program element focuses on further developing partnerships by establishing Memoranda of Understanding or Agreements that facilitate the following:

- Identifying jurisdictional representatives with decision-making authority;
- Participating in the development of Water Quality Management Plans and TMDL-specific implementation plans that apportion implementation responsibilities;
- Sharing of information on urban development standards;
- Sharing TMDL implementation costs; and
- Developing, improving and standardizing water quality data collection, including runoff flow data.

High Priority Recommended Activities (Section 9.8)

10) Identify key agencies and establish jurisdictional partnership agreements for developing, implementing and cost-sharing of Water Quality Management Plans and TMDL-specific Implementation Plans (Lead: WPD).

Other Recommended Activities

11) Establish regional project teams (jurisdictional agencies, non-governmental organizations, others) to develop data collection / sharing protocols regarding water quality, operation and maintenance of water quality improvement projects, and other environmental benefits (Lead: WPD).

Subinitiative 3 - Research & Evaluation

There are many BMPs available, but much less is known about their effectiveness, O&M requirements and cost effectiveness. This subinitiative consists of two program elements that will attempt to address these issues:

BMP Evaluation and Pilot Studies

Prior to and after widespread implementation of any BMP technology, pilot studies will be used to evaluate their effectiveness. Pilot studies not only need to focus on the technological aspects of a structural BMP (e.g., evaluating how well a green roof design functions), but they may also be used to test the effectiveness of non-structural BMPs (e.g., increased education, implementation of a streamlined permit program, or implementation of new building specifications for green streets).

Research

The WPD currently works with vendors to test and evaluate new products that can mitigate pollutants in urban runoff. WPD will continue to evaluate BMP technologies as resources are available. WPD also participates in research efforts by organizations such as the Water Environment Research Foundation (WERF). As resources allow, the City may also sponsor its own research to address issues unique to the City. An example of an important area where the City can benefit from research is the implementation of stormwater use as a component of urban runoff management.

High Priority Recommended Activity (Section 9.8)

12) Continue participation in regional and national research opportunities with organizations such as WERF (Leads: WPD, RAD).

Other Recommended Activities

13) Conduct pilot studies to evaluate the effectiveness of BMPs recommended and selected for urban runoff management (Lead: WPD); and

14) Subject to resource availability, support independent or collaborative research and encourage peer review to address specific City research needs and BMP implementation projects (Lead: WPD).

9.3 Citywide Collaboration Initiative

This initiative focuses on the review, revision and development of citywide policies, ordinances, specifications, incentive opportunities, and guidance documents that control and direct how the City manages urban runoff. These "tools" may range from the high-level policies that direct how the City carries out day-to-day activities to program details such as specifications for tree planting in medians, and the use of easements or parks to increase infiltration of urban runoff. This initiative recognizes that management, implementation and budgeting of urban runoff programs are key elements in (re)-developing Los Angeles, requiring citywide collaboration with and shared responsibilities by all City agencies involved with urban development, *Figure 9-2*.

This initiative complements and expands upon existing collaborative efforts for a green and sustainable Los Angeles by specifically addressing urban runoff concerns (*Appendix 9-4*). Examples are the City of Los Angeles Water Integrated Resources Program (Water IRP) (*Ref. 9-3*), Los Angeles Green Building Program (*Ref. 9-4*), and the Green Los Angeles Action Plan (*Ref. 9-5*). The Water IRP has a specific urban runoff component as discussed in *Section 8.3.8. Table 9-2* summarizes the linkage between the Water IRP directives and recommended citywide collaboration.

Four subinitiatives will be implemented under this initiative, focusing on the General Plan updates (including City ordinances and policies), green solutions, runoff management and source reduction.

Subinitiative 1 - General Plan Update

Many of the issues of concern regarding the quality of urban runoff are related to urban growth including land use, zoning, and development requirements. Accordingly, it is critical that urban runoff management be incorporated into General Plan policies to ensure that new development and redevelopment projects incorporate urban runoff management into their design. In addition, open space including private land, and residential and commercial properties could be considered as potential locations for urban runoff management. The City of Los Angeles General Plan is a comprehensive, long-range planning document that serves as a policy guide for all City programs (*Ref. 9-6, Appendix 9-4*). Twelve elements, as illustrated in *Figure 9-3*, make up the General Plan, which must be internally consistent and integrated with planning activities of regional agencies such as the Southern California Association of Governments and the Los Angeles County Metropolitan Transportation Authority. *Figure 9-3* illustrates that one element of the General Plan, the Land Use Element, is actually made of many Community Plans that address specific needs and concerns of individual parts of the City. General Plan elements are periodically reviewed and revised under the purview of the City's Planning Department.

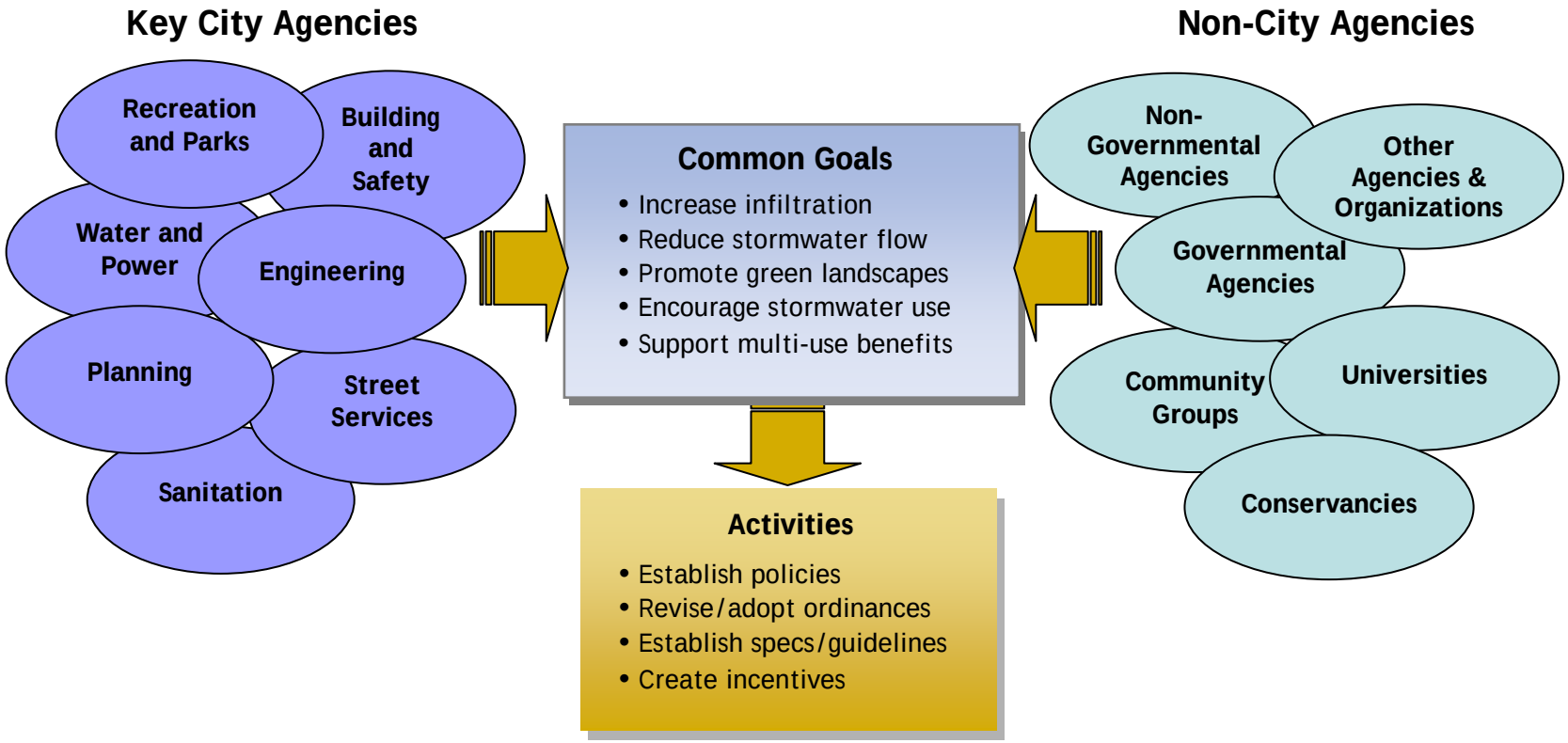

Figure 9-2
Citywide Collaborative Effort

This initiative will seek to better coordinate the water quality management related activities of City Departments and external jurisdictions and interest groups by expanding partnerships to identify common goals and shared activities and projects.

Table 9-2
Relationship Between Water IRP Directives and WQCMPUR

Water IRP "Go-Policy" Directives	Linkage to WQCMPUR
Direct Public Works to review SUSMP requirements to determine ways to require where feasible on-site infiltration and/or treat/use, rather than treat and discharge, including in-lieu fees for projects where infiltration is infeasible.	Green Solutions, Runoff Management, Infiltration
Direct Building and Safety to evaluate and modify applicable codes to encourage BMPs for maximizing on-site capture and retention and/or infiltration of stormwater (instead of discharge to the street and storm drain, including porous pavement).	Green Solutions, Public Development, Runoff Management, Infiltration
Direct Public Works and Department of Planning to evaluate the possibility of requiring porous pavements in all new public facilities in coordination with LA River Revitalization Master Plan, and large developments greater than 1 acre. Program feasibility should consider slope and soil conditions.	Runoff Management, Infiltration
Direct Department of Planning to evaluate ordinances that would need to be changed to reduce the area on private properties that can be paved with non-permeable pavement (i.e., change/support landscape ordinance and encourage the use of permeable pavement).	Green Solutions, Open Area (LID strategy)
Direct Public Works to evaluate and implement integration of porous pavements into the sidewalks and street programs where feasible. For example, conduct pilot program in East Valley, taking into consideration soil conditions and Proposition O project criteria, as well as along the future LA River Revitalization Master Plan.	Green Solutions, Public Right-of-Ways
Direct Public Works and DWP and Department of Recreation and Parks to prepare a concept report and determine the feasibility of developing a power line easement demonstration project (for greening, public access, stormwater management, and groundwater replenishment).	N/A
Direct Public Works and DWP to work with LAUSD to determine the feasibility of developing projects for both new schools and for retrofitted schools, as well as IRP Implementation Strategy government/city-owned facilities with stormwater management BMPs. As appropriate, integrate with LAUSD's new schools development program.	Green Solutions, Open Area Runoff Management, Infiltration
Direct Public Works, General Services, and Recreation and Parks to identify sites that can provide onsite percolation of wet weather runoff in surplus properties, vacant lots, parks/open space, abandoned alleys in East Valley, and along the LA River in the East Valley where feasible. Program feasibility should consider slope and soil conditions.	Green Solutions, Open Area, Community Gardens, Public Right-of-Ways
Direct Public Works and General Services and the Department of Transportation (DOT) to maximize unpaved open space in City-owned properties and parking medians through using all feasible BMPs and by removing all unnecessary pavement.	Green Solutions, Open Area, Public Right-of-Ways
Direct Public Works to include all feasible BMPs in the construction or reconstruction of highway medians under its jurisdiction.	Green Solutions, Public Right-of-Ways
Direct Public Works to coordinate with the Million Trees LA team on identifying potential locations of tree plantings that would provide stormwater benefit, with consideration of slope and soil conditions	Green solutions

Table 9-2 (Continued)
Relationship Between Water IRP Directives and WQCMPUR

Water IRP "Go-Policy" Directives	Linkage to WQCMPUR
In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from Ballona Creek to constructed wetlands, wastewater system, or urban runoff plant for treatment and/or beneficial use. Coordinate with the Department of Recreation and Parks. Coordinate and evaluate the impact with the LA River Master Plan.	Water Quality Management Plan – Ballona Creek Watershed
In the context of developing TMDL implementation plans, direct Public Works to consider diversion of dry weather runoff from inland creeks and storm drains that are tributary to the Los Angeles River to wastewater system or constructed wetlands or treatment/retention/infiltration basins with consideration for slope and topography.	Water Quality Management Plan – Los Angeles River Watershed

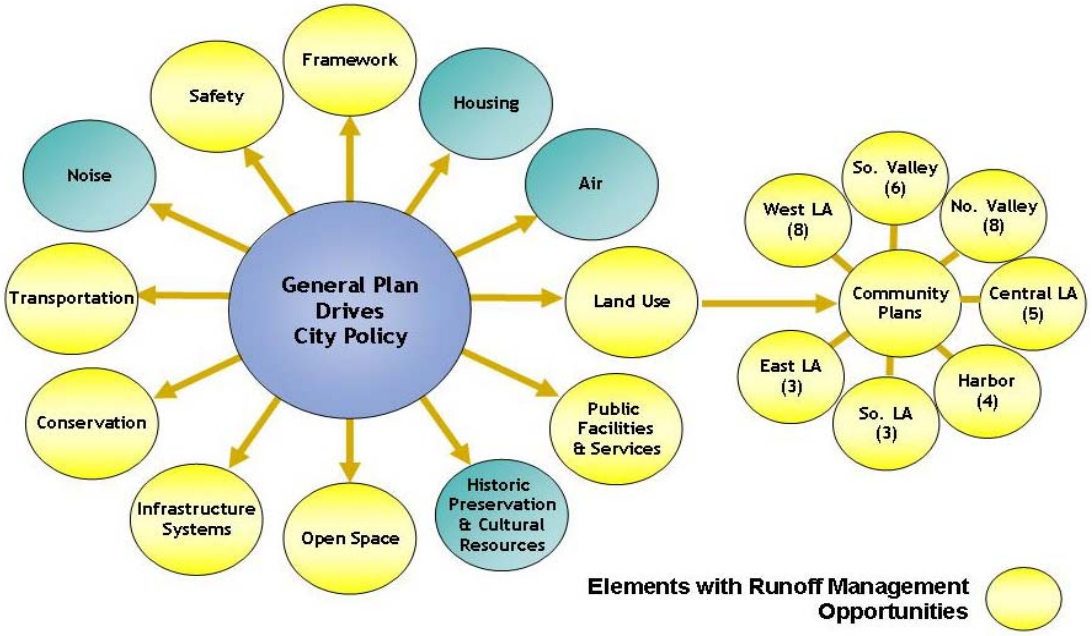

Figure 9-3
City of Los Angeles General Plan Elements

Implementation Approach

WPD will work closely with the Planning Department by providing advice on citywide implementation of urban runoff management opportunities.

High Priority Recommended Activities (Section 9.8)

15) Review the General Plan, including Community Plans, and related City polices and ordinances for opportunities to implement urban runoff management goals of the WQCMPUR for existing and new development (Lead: DCP; Support: WPD).

Subinitiative 2 - Green Solutions

Green solutions are defined as structural BMPs focused on: a) reducing the volume of urban runoff (thereby indirectly improving water quality); and b) removing pollutants from urban runoff through natural processes. Green solutions often are local urban runoff management alternatives that increase the area of green space and they often have a water resources element (infiltration of urban runoff for groundwater recharge, or capture and use for irrigation), *Ref. 9-7*. Implementation of green solutions can transform the City in many positive ways. The benefits may go beyond the primary purpose of improving the water quality as they may include, for example, reducing air pollution, cooling urban surface temperatures, supporting flood control requirements, conserving water supply, and improving quality of life. *Appendix 9-4* provides examples of how green solutions are being implemented in other cities.

This subinitiative has four program elements that are closely related to Low Impact Development (LID): an approach for land planning and engineering design with the goal of maintaining and enhancing the pre-development hydrologic characteristics of an area.

High Priority Recommended Activities (Section 9.8)

16) Develop and implement a citywide LID[1] strategy (Lead: WPD).

Open Area

The purpose of this program element is to preserve and increase open areas, undeveloped and developed, in the City to help meet urban runoff goals. The value of open areas for urban runoff management depends on the location. Undeveloped open areas are often in the upstream parts in some of our watersheds but, while valuable, they provide limited benefits for urban runoff management. However, the open areas located near storm drains in urbanized areas with significant upstream pollutant loadings may provide significant benefits for urban runoff management. These open areas are often developed (e.g., parking lots, parks, schools, playgrounds, etc.) and they are typically more distributed throughout the watershed, often downstream of areas where urban runoff management is needed. The infiltration capacity of developed open areas will vary based on the nature of the existing development. However, many of these areas have the potential to be retrofitted as sites for infiltration and beneficial stormwater use.

[1] The development of an LID policy for new development and redevelopment projects will be coordinated with a number of City agencies including the Planning and Transportation Departments and the Bureau of Street Services. Various resources, including the Low Impact Development Center and EPA, will be consulted to develop an ordinance that has minimum numeric requirements for compliance. Examples of where such requirements will be considered include area of disturbance thresholds for determining when LID requirements must be implemented for redevelopment projects; pre- and post-site hydrology criteria; and a maximum allowance for construction of impervious surfaces.

Currently, the City of Los Angeles is developing a Stream Protection Ordinance to restore and protect open space associated with natural streams while sustaining development and growth of city neighborhoods. Development of this ordinance was initiated by the Board of Public Works. An ordinance task force, which is coordinated by the Watershed Protection Division, consists of the Departments of Building & Safety, Planning & Zoning and Public Works, several Council Districts, environmental organizations, representatives from the real estate development industry and other interested stakeholders. Adoption of the Stream Protection Ordinance, which is expected in the near future, will protect habitat, reduce runoff pollutant loads, and reduce stormwater peak flows. Stream protection, in particular the restoration of natural functions of streams, has been shown to reduce the levels of nutrients (nitrogen and phosphorus), sediment (less erosion), bacteria and metals.

Implementation Approach
The City will continue to promote conservation of undeveloped, permeable open areas that already exist, including undeveloped mountainous areas and stream corridors. The City will also maximize urban runoff management using developed open areas and, where it is appropriate, to store and treat urban runoff for beneficial stormwater use.

High Priority Recommended Activities (Section 9.8)
17) Develop and implement a Stream Protection Ordinance (Leads: WPD, BOE).

Other Recommended Activities
18) Identify available developed open areas and open space in all watersheds (including privately owned) for implementation of urban runoff BMPs and establish a program for land acquisition (Lead: WPD);

19) Create partnerships, including outreach and incentives, with owners of large areas of open land, such as schools, golf courses, or privately owned lots for beneficial stormwater use (Lead: WPD, others); and

20) Establish urban runoff review policy with Recreation and Parks Department to implement urban runoff management opportunities in both existing and planned parks (Leads: WPD, RAP).

Community Gardens

Community gardens are neighborhood spaces that bring residents together to grow crops, whether for personal use or for community profit. Community garden land maintains and/or reclaims green space within urban settings, preserving areas for biological uptake and possibly providing areas for the infiltration of urban runoff. Over 70 active community gardens exist in Los Angeles County, many in the City of Los Angeles, serving 3,900 families.

Implementation Approach
The City will evaluate the availability of community gardens for urban runoff management and determine if they are appropriate sites for urban runoff BMPs. This evaluation should include mitigation measures to avoid contamination of garden vegetables and other edible plants.

Other Recommended Activities
21) Evaluate existing community gardens for potential retrofits for urban runoff management considering water quality, soil quality, and public health and safety concerns associated with the discharge of urban runoff to or from community gardens and develop implementation strategies that address outreach and incentives (Lead: WPD); and

22) Evaluate the leasing of land from private landowners to convert vacant lots into combination of open area for urban runoff management and auxiliary benefits such as community gardens (Lead: WPD).

Public Right of Ways

Public right of ways, developed as "green streets," provide opportunities for intercepting rainwater for beneficial use and reducing peak flows. Initial rainwater is intercepted by tree canopies and much of the remaining rainwater is captured and infiltrated in green medians, easements, and constructed stormwater retention areas. In addition, the use of public right of ways for managing urban runoff can be enhanced in some areas by the use of pervious pavements and subsurface structures, which allow some of the rainwater falling on the pavement to directly infiltrate.

Implementation Approach
The City will evaluate the use of public right of ways for managing urban runoff (e.g., green streets, permeable pavement) and develop guidelines, specifications and, if needed, ordinances.

High Priority Recommended Activities (Section 9.8)
23) Evaluate the use of public right of ways (streets, alleys, parking lots, etc.) for local management of urban runoff to reduce urban runoff to storm drains (Leads: WPD, BSS).

Other Recommended Activities
24) Partner with Los Angeles County, Caltrans and other agencies on the use of public right of ways for management of urban runoff (Lead: WPD, others);

25) Evaluate the use of financial incentives for participation by private entities in green street projects (Lead: WPD); and

26) Where technically feasible, consider the use of permeable paving in new development and redevelopment projects (Lead: WPD).

Public Development (Green Roofs)

The application of green solutions to public developments can provide opportunities for onsite infiltration and for storage, treatment and use of stormwater runoff from adjacent locations. With regard to water quality, green roofs are most effective in developed areas that do not have much land available for other BMPs. Other benefits of green roofs include providing a natural cooling method for the building, aesthetic properties, and potential recreational uses. These benefits are consistent with the LID goals.

The City's Environmental Affairs Department (EAD) has already prepared a guidance document for the development of green roofs (***Ref. 9-8***). In addition, green roof events have previously been held at the Environmental Affairs Department and the Metropolitan Water District facilities.

Implementation Approach

The City will continue its approach in promoting the implementation of green roofs on publicly-owned properties and build upon the efforts of EAD. Increased use of green roofs and demonstration of their success in managing urban runoff can be used to encourage the incorporation of green roofs into the design of private developments.

Other Recommended Activities

27) Increase the awareness of green roofs and promote the benefits to urban runoff management (Lead: WPD, EAD);

28) Develop guidelines that encourage or even require the incorporation of green solutions into public developments (Lead: WPD, EAD, DBS); and

29) Lead by example by incorporating green roofs, where appropriate, into new City facilities (Lead: WPD, EAD, DBS).

Subinitiative 3 - Runoff Management

This subinitiative focuses on the management of urban runoff by controlling the flowrate and the volume of urban runoff that reaches streams, rivers, and beach waters. Reducing the rate and volume of urban runoff allows the reduction of the mass flux of pollutants transported to waterbodies. Additional benefits include the reuse of captured urban runoff, e.g., for infiltration, irrigation and groundwater recharge and less impact on downstream habitats by reduced peak flows.

Reduction of the volume and flowrate of urban runoff requires a watershed-wide approach with a strong focus on local management of urban runoff at the source ("upstream" BMPs at the street or parcel level). This could reduce the need for large downstream BMPs, which are relatively expensive and often more difficult to implement because of space limitations in the more urbanized areas of the City.

This subinitiative contains three program elements (infiltration, water conservation and stormwater use) and is related to the City of Los Angeles Water Integrated Resources Program (Water IRP) and WPD's SUSMP program.

High Priority Recommended Activities (Section 9.8)

30) Support implementation of the urban runoff goals of the Water IRP (*Section 8.3.1, Table 9-2*) (Leads: WESD, WPD); and

31) Revise the SUSMP requirements, as needed, to incorporate onsite infiltration requirements for new development and redevelopment (Lead: WPD).

Infiltration

BMPs such as infiltration trenches, porous pavement, downspout redirections, green streets, berms, bio-swales, tree wells and vegetated street medians reduce the amount of urban runoff by infiltration and are typically implemented for local management of urban runoff (dry and wet-weather). This program element is related to Low Impact Development and green solutions as discussed in the previous subinitiative.

Implementation Approach

The City will evaluate existing and future possibilities for promoting local infiltration of urban runoff. When evaluating the potential for incorporating infiltration BMPs into a project, current and anticipated future regulations will be considered to ensure that groundwater quality is preserved or improved. Where necessary, studies may be needed to ensure that infiltration does not result in any such environmental concerns. Accordingly, coordination among several agencies will be necessary, e.g., the California Department of Public Health (CDPH), Los Angeles County Department of Health Services (LACDHS) Los Angeles Department of Water and Power (LADWP), and the Upper Los Angeles River Area Watermaster.

High Priority Recommended Activities (Section 9.8)

32) Evaluate the retrofit of publicly owned properties (e.g., parks and other open areas) and parking lots (publicly-owned and private) for infiltration opportunities (Leads: WPD, RAP).

Other Recommended Activities

33) Conduct research to develop (1) infiltration testing protocols, (2) infiltration design specifications, (3) maintenance and operations requirements, and (4) life-cycle costs (Lead: WPD);

34) Initiate a "downspout redirection" pilot program to maximize capture of stormwater (Lead: WPD);

35) Evaluate the retrofit of privately owned properties for infiltration projects, including the use of incentives, public education and outreach (Lead: WPD); and

36) Seek grants for demonstration programs to further the development of infiltration technology (Lead: WPD).

Water Conservation

Urban runoff, in particular during dry weather, is partly caused by landscape irrigation and other activities. Hence, measures for conserving water in those activities that cause excessive generation of urban runoff will benefit urban runoff management as well as reduce the City's demand for potable water.

Implementation Approach
The City will evaluate and build upon urban runoff management elements (e.g., smart irrigation, evapotranspiration controllers, native plants, etc.) in existing and future water conservation efforts and policies.

Other Recommended Activities

37) Support implementation of the landscape ordinance, as revised by the Planning Department, ***Ref. 9-9*** (Leads: DCP, WPD);

38) Support development and implementation of the State's Updated Model Water Efficient Landscape Ordinance AB 1881, ***Ref. 9-10*** (Leads: DCP, WPD); and

39) Investigate ways, including the use of incentives, to further reduce or eliminate the generation of dry weather urban runoff from private properties, i.e., from landscape irrigation and the washing of sidewalks and driveways (Lead: WPD, BSS).

Beneficial Stormwater Use

The use of stormwater as a water resource involves the capture, storage, and treatment of stormwater that can then be used in place of potable water. Beneficial use options include irrigation, groundwater recharge, diversion to constructed wetlands, and diversion to lakes that require supplemental water. Implementation of this program element is consistent with LID principles and reduces dependence on imported water.

Implementation Approach
In support of Proposition O projects, the WPD has started with establishing a regulatory framework for beneficial stormwater use, including the development of guidelines and requirements.

High Priority Recommended Activities (Section 9.8)

40) Collaborate with appropriate agencies (e.g., City, CDPH, LACDHS, others) to establish water quality requirements for the use of stormwater (Lead: WPD, others).

Other Recommended Activities

41) Develop guidelines and specifications for local storage, treatment, distribution systems, and operation and maintenance of stormwater use systems (Lead: WPD); and

42) Evaluate the availability of open areas owned by City, County, State and Federal agencies and privately owned open areas (e.g., home owners, commercial property, golf courses) for beneficial stormwater use options and develop implementation strategies (including outreach and incentives) (Lead: WPD).

Subinitiative 4 - Source Reduction

This subinitiative focuses on prevention of urban runoff pollution by reducing waste that could enter the environment, eliminating the use of products or processes that can introduce toxic chemicals into the environment and enforcing existing and proposed regulations that focus on source control. There are three proposed program elements.

Waste Reduction

Waste reduction refers to the reduction of waste that is generated and ultimately disposed of in City landfills or ends up as litter on City streets and in storm drains. This waste introduces toxic materials into waterbodies beyond the physical presence of the trash. This program element is directly related to trash TMDLs and, possibly, toxic pollutants TMDLs.

Implementation Approach

Reducing the amount of wastes in the watershed will be coordinated with the City's Zero Waste Plan as well as the Zero Waste California program. The State program involves "managing the estimated 92 million tons of waste generated each year by reducing waste whenever possible, promoting the management of all materials to their highest and best use, regulating the handling, processing, and disposal of solid waste, and protecting public health and safety and the environment" (*Ref. 9-11*). The City is also preparing a Solid Waste Integrated Resources Plan that has specific waste reduction goals. In addition to these goals, through the Plastic/Polystyrene Task Force, the City is working with other cities, the State, and businesses to reduce waste from products that cause runoff pollution. The City has implemented programs to recycle plastic bags and polystyrene containers. The City is also already working to reduce the use of Styrofoam and other non-degradable products to support compliance with trash TMDLs.

Other Recommended Activities

43) Coordinate implementation of the WQCMPUR with ongoing waste reduction efforts and, where appropriate, evaluate additional waste reduction activities to meet critical TMDL trash targets.

Toxics Reduction Program

The term "toxics" includes metals, organic chemicals, hazardous materials, and pesticides. Their removal from the environment is often challenging and costly, therefore, the focus of this program element is on prevention by controlling or banning the use of toxic substances in the watershed. This program element is directly related to toxic pollutants TMDLs.

Implementation Approach

A great deal of work in this area has been done by County, State and Federal agencies. The City will coordinate with these agencies and, if needed, develop a toxic reduction program specific for Los Angeles that builds upon current outreach activities for reducing the use of certain toxics (e.g., Outreach Initiative, Subinitiative 4 – Business Outreach). This will require identification of: a) the toxics to be targeted; b) the public and private sectors that release these toxics; and c) the tools for reducing the use of these toxics.

Other Recommended Activities

44) Collaborate with appropriate agencies to implement integrated pest management strategies to reduce the use of pesticides (Lead: WPD);

45) Collaborate with regulatory agency programs, such as the Department of Toxic Substance Control's Green Chemistry Initiative, to find alternate chemicals and processes for reducing pollutant loads derived from industry (Lead: WPD);

46) Collaborate with California Stormwater Quality Association's (CASQA) Watershed Management and Impaired Waters subcommittee on new source control approaches (Lead: WPD);

47) Review and revise outreach programs that educate the public on the use and proper disposal of toxic chemicals, e.g. disposal of mercury thermometers, and provide information to targeted industries (Lead: WPD); and

48) Evaluate development of City ordinances that ban or reduce the use of selected chemicals (Lead: WPD).

Enforcement

An important element of source control is the establishment of sufficient authority to regulate pollutants where they are generated. The Industrial Waste Inspections program is part of WPD. Under this program, specific staff members designated as inspectors are "public officers" who can and do issue "notice to comply" or "notice of violation." The finding of a violation is based on the Los Angeles Municipal Code, section 64.70, and issuance of a "notice of violation" can have fines associated with it.

Implementation Approach
As part of the implementation of this strategy, the existing water quality enforcement program will be periodically evaluated to as to how it is supporting water quality goals. This evaluation consists of two parts: 1) as a high level review to determine if sufficient enforcement authority exists; and 2) as new or revised ordinances are established through the implementation of the WQCMPUR, then the City enforcement provisions and authority will need to be reviewed and revised as appropriate.

Other Recommended Activities
49) Review existing enforcement provisions to ensure that they are properly implemented and evaluate adequacy of authority and the fines that may be levied (Lead: WPD).

9.4 Outreach Initiative

The Outreach Initiative focuses on enhancing existing public education and community involvement activities to reach the appropriate target audiences and establish methods to quantify the water quality benefits achieved through outreach activities. The City's outreach program is a collaborative effort with other agencies and supports the Los Angeles County NPDES MS4 Permit. In addition, collaboration will be sought with non-governmental organizations that often have specific knowledge of local neighborhoods and established relationships with communities.

The City's outreach program is structured around the following public education and involvement strategies (*Ref. 9-12)*:

- **Preventing Pollution** – Educate polluters about ways they can prevent pollution through BMPs related to specific pollutants and polluting activities.

- **Building a Team of Messengers** – Using the interest expressed by voters through Proposition O (*Chapter 7* and *Appendix 7-1*), keep residents enthused about water quality, engage them in activities that demonstrate pride in neighborhoods, motivate (apply social pressure) polluters and non-polluters to be part of the solution for pollution prevention.

By pursuing both strategies in parallel, the end result should be a progressive reduction of pollutants in Los Angeles' waterways that will contribute to meeting TMDL water quality requirements and deadlines. The results should be quantifiable wherever possible, as discussed in *Section 9.4.2*.

9.4.1 Outreach Subinitiatives

WPD coordinates the City's existing outreach program and will continue to improve and expand it through the implementation of eight subinitiatives:

- Subinitiative 1 – Pollutant-Specific Outreach

- Subinitiative 2 – Stormwater NPDES and TMDLs Outreach
- Subinitiative 3 – School Outreach
- Subinitiative 4 – Business Outreach
- Subinitiative 5 – Employee Training Program
- Subinitiative 6 – Mass Media Advertising
- Subinitiative 7 – Stakeholder Involvement
- Subinitiative 8 – Collaboration With Other Programs

Each subinitiative specifies the existing activities and opportunities and recommends future activities.

Subinitiative 1 – Pollutant-Specific Outreach

Existing Activities

Education campaigns are designed to target the behaviors that are causing pollution and to motivate the members of the public engaged in those behaviors to make changes. The City's current outreach program targets the pollutants associated with the trash TMDLs, dry and wet weather bacteria TMDLs, and nitrogen TMDLs. To address these pollutants and others (e.g., used oil), the City is currently creating education campaigns for litter/trash, dog waste, used oil, fertilizers and pesticides using several outreach activities.

High Priority Recommended Activities (Section 9.8)

50) Integrate messages and materials about specific toxics, metals, and other pollutants with existing education campaigns.

51) Evaluate existing outreach activities for their effectiveness in targeting new pollutants.

Subinitiative 2 -- Stormwater NPDES and TMDLs Outreach

Existing Activities

The City's current outreach program includes activities to inform the general public as well as community, business and environmental leaders and organizations about meeting the NPDES MS4 Permit requirements, achieving TMDL compliance, and implementing approved Proposition O projects:

- **Websites** - Two City websites, www.lastormwater.org and www.lapropo.org, were created by and are maintained by the Department of Public Works. Through these websites and their site links, the general public can get information on "how-to" tips, BMPs, regulations related to the NPDES MS4 Permit and TMDLs, watershed-level water quality data, neighborhood events, educational materials,

and detailed information about Proposition O projects in the implementation stage.

- **Public information materials and programs** - The City distributes print materials to the general public through libraries and at community events. These are the same materials that can be retrieved through the websites identified above.

- **Project-specific Proposition O outreach programs** - Each major Proposition O project currently in implementation includes an outreach element.

High Priority Recommended Activities (Section 9.8)

52) Outreach to community, business, and environmental leaders will target many of the City's most influential messengers with information about the NPDES MS4 Permit, TMDLs, and Proposition O projects. The focus of this outreach will be to keep them well-informed, to maintain their enthusiasm for investments and efforts to improve water quality, to encourage them to exert social pressure to adopt new non-polluting behaviors, and to encourage them to support the implementation of needed projects and programs. An outreach work plan is being prepared that will include these elements:

    - Presentations to Neighborhood Councils, other community organizations including Los Angeles area houses of worship with very large congregations, and academic institutions;

    - Presentations to Los Angeles Business Improvement Districts; and

    - Partnerships and joint ventures with environmental organizations for community outreach.

Subinitiative 3 – School Outreach

Existing Activities

The City's current school outreach program revolves around three key strategies:

- Teach kids to be environmental stewards;

- Empower kids to take action and become messengers; and

- Use schools as a base of support to build-out community engagement (e.g., community cleanups, Adopt-a-beach, Ocean Day).

School outreach programs address different ages and needs:

Elementary Grades - Program focuses on elementary school assembly programs, supporting teachers after the assembly programs by providing hands-on classroom activities and lesson plans, and the widely publicized "Ocean Day" beach cleanup field trip. The City partners with the California Coastal Commission to provide

teachers with the specially-designed curriculum project "Waves, Wetlands, and Watersheds."

Secondary School Grades -- Program focuses on teaching students who might engage in polluting behaviors. When working with school clubs and youth community service programs, the City teaches students about the problem / solutions with stormwater pollution and encourages them to become mentors to younger kids and to lead specific aspects of the outreach project.

Linking to Other Environmental Educators - The City's program also emphasizes connecting kids to non-profit organizations who are already working in their communities. Los Angeles' non-profits offer watershed education for students ranging from K-12. Examples include (not a complete list):

- **Los Angeles Conservation Corps** – SEA labs, traveling tide pools, service learning programs;
- **TreePeople** – Eco-Tour Program and La Kretz Urban Watershed Education Gardens;
- **Heal the Bay** – Key to the Sea, Adopt-a-Beach, Heal the Bay curriculum; and
- **Santa Monica BayKeeper** – In-class presentations on kelp reforestation.

High Priority Recommended Activities (Section 9.8)
There are several opportunities to expand school outreach. Recommended future activities for this subinitiative include:

53) Expand partnerships with City Council offices, LAUSD, MTA, and environmental organizations in all watersheds (such as Santa Monica Mountains Conservancy, Los Angeles and San Gabriel Rivers Watershed Council, Friends of the LA River, Ballona Creek Watershed Task Force and associated organizations, others), to provide outreach services and support to conduct City-sponsored events with Los Angeles' kids, like Ocean Day.

54) Work with LAUSD to incorporate the curricula of the comprehensive state program, the Education and Environment Initiative (EEI), into all disciplines (science, history / social sciences, English / language arts, and mathematics) for all K-12 grades in the City's public schools. Build upon existing curricula that have been developed by other organizations (e.g., TreePeople, Adopt-a-Watershed).

55) Promote teacher training through partnerships with non-profit organizations. These organizations are conducting successful teacher training programs, e.g., Heal the Bay's teacher training for "Key to the Sea" and "Adopt-a-Beach".

56) Develop pollution prevention education beyond high school. The City has already partnered with California's community colleges to provide in-classroom training of BMPs related to automobile maintenance and repair. This effort to reach students continuing their education past high school can be expanded to include other professions including landscape maintenance, landscape design and horticulture, construction management, forestry, and urban planning.

57) Form and train a speaker's bureau of City employees working water quality jobs to talk to students in high school or college taking courses that could lead to jobs in the water quality arena. Speakers would encourage environmental stewardship and potentially open doors to students to enter the profession.

Subinitiative 4 – Business Outreach

Existing Activities

The City's current outreach program is beginning to target businesses in areas with the greatest potential to reduce pollution related to urban runoff. Businesses are targeted in two ways: (1) **by pollutant**; and (2) **by problem area**. Key pollutants and the associated businesses being targeted include:

- **PAHs/Used Oil** – Auto repair shops and gas stations
- **Bacteria** – Food service and related industries
- **Litter** – Key retail businesses in problem areas
- **Sediments** – Construction and new development
- **Metals** – Manufacturing facilities
- **Nutrients/Pesticides** – Landscaping companies and nurseries

To produce a visual picture of areas to specifically target, the City is developing GIS maps of problem areas using water quality monitoring data, catch basin clean out data, and census bureau business data by SIC codes.

The City has begun implementing the following activities in the current phase of the business outreach campaign:

- Partnering with Business Improvement Districts;
- Partnering with Industry Associations, including:
  - Developing and participating in conferences relevant to the business sectors mentioned above;
  - Distributing information through trade/industry associations; and

- Working with problem businesses individually identified through City inspections.

Â Partnering with specific businesses to target specific pollutant sources, e.g., oil waste or battery disposal;

Â Pilot business-driven cleanups;

Â Building stakeholder-driven partnerships;

Â Multi-language outreach; and

Â Outreach targeting business owners, managers, and personnel.

High Priority Recommended Activities (see Section 9.8)
Recommendations for future programs include:

58) Expand business-focused anti-litter education to address keeping plastic packaging out of waterways through recycling or disposal.

59) As additional TMDLs are adopted, examine whether or not the existing business outreach efforts address the new pollutants and/or affected water bodies. Modify existing business outreach accordingly. Evaluate opportunities for outreach to the landscape profession (design, architecture and maintenance).

60) Begin discussions with Business Improvement Districts about positive reinforcement approaches such as incentives, employee education, certification, and clean business recognition, versus a focus on enforcement, including the use of fines.

Subinitiative 5 – Employee Training Program

Existing Activities
The City conducts stormwater management training to its departments that have a direct impact on urban runoff pollution (e.g., about 6,500 employees received training on Stormwater Pollution Prevention Plans in 2007). Orientation of new City employees includes a video presentation on how they can reduce the amount of pollutants in urban runoff by modifying their behavior and actions while carrying out their job responsibilities. The WPD also provides training to City Departments on urban runoff management and stormwater pollution prevention. In the past, these training programs had a strong focus on the City Departments that are directly related to the Public Agencies Activities Program and the implementation of SUSMPs (*Section 6.2.1*). Plans are currently being developed to broaden the training of City employees to other departments, including the Department of Transportation, the Bureau of Street Services, and the Department of General Services. Additionally, stormwater issues that require establishment of City policies will be presented to the supervisors and upper management staff of all Departments and Bureaus.

High Priority Recommended Activities (Section 9.8)

61) The City will review training materials from EPA and other MS4 programs and evaluate the effectiveness of the City's program.

62) The City will begin periodic self-audits to ensure that staff are implementing appropriate stormwater management procedures; especially at City maintenance yards. The EPA has developed a tool to support self-audits (***Ref. 9-13***).

Subinitiative 6 -- Mass Media Advertising

Existing Activities

The current outreach program uses several methods to reach the general public, including mass media (paid) advertising. In keeping with the City's approach of targeting TMDLs and specific geographic areas, primary advertising outlets are community-based newspapers. The current strategy for media planning and buying advertising campaign:

- Bases media decisions on highest reach and frequency within a targeted pollution "hotspot" area;
- Considers buying media when the messages have the most relevance (e.g., spring and summer if related to pesticides and fertilizers; fall before the first rains or during an event when awareness is already heightened); and
- Stretches the available budget by continuing to secure lower rates and bonus media, and aggressively negotiating discounts and pro bono space.

High Priority Recommended Activities (Section 9.8)

There are three primary recommendations for building on the previous creative execution for advertising:

63) Continue to broaden the relevance to inland residents;

64) Develop new or focus existing creative advertising that addresses priority TMDLs; and

65) Create new "visuals" to better connect people to the problem and to the solution.

Subinitiative 7 -- Stakeholder Involvement

Existing Activities

The City seeks stakeholder involvement during master plan development (i.e., Water IRP, WQCMPUR), facility siting and design of specific projects, and in all aspects of its public outreach program.

The City has begun implementing several of the first projects approved for funding with Proposition O Clean Water Bond funds. Each of these projects incorporates an outreach program that typically includes:

- Stakeholder involvement from pre-design through construction;
- Public information through the City's website, www.LApropO.org;
- On-site informational signage or advertorials in community newspapers; and
- Presentations to Neighborhood Councils and other community organizations.

High Priority Recommended Activities (Section 9.8)

66) As additional Proposition O projects and urban runoff management activities associated with the WQCMPUR are initiated (*Sections 9.6 and 9.8*), outreach programs with opportunities for stakeholder involvement will continue to be developed and implemented.

Subinitiative 8 – Collaboration with Other Programs

Existing Activities

The City's stormwater public education and outreach program is one of the longest running environmental education programs in California. Collaboration with other programs has been a mainstay of the outreach program from the beginning.

The benefits of collaborating with other programs are several and profound:

- Internal stakeholders (including within Public Works, the Mayor's Office, City Council and Neighborhood Councils) and external stakeholders (including community-based organizations, environmental groups, businesses, and more broadly, voters and residents) need to remain convinced about the importance of good water quality and they need to be excited about the status and successes of projects that are funded by Proposition O;
- Organizations that have been actively involved in watershed planning efforts bring a unique understanding of the needs, goals and objectives of local and regional stakeholders;
- Collaborating with other programs – developed by other cities, the County, the State, regional agencies, non-profit organizations, and others – and engaging residents to become more active in the process of cleaning up Los Angeles urban runoff, causes messages about water quality and protecting the environment to reach more people, be heard more clearly, and be implemented more economically. This is especially important in light of the current economic downturn while at the same time community awareness of environmental challenges and the desire for community-based action are increasing.

Â Credibility is gained through collaboration and developing important partnerships. Non-profit organizations, especially organizations involved in watershed management planning, are often viewed in the community as the bearers of truth. Regulators are often viewed as protectors of the environment. When the City, non-profits, regulators, and a number of public agencies are saying relatively similar messages, the public has increased faith in the message and a stronger tendency to take action according to what they are hearing.

High Priority Recommended Activities (Section 9.8)

67) The City will continue to look for new partnering opportunities. For example, an outreach plan is currently being prepared for Green LA, the Mayor's policy on Climate Change. Likewise, opportunities for collaboration between Green LA and the City's stormwater public education program and partnerships and joint ventures with stakeholder organizations will be evaluated and implemented.

9.4.2 Outreach Quantification

For implementation strategies that include public outreach, it is important to quantify the effectiveness of outreach BMPs because of the potentially large impact on water quality improvement (e.g., quantitative nexus, *Section 9.2*). Accurately measuring these improvements in water quality is challenging because: 1) the success of public outreach usually is not immediate, but may take several years to take effect; 2) most watersheds have multiple activities for water quality improvement, which makes it difficult to single out the impact of outreach BMPs.

Existing Activities

The City's current outreach program includes methods to measure the effectiveness of outreach. These focus primarily on whether or not the target audience successfully receives the intended information and often measures whether or not the outreach resulted in the target audience *following through* with the intended action (new non-polluting behaviors). Examples are tracking used oil collected at recycling centers and private partnership drop-off locations; or tracking the number of students who participate in local cleanup events. The current methods of measuring the effectiveness of the City's outreach program are all valid and important to continue.

At least one City program – education of restaurant managers and personnel – measures a direct correlation between education and water quality. City inspectors prioritize educating the restaurant industry, and use different level of enforcement measures, to achieve fewer fats, oil, and grease (FOG) spills in sewers. Restaurants are taught to contain FOG, rather than pour it down sewer drains or dump in nearby storm drains. The City tracks sewer spills caused by FOG, and targets education/inspections toward areas of hot spots.

Implementation Approach

To improve quantification accuracy, two approaches are recommended. For the short term, quantification can be improved by conducting a study or survey in Los Angeles

that estimates what percent of the population would change a given behavior once educated on specific topics (e.g., used oil recycling, pet waste pickup).

For the longer term, the data required to quantify an outreach program requires a comparison of pre-outreach water quality monitoring to post-outreach water quality monitoring. The recommendation is to conduct a pilot study using a target subwatershed for a target pollutant(s).

High Priority Recommended Activities (Section 9.8)

68) Behavior change survey: Conduct a survey asking the public what their current behavior is, educating them on what changes would improve the water quality, and then asking them if they will change their behavior based on the new information. This would be done for specific behavior changes for activities related to specific pollutants of concern. Follow up periodically to estimate expected behavior with time.

69) Water quality improvements by outreach: Select specific outreach BMPs that are targeted in areas without structural BMPs. Identify some possible, measureable parameters for long-term tracking; follow-up by measuring the pollutants of concern in the target waterbody or watershed prior to the public education campaign and periodically, thereafter. The period of this recommended activity should be realistic in terms of developing performance data (it may take several years or longer to significantly change peoples' habits and lifestyles).

9.5 Resources Requirements

Additional resources will be needed to implement the Implementation Strategy. The following list summarizes potentially required resources:

Â Technical staff for:

- BMP design and construction oversight;
- BMP operation and maintenance;
- Pilot and research studies (design, oversight, data analysis);
- Field investigations;
- Monitoring and data analysis;
- GIS development;
- Modeling analyses;
- Guidance and specifications development;

- Implementation of effectiveness evaluation program; and
- Outreach development, training, coordination, and implementation.

Â Support staff for:

- Staff for development of initiatives; writing and updating of plans; oversight of new programs and initiatives;
- Coordination with other agencies, departments and potential partnerships;
- Enforcement;
- Coordination with various industries;
- Outreach; and
- Stakeholder facilitation.

Â Production of outreach and training materials.

Â Capital costs of BMPs and pilot projects.

Â Operation and Maintenance (O&M) costs.

Â Employee training for O&M.

9.6 Stakeholders Role

To facilitate stakeholder participation, WPD will provide a link to WQCMPUR activities on the WPD website, http://www.LAstormwater.org (high priority recommended activity 70). The City will continue to engage stakeholders in various activities, including:

Â **City Policy Development** – Revision and update of the City's General Plan provides an opportunity for stakeholders to participate in discussions that will shape future urban growth policies.

Â **Ordinance Development** – Stakeholders may take part in ordinance development either through direct participation or by providing review and comment on draft documents.

Â **Guidance/Specifications Development** – Stakeholders with appropriate expertise or interest will be asked to participate in the development of guidance or technical specification documents.

Â **Water Quality Management Plan Development** – Development of each Water Quality Management Plan will be an open process where stakeholders will

provide input, especially during the development of potential strategies for each watershed, evaluation of BMP alternatives, and preparation of TMDL-specific Implementation Plans.

Â **Implementation of Water Quality Improvement Projects** – The City will evaluate and seek opportunities for collaboration and partnerships with stakeholder organizations in the implementation of all water quality improvement projects.

9.7 Measuring Success

For assessment of the implementation of the WQCMPUR, metrics for measuring success will be developed (high priority recommended activity 71) and incorporated into the Implementation Strategy Action Plan (*Section 9.8*). Metrics and assessment of the implementation of the WQCMPUR will in general address three areas:

Â Water quality related:

- Status of compliance with water quality standards and wasteload allocations (*Appendix 5-1*);

Â Progress related:

- Water quality indicators such as the number of beach closures;
- Volume or Percentage of urban runoff recharged;
- Percent attainment of urban runoff goals of the Water IRP;
- Tons of pollutants captured;
- Number of green street projects;
- Number of green roof projects; and
- Acres of open areas retrofitted to capture, treat and use stormwater runoff

Â Outreach and source control related:

- Status of city-wide collaboration activities; and
- Estimates of the pollution prevented through source reduction activities, particularly through implementation of the Outreach Initiative (*Section 9.4.2*).

9.8 Implementation Strategy Action Plan

A ten-year Implementation Strategy Action Plan is provided in *Table 9-3*. This Action Plan contains the high-priority recommended activities from *Sections 9.2, 9.3 and 9.4*, which are considered the most important tasks for implementation under the

WQCMPUR. The Implementation Strategy Action Plan also identifies the lead agencies and tentative milestones for completion. It is important to note that the implementation of high priority recommended activities depends on the financial resources available to the Watershed Protection Program (*Chapter 10*). Whereas some high priority recommended activities in *Table 9-3* have already begun and may be implemented under the existing budget (in particular plan development and institutional BMPs), others will require additional financial resources before they can be implemented (in particular structural projects that require capital investments and O&M). It should also be noted the completion milestones of high priority recommended activities depend on the funding available. Any delay in additional funding will cause these milestones to be completed at a later time.

Given the uncertainties and costs involved in the execution of this Implementation Strategy, an adaptive implementation process[2] has been included, *Figure 9-4*. Accordingly, this Implementation Strategy will be reviewed and, if necessary, revised at least once every five years (high priority recommended activity 72). These reviews will focus on the following:

- Status of meeting Action Plan milestones;
- Incorporation of new information, where appropriate, from the following:
  - Outcomes from citywide collaboration and outreach activities;
  - New / revised water quality regulations; and
  - Findings from pilot studies and research projects
- Updates to the Action Plan schedule, if appropriate;
- Establishment of new implementation recommendations, where appropriate; and
- Stakeholder review of recommended updates to the plan.

[2] The National Research Council (NRC) recommends the use of an adaptive implementation process to address uncertainty in the TMDL process (*Ref. 9-14*):

> "Adaptive implementation is … the application of the scientific method to decision-making. It is a process of taking actions of limited scope commensurate with available data and information to continuously improve our understanding of a problem and its solutions, while at the same time making progress toward attaining a water quality standard. Plan for future regulatory rules and public spending should be tentative commitments subject to revisions as we learn how the system responds to actions taken early on."

Table 9-3
Implementation Strategy Action Plan with High Priority Recommended Activities

Initiative	RA	Lead	Task	Year									
				1	2	3	4	5	6	7	8	9	10
Water Quality Management	1	BOE WPD	Implement TMDL compliance projects currently identified in CIP	•	•	•	•	•					
	2	WPD	Complete BMP Prioritization Methodology Phase II	•									
	3	WPD	Establish BMP siting, design storm and BMP performance criteria	•									
	4	WPD	Develop methodology for quantitative nexus between BMP selection and water quality standards attainment	•									
	5	WPD	Develop Water Quality Management Plan (WQMP) for Ballona Creek Watershed	•	•					**R**			
	5	WPD	Develop WQMP for Los Angeles River Watershed		•	•					**R**		
	5	WPD	Develop WQMP for Santa Monica Bay Watershed			•	•					**R**	
	5	WPD	Develop WQMP for Dominguez Channel Watershed				•	•					**R**
	6	BOE WPD	Implement future CIP projects for TMDL compliance			•	•	•	•	•	•	•	•
	10	WPD	Establish jurisdictional partnership agreements in each watershed	•	•	•	•	•					
	12	WPD	Participate in regional and national research opportunities	•	•	•	•	•	•	•	•	•	•
Citywide Collaboration	15	DCP WPD	Review and update General Plan for implementation of urban runoff management goals	•	•	•							
	16	WPD	Develop Low Impact Development strategy	•	•	•							
	17	WPD	Develop Stream Protection Ordinance	•	•								
	23	WPD BSS	Evaluate the use of public right of ways for local management of urban runoff (green streets)	•	•								
	30	WES D WPD	Support implementation of urban runoff goals of Water IRP	•	•	•	•	•	•	•	•	•	•
	31	WPD	Revise SUSMP requirements	•	•								
	32	WPD DRP	Evaluate use of publicly owned land for infiltration and urban runoff management	•	•	•							
	40	WPD	Establish water quality requirements for use of stormwater runoff	•	•								
Outreach	50-67	WPD	Evaluate and implement future outreach program elements as identified in Section 9.4.1	•	•	•	•	•	•	•	•	•	•
	68-69	WPD	Implement pilot studies to quantify benefits of non-structural BMPs	•	•	•	•						
	70	WPD	Create link to WQCMPUR activities on WPD website	•									
All Initiatives	71	WPD	Develop metrics for measuring success	•	•	•	•	•					
	72	WPD	Implementation strategy assessment and review					**R**					**R**

RA = Recommended Activity in Chapter 9; this Action Plan only includes the high priority recommended activities.
R = Review and revise document

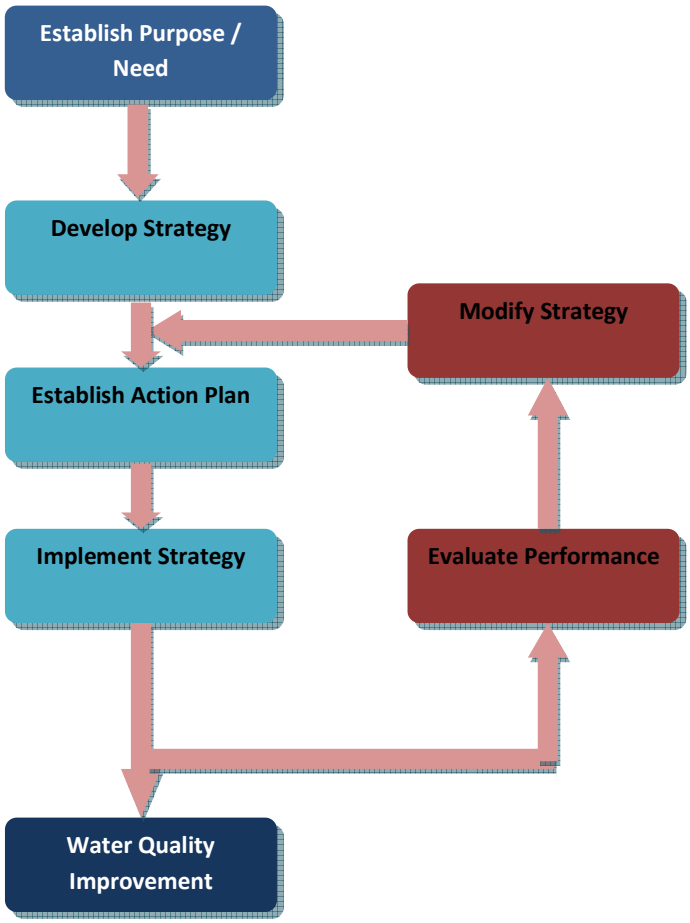

Figure 9-4
Adaptive Implementation Process

References

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Chapter 10
Financial Plan

10.1 Introduction

The City of Los Angeles faces challenges to meet existing and emerging water quality regulations for urban runoff over the next two decades. The City covers a large urbanized area (approximately 469 square miles), *Figure 10-1*, and encompasses a complex topography as previously discussed in *Chapter 2*. The numerous pollutants of concern, reviewed in *Chapter 4*, are diverse in nature and source; new pollutants are likely to also become regulated. Emerging water quality regulations set limits to the amount of urban runoff pollutants that can be discharged into receiving waters, *Chapters 3 and 5*. To satisfy these requirements, the City will need to implement a broad array of measures or BMPs to reduce urban runoff pollution, which have been categorized in *Chapter 6*. In addition, urban runoff management in Los Angeles will need to be coordinated with other implementation and watershed management plans in the City, *Chapters 7 and 8*.

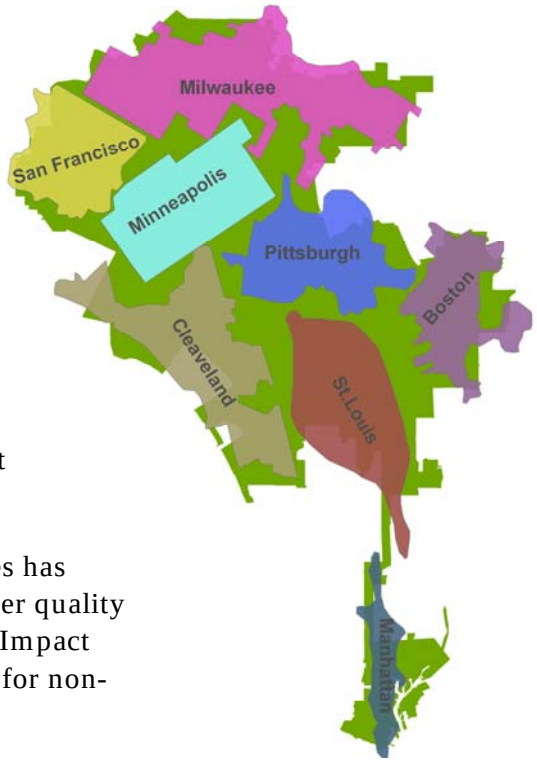

Figure 10-1 City of Los Angeles
Eight large metropolitan areas could fit within the City boundaries.

To address all these factors, the City of Los Angeles has developed, *Chapter 9*, a strategy to coordinate water quality management programs with an emphasis on Low Impact Development (LID), green programs, a preference for non-structural BMPs, and an adaptive management philosophy. Based on the currently available knowledge, this strategy is the best approach to bring the City to water quality compliance, but the projected costs are significant. As such, additional funding is necessary to meet the many challenges over the next 20 to 30 years. Without additional financial resources, there will be a delay in implementing many water quality improvement projects, which could potentially cause violations of water quality regulations, and subject the City of Los Angeles to penalties and lawsuits.

This chapter provides a review of current sources of revenue, estimates costs for water quality compliance, and identifies new potential sources of revenue. Each avenue has its own specific hurdles to overcome. Increases in taxes or fees as a sustainable funding source may be necessary, but should be viewed in the context that:

- The current stormwater fee allocated to the City's Watershed Protection Program is one of the lowest in the nation;

- Current revenues are fully allocated to the City's existing Watershed Protection Program and are not sufficient for addressing emerging water quality regulations; and
- Implementation of the WQCMPUR may result in benefits that exceed the cost impact of implementing water quality improvement projects.

10.2 Existing Cost Estimates for TMDL Implementation

Figure 10-2 illustrates the results of recent studies to evaluate the possible cost of implementing TMDLs in the Los Angeles region that are required by the Clean Water Act (CWA), *Refs. 10-1 to 10-6*. These cost estimates cover a range of $1 billion to over $70 billion. The studies made significantly different assumptions regarding the strategies to satisfy the TMDLs. At the high end of the estimates are approaches that rely on the use of regional and sub-regional stormwater treatment plants with proven technologies likely to be capable of meeting water quality regulations. Such plants might be similar to existing wastewater treatment plants using tertiary treatment, but there are limited opportunities for locating such plants. Many of those cost studies did not adequately account for land acquisition costs in the City of Los Angeles, otherwise some of these estimates could have been as high as $200 billion. This approach is

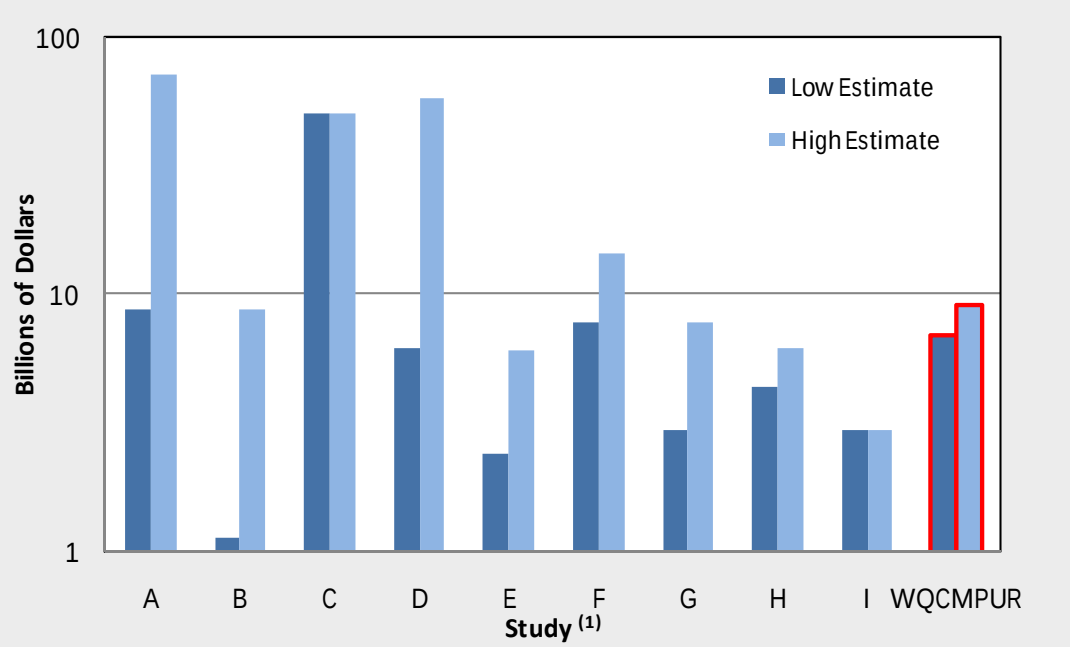

Figure 10-2
Comparison of TMDL Implementation Cost Estimates for Los Angeles
Estimates from recent independent studies for water quality compliance are compared with the 2007 compliance estimates per the WQCMPUR.

(1)
A – Stanley & Holman, 1998; ***Ref. 10-1***.
B – EPA, 1999; cited in ***Ref. 10-2***.
C – Moore, 2003; ***Ref. 10-5***.
D – Kuprenas, 2003; ***Ref. 10-3***.
E – CA Cities Survey, 2004; cited in ***Ref. 10-2***.
F – LA Region TMDLs; cited in ***Ref 10-2***.
G – CALTRANS, 2005; ***Ref. 10-6***.
H – Currier, 2005; Appendix H; ***Ref. 10-2***.
I – ASCE, 2005; ***Ref. 10-4***.

not considered fiscally realistic. At the other extreme, some studies assumed that TMDLs could be satisfied with non-structural BMPs focused on source control, with the addition of some infiltration projects. The authors of these studies acknowledged that there was considerable uncertainty in the ability of the non-structural approaches to meet the TMDL requirements.

The LARWQCB, as part of the TMDL development and approval process, prepares staff reports, *Refs. 10-7 to 10-11*, that include general cost estimates for implementing TMDLs. *Table 10-1* summarizes the LARWQCB estimates for several approved TMDLs in the Los Angeles Region. The LARWQCB estimates are based, in part, on some of the previously mentioned cost studies. There is a great deal of uncertainty in the estimates because of the number of BMP options and the performance assumed for each BMP. It appears that the LARWQCB cost estimates suggest a range of approaches similar to the lower estimates, *Ref. 10-4* in *Figure 10-2*. Therefore, the TMDL implementation costs in *Table 10-1* should be considered low estimates.

10.3 Cost Estimate for Water Quality Compliance

The City will be faced with significant new expenditures to satisfy water quality regulations over the next 20 to 30 years. The costs largely depend on the approach of implementation: focus on treatment or on programmatic elements. The City could rely heavily on technologies from wastewater treatment applied to urban runoff treatment. The cost of such an approach would be daunting, however, as indicated by the cost estimates previously discussed in *Section 10.2*, the City could also take an approach that might be technically challenging with less costs. This latter approach, discussed in *Chapter 9*, assumes there would be:

- An emphasis on non-structural, source-control BMPs where appropriate;
- Incorporation of multi-use, multi-benefit projects, supporting the goals of the Water IRP;
- A preference for green solutions and Low Impact Development;
- A focus on runoff reduction; and
- A reliance on treatment (structural) BMPs, when necessary.

Table 10-1
Summary of LARWQCB Cost Estimates to Implement TMDLs in Various Watersheds

Watershed	TMDL	Year	Capital Cost	Annual O&M	Comments
Santa Monica Bay	Bacteria (wet weather)	2002	$379M	$3.7M	RWQCB Staff estimate for *interim* strategy with stormwater diversion at 12 locations; long-term integrated resource strategy is estimated to cost more. (see RWQCB Staff report of 11-7-2002 (wet weather))
Santa Monica Bay	Bacteria (dry weather)	2002	$46M	$1.5M	RWQCB Staff estimate for *interim* strategy with stormwater diversion at 12 locations; long-term integrated resource strategy is estimated to cost more. (see RWQCB Staff report of 1-14-2002 (dry weather))
LA River	Trash		$554M		Based on Draft RWQCB Report estimate: {estimated cost of $14/household} x {12 years} x {3.3 million households}. (see RWQCB Staff reports of 1/6/2004)
LA River	Metals	2005	$1,039-1,426M	$135M	RWQCB estimate based on "phased implementation approach," implementation of IRP goals (not included in cost estimate), street sweeping and incorporation of structural BMPs. (see RWQCB Staff report of 6-2-2005)
Ballona Creek	Metals	2005	$245-335M	$37M	Similar strategies are suggested for the Ballona Creek Metals and Toxic TMDLs, consisting of a combination of implementation of IRP goals (not included in cost estimate), street sweeping and incorporation of structural BMPs. (see RWQCB Staff reports of 7-7-2005 (BC-metals) and 7-7-2005 (BC-toxics))
Ballona Creek	Toxic pollutants (Estuary)	2005	$245-335M	$37M	
Ballona Creek	Bacteria	2006	$375-917M	$12.5 - 6.7M	Cost for "Preferred Strategy", relying on a combination of flow and bacteria source control, limited treatment and discharge, and diversion to HTP. Costs are for interim control only. (see RWQCB Staff reports of 7-21-2006(BC))
Marina del Rey Harbor	Toxic Pollutants	2005	$5.5-7.6M	$0.8M	Cost for structural BMPs that would result in compliance of 70% of the urbanized portion of the watershed.
Marina del Rey Harbor (Mother's Beach and Back Basins)	Bacteria	2003	1) $36.6M 2) $3.1M 3) unknown	1) $0.07M 2) $0.03M 3) unknown	For compliance with dry and wet weather includes (1) diversion/ treatment strategy, (2) improved circulation and (3) structural and non-structural BMPs.

Note: Capital costs estimates in this Table have not been adjusted to 2008 because: (1) of the complexity of the estimates, and (2) some implementation activities have already been initiated. The cost summaries in the TMDL staff reports imply that there may be some overlapping costs because some BMPs implemented for one set of TMDLs may also benefit other TMDLs.

Cost Estimate Methodology: Preliminary estimates of the City's cost to implement programs for water quality compliance in the four regional watersheds area are summarized in *Tables 10-2* and *10-3***.** The general methodology was to develop unit costs for each TMDL category based on area. The specific steps to generate these estimates are the following:

1. Define the City-owned portions of the four watersheds.

2a. The 2006 CWA 303(d) List (*Appendix 5-2)* lists over 250 impairments in the Los Angeles River, Santa Monica Bay, Dominguez Channel and Ballona Creek (including Marina del Rey) watersheds. It is expected that these impairments will be grouped into a smaller number of TMDLs (as discussed in *Chapter 5*) by commonalities of characteristics, sources and watershed or sub-watershed areas. It is assumed that TMDLs in each watershed can be grouped into six major pollutant categories: metals, organics, trash, bacteria, toxics and nutrients.

Use available LARWQCB cost estimates for implementing adopted TMDLs as a baseline, *Table 10-2.* Not all watersheds or TMDLs have an estimated cost.

2b. Use an internal WPD cost estimate for implementing adopted TMDLs as an alternate baseline, *Table 10-3.* Note: the LARWQCB estimate was used for the LA River Watershed.

3. Calculate unit costs for each TMDL (with a baseline cost estimate) for each watershed by dividing the total TMDL implementation cost by the total watershed area. Unit costs are expressed in $ per acre. Again, not all TMDLs will have a unit cost.

4. Calculate the cost for compliance on City-owned watershed property for each TMDL in each watershed. Cost is calculated by multiplying unit cost per acre by the total watershed acreage and the percentage of City-owned property. Since many combinations of watersheds and pollutant categories do not have a unit cost per acre, it was assumed that implementation costs for specific pollutant categories were the same for comparative watersheds. For TMDLs that address organics, it was assumed that implementation would be the same as for toxic pollutants TMDLs. For TMDLs that address nutrients, it was assumed these have been largely addressed by recent upgrades to three WWTPs.

5. Calculate the total compliance estimate by adding all the individual TMDL implementation cost estimates.

Total Approximate Cost Estimates for Water Quality Compliance: *Table 10-2* estimates the approximate cost for water quality compliance using the LARWQCB estimates (*Table 10-1*) as a baseline. *Table 10-3* estimates the approximate cost for water quality compliance using internal WPD cost estimates as a baseline. Both

Table 10-2 Estimate of City of Los Angeles Implementation Costs (RWQCB basis)

The table summarizes a TMDL implementation cost estimate based on LARWQCB implementation cost estimates as a starting point. The costs described in the TMDLs may be duplicative in certain cases, as some BMPs could benefit more than one TMDL category. In other cases, no costs were included for IRP projects that might benefit water quality goals.

	LA River	SMB: J2 & J3	BC (&MdR)	DC	Comment
Total Area (acres)	533,416	34,457	82,114	84,693	
% in City of Los Angeles	33%	58%	81%	26%	
Estimated Costs for Selected TMDLs ($ billion)					
RWQCB TMDL Estimate - Metals	$3.74 billion		$1.08 billion		RWQCB Staff Report (LAR metals), 6/2/2005 - 1994-97 $ - 20 years, Page 75 RWQCB Staff Report (BC metals), 7/7/2005 - 1997 $ - 20 years, Page 57
RWQCB TMDL Estimate - Organics					
RWQCB TMDL Estimate - Trash	$0.55 billion		$0.11 billion		From Draft Staff Report: 3.3M households x 12 years x $8.8/household. Includes O&M. RWQCB Draft staff report for BC- trash, 1/16/2004
RWQCB TMDL Estimate - Bacteria		$0.46 billion	$0.62 billion		RWQCB Staff Report (SMB - WW Bacteria (Interim)), 11/07/02, Page 70 - draft - 2001-$, 7%)+ 01/14/02 dry weather TMDL RWQCB Staff Report (BC-Bacteria), 7/21/2006, Page 53 - final, preferred
RWQCB TMDL Estimate - Toxics			$0.99 billion		RWQCB Staff Report (BC Estuary only - toxics), 7/7/2005 - 1997 $ - 20 years
RWQCB TMDL Estimate - Nutrients					Assumes covered by WWTP upgrades
Unit Costs ($/acre)	**(blue ⇒ adjusted)**				
Unit cost per acre - Metals	$9,420/acre		$13,100/acre		RWQCB assumed LAR costs applied to Machado Lake TMDL (DC).
Unit cost per acre - Organics			$7,490/acre		Rate assumed same as for bacteria
Unit cost per acre - Trash	$1,040/acre		$1,320/acre		
Unit cost per acre - Bacteria		$13,300/acre	$7,490/acre		
Unit cost per acre - Toxics			$16,100/acre		
Unit cost per acre - Nutrients					
Cost Projections ($ billion)					
Projected City Cost - Metals	$1.66 billion	$0.19 billion	$0.87 billion	$0.21 billion	Used LAR rate for SMB & DC
Projected City Cost - Organics	$1.32 billion	$0.15 billion	$0.50 billion	$0.16 billion	
Projected City Cost - Trash	$0.18 billion	$0.02 billion	$0.09 billion	$0.02 billion	Used LAR rate for SMB & DC
Projected City Cost - Bacteria	$1.32 billion	$0.27 billion	$0.50 billion	$0.16 billion	Used unit cost for BC for LAR and DC
Projected City Cost - Toxics	$0.43 billion	$0.05 billion	$1.07 billion	$0.05 billion	Assumes it applies on 15% to LAR, SMB, DC
Projected City Cost - Nutrients	$0.03 billion				Upgrades already applied to LAG, DCT & BUR
Total Estimated Implementation Costs for TMDLs for City				**$ 9.2 billion**	

Table 10-3 Estimate of City of Los Angeles Implementation Costs (WPD basis)

Independently, the City's Bureau of Sanitation, Watershed Protection Division, estimated in a white paper (October 2007) the cost for TMDL implementation using a similar methodology as for Table 10-2. This alternate estimate projects costs about 15% lower. The starting points for the estimate that were significantly different, from those used in *Table 10-2*, are shaded.

	LA River	SMB: J2 & 3	BC (&MdR)	DC	Comment
Total Area (acres)	533,416	34,457	82,114	84,693	
% in City of Los Angeles	33%	58%	81%	26%	
Estimated Costs for Selected TMDLs ($ billion)					
RWQCB TMDL Estimate - Metals	$1.34 billion		$0.37 billion		2007 WPD White Paper: Report on the Financial Needs of the Stormwater Program (Oct. 2007)
RWQCB TMDL Estimate - Organics					
RWQCB TMDL Estimate - Trash	$0.55 billion				From RWQCB Draft Staff Report: 3.3M households x 12 years x $8.8/household. Includes O&M.
RWQCB TMDL Estimate - Bacteria		$0.57 billion	$0.33 billion		SMB From final and draft RWQCB staff reports. RWQCB interim cost was increased by 50%.
RWQCB TMDL Estimate - Toxics			$0.37 billion		2007 WPD White Paper: Report on the Financial Needs of the Stormwater Program (Oct. 2007)
RWQCB TMDL Estimate - Nutrients					Assumes covered by WWTP upgrades
New MS4 Additional Costs					$1.5M/year
Unit Costs ($/acre)					
Unit cost per acre - Metals	$2,510/acre		$4,510/acre		RWQCB assumed LAR costs applied to Machado Lake TMDL (DC).
Unit cost per acre - Organics			$4,510/acre		Rate assumed same as for Toxics
Unit cost per acre - Trash	$1,040/acre		$1,530/acre		RWQCB Draft staff report for BC appears to have estimated rates that are 47% higher than LAR
Unit cost per acre - Bacteria		$16,500/acre	$4,020/acre		
Unit cost per acre - Toxics			$4,510/acre		
Unit cost per acre - Nutrients					
Cost Projections ($ billion)					
Projected City Cost - Metals	$0.44 billion	$0.09 billion	$0.30 billion	$0.10 billion	Used BC rate for SMB and DC
Projected City Cost - Organics	$0.79 billion	$0.09 billion	$0.30 billion	$0.10 billion	
Projected City Cost - Trash	$0.18 billion	$0.02 billion	$0.10 billion	$0.02 billion	
Projected City Cost - Bacteria	$2.91 billion	$0.33 billion	$0.27 billion	$0.36 billion	Used SMB rate for LAR and DC
Projected City Cost - Toxics	$0.12 billion	$0.01 billion	$0.30 billion	$0.01 billion	Assumes it applies on 15% to LAR, SMB, DC
Projected City Cost - Nutrients	$0.03 billion				Upgrades already applied to BUR, DCT, LAG
Total Estimated Implementation Costs for TMDLs				**$ 6.9**	**billion**

approaches result in a comparable result with an estimated total cost for water quality compliance ranging from $7 to $9 billion.

Uncertainties in Estimating Costs: The range of $7 to $9 billion reflects underlying uncertainties in the cost estimate. For example, the actual costs may be higher because:

- Cost estimates were based on 2007 dollars and don't account for inflation;
- New regulations may be adopted that require further action; and
- The cost of land and the acreage needed for implementing BMPs is difficult to estimate.

On the other end, the actual costs may be lower because:

- Many types of BMPs remove more than one pollutant (for instance BMPs that rely on infiltration of urban runoff), thereby addressing multiple TMDLs at the same time;
- Urban runoff management strategies will become more cost effective as new technologies are developed and research in urban runoff management and water quality progresses; and
- Source control becomes more effective and accepted as a means of reducing or eliminating pollutants.

The cost estimate prepared in this section is about in the middle of other available estimates that were summarized in *Figure 10-2*. Use of any of these cost estimates for other than scoping purposes should be carefully considered.

Annual Cost Estimates for Water Quality Compliance: *Figure 10-3* provides an extrapolation of annual capital expenditures for water quality compliance over a 20-year period starting after realization of new revenue sources. The City's Bureau of Sanitation often estimates O&M costs at 6% of the expected capital expenditures. This number reflects both the importance of O&M costs and the uncertainty of maintenance requirements on new and unproven technologies. It does not reflect improvements in technology or adaptive management (as it applies to O&M) that is expected to occur over a 20-year period. Also, O&M requirements may be reduced because of economies of scale. Therefore, *Figure 10-3* projects the 6%-level of O&M costs over the same 20-year period as well as O&M costs at the 3%-level. The absolute spread between these two lines increase significantly beyond 5 years and the 3% figure might be viewed as a goal for future "programmatic" costs, in particular because the costs for O&M will continue beyond the 20-year period shown.

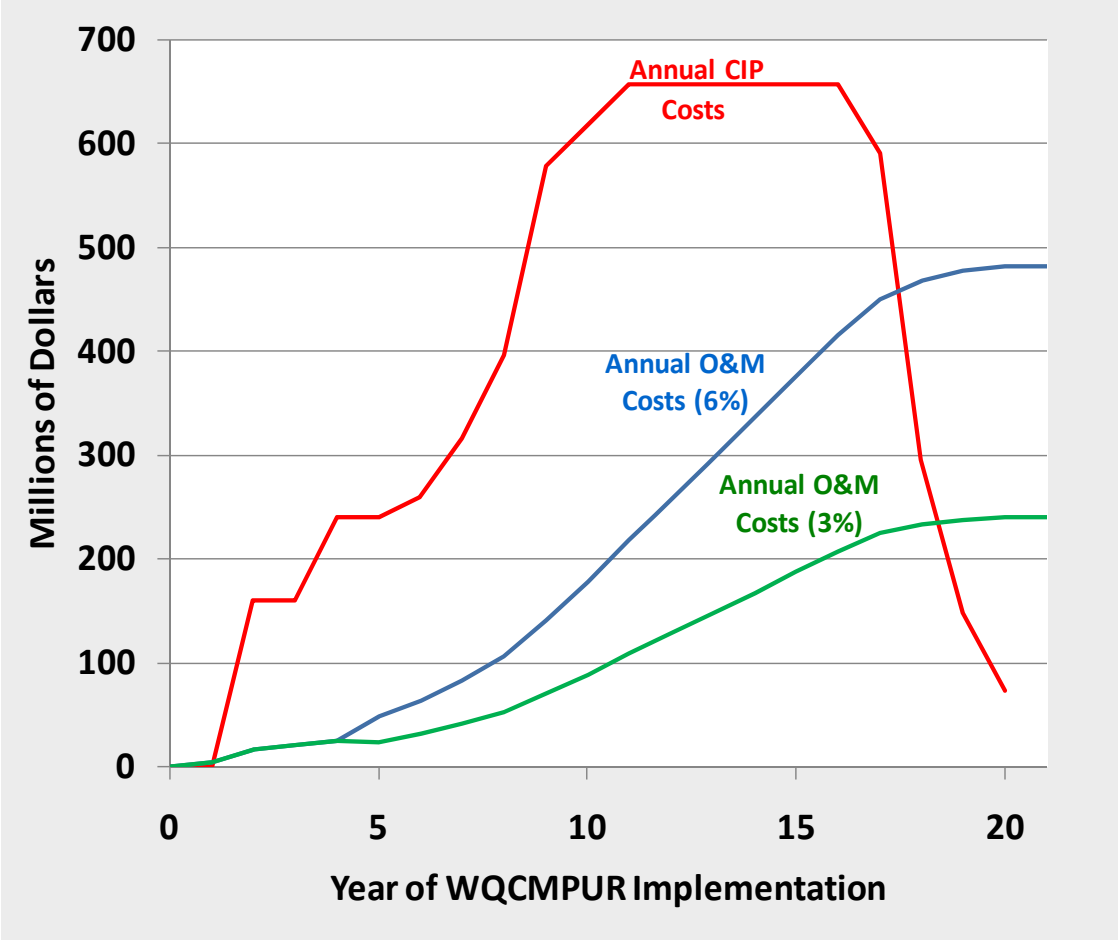

Figure 10-3
20-Year Projected Capital and O&M Costs for Implementing the WQCMPUR after Securing Funds for Implementation Projects in Year 0.
Basis: 2007 dollars

10.4 Current Revenues

Except for Proposition O bond proceeds, almost all current revenues for the City's Watershed Protection Program and urban runoff-related projects are derived from the Stormwater Pollution Abatement Charge (SPAC). Minor other sources of revenue include grants and other miscellaneous sources that tend to be limited and sometimes require a matching element.

Stormwater Pollution Abatement Charge: The Stormwater Pollution Abatement Fund (SPAF) was established in 1990-91 by the City Council to collect revenues from the SPAC on each property tax bill. The SPAC is actually collected by the County of Los Angeles and distributed to the City of Los Angeles. The SPAC to a property owner is determined by a formula that is proportional to the amount of runoff from each property in the City; the formula is based on a monthly rate of $1.92 per

equivalent dwelling unit (EDU) on each parcel[1]. The proceeds from the fund must be expended only for stormwater and pollution abatement related activities. They can be applied, however, to operation and maintenance as well as capital improvement projects.

SPAC fees were not required to be voter approved when originally implemented. However, the City now needs property owner or voter approval to increase property related fees such as the SPAC per restrictions of California Proposition 218 (1996). Proposition 218 exempts water, sewer, and refuse fees from the voter approval process, but legislation is currently being considered to include stormwater fees in the exemption.[2] Mostly as a result of the passage of Proposition 218, an attempt to increase the SPAC has not been undertaken since 1994. Therefore, the SPAC has not kept pace with revenue requirements to satisfy increasingly stringent regulatory requirements and SPAF revenues have been relatively constant over the years at approximately $28 million per year. Insignificant fluctuations are a result of delinquent property tax payments and / or requests for changes in how parcel runoff factors are applied to a particular property (usually initiated as a result of land-use changes).

Figure 10-4 illustrates that the Los Angeles SPAC rate is relatively low compared to cities in the western United States that might be expected to have similar issues as Los Angeles. Some of these cities have stormwater related fees that are as much as 8 times higher than current Los Angeles rates.

Proposition O Bond Proceeds: Proposition O (2004) authorized the City to issue a series of general obligation bonds up to $500 million for projects to protect public health by cleaning up pollution, including bacteria and trash, in the City's

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[1] The unit of measure for the City of Los Angeles is based on the Basic Assessment Unit (BAU), which is defined (in Section 64.51.01 of the Los Angeles Municipal Code (LAMC)) as, "the proportionate run-off from the average single-family residential parcel. The average single-family residential parcel has an area of 0.1526 acres (6,650 square feet) and a run-off factor of 0.4176.The product these (0.0637) is defined as the Basic Assessment Unit." The number of BAUs a particular parcel represents, the "Equivalent Dwelling Unit" (EDU), is determined using the following formula:

$$\text{EDU} = \frac{(\text{parcel area in acres}) \times (\text{parcel runoff factor})}{\text{BAU}}$$

The parcel runoff factors are defined in Section 64.51.05 in the LAMC as established by the Los Angeles County Flood Control District.

[2] An important development in California was the litigation between the City of Salinas and the Howard Jarvis Taxpayers Association that was decided June 3, 2002. It blocked the imposition of a stormwater fee on owners of improved or undeveloped graded properties due to its status as a "property related" fee subject to Proposition 218 balloting. Unless the case is successfully appealed or reviewed by the California Supreme Court, it will serve as a significant roadblock to funding compliance through user fees. The City should consider revisiting this issue at some future date once legal precedents related to the Salinas case have been established in this matter.

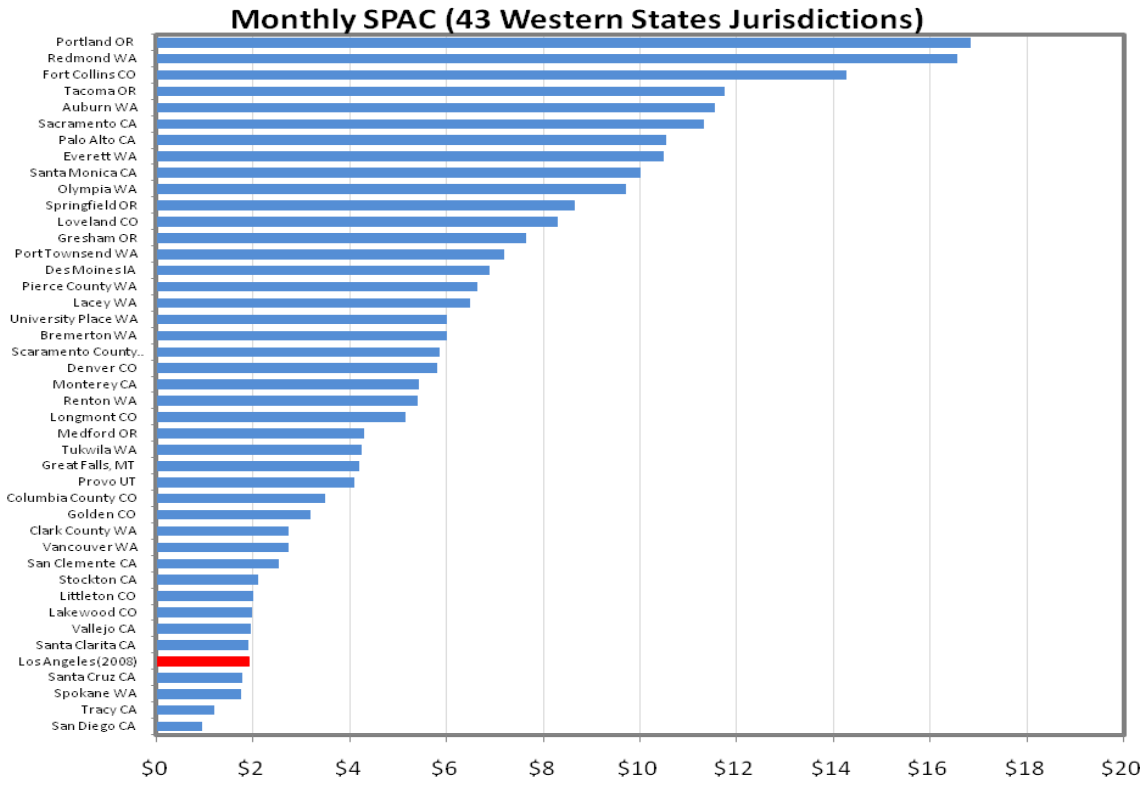


Figure 10-4
Comparison of Los Angeles Current Stormwater Fee with Other Western States City's Fees
Figure based on 2007 Stormwater Utility Survey by Black & Veatch.
The current Los Angeles SPAC is represented by the red bar.

watercourses and waterbodies in response to regulatory requirements of the CWA. These obligation bonds are funded by the City's General Fund from proceeds of ad valorem taxes levied on property subject to taxation over a period of approximately 20 years. The payment of the Proposition O bond is indicated by a line item on property tax bills so the amount can be readily identified by the taxpayer. Since the funds available from the Proposition O program have fully been allocated, no additional funding is available for implementation of the activities identified in the WQCMPUR.

Other Revenue Sources: Other revenue sources include interest payments on cash balances, developer plan review fees, grant reimbursements, reimbursements from other funds / agencies, fines and other minor revenue sources. Over the projection period, these revenue sources are expected to be relatively minor (about 10% in recent years, but expected to decrease as costs rise significantly) in comparison to SPAC generated-revenues and Proposition O bond proceeds.

10.5 Strategy for Future Funding

Without an increase in funds, there will be a delay in initiating new water quality programs, and possibly a delay in meeting water quality regulations. *Figure 10-5* illustrates the annual difference between expected revenues and expenses for the next

five years. These estimates are based on 2007 dollars; actual costs in the future will be higher due to inflation and future increases in construction costs.

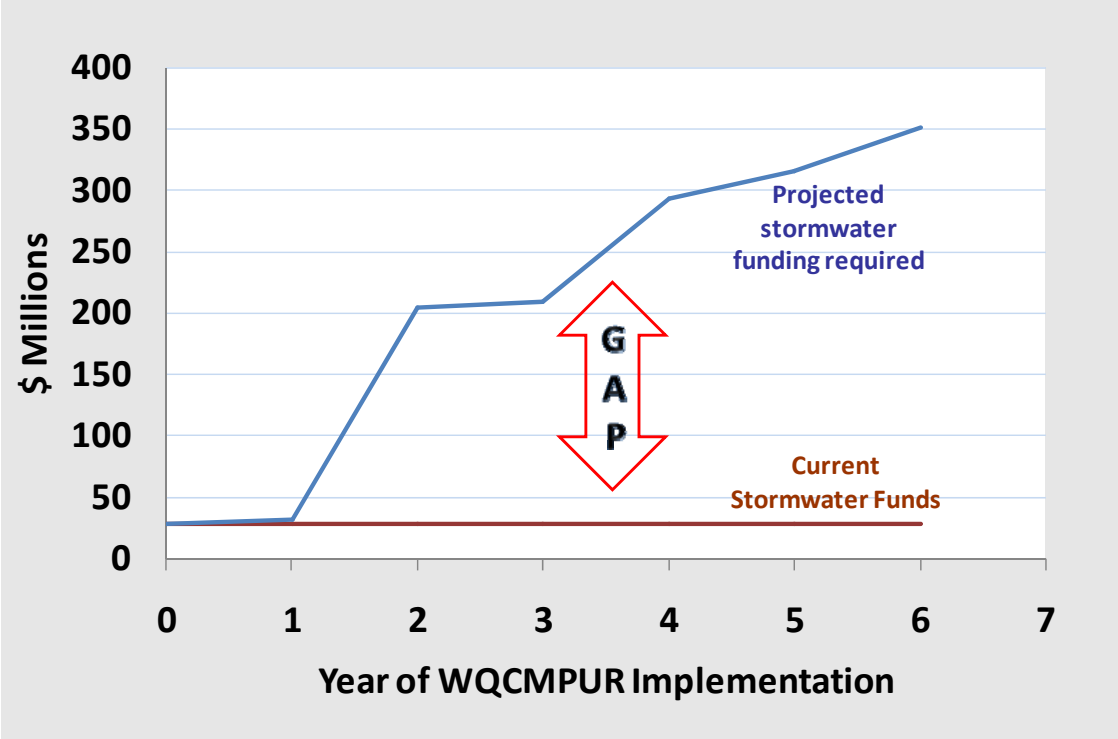


Figure 10-5
Predicted Annual Funding Gap for the Watershed Protection Program without an Increase in Funds - over a 5 year period of implementing programs defined in the WQCMPUR
Current SPAF funding and projected Watershed Protection Program funding needs are based on 2007 dollars. The projected funding requirements may increase or decrease after 5 years depending on the implementation rate of various water quality compliance projects.

This section discusses three options for future funding:

- **Option 1**: Increase of the SPAC;
- **Option 2**: Partnership with County of Los Angeles Flood Control Program; and
- **Option 3**: No additional funding for implementing the WQCMPUR.

Option 1, SPAC Increase: Based on the expected revenue shortfall illustrated in *Figure 10-5*, a SPAC increase is a source of funds for two purposes: (a) to finance the capital costs of required stormwater projects; and (b) to cover on-going increases of O&M costs. If opting for this approach, the City could draft a 5-year SPAC increase

schedule for voter or property owner approval (as required by Proposition 218), rather than attempt to gain approval for yearly rate increases. *Table 10-4* illustrates a possible SPAC adjustment schedule that would fund the estimated cost of $7-9 billion to implement the WQCMPUR through debt financing (note: calculations are based on 2007 dollars and have not been adjusted for yearly cost-of-living adjustment, COLA).

Table 10-4
Example of a SPAC Rate Adjustment and the Resulting Projected Revenue

	Current	Year 1	Year 2	Year 3	Year 4	Year 5
Monthly Rate/EDU(1)	$1.92	$3.93	$5.00	$6.08	$7.15	$8.25
Projected SPAF Revenue from SPAC	$31M(2)	$59M	$74M	$91M	$107M	$123M

(1) EDU: Equivalent Dwelling Unit.
(2) Includes $2.4M from permit fees and others.

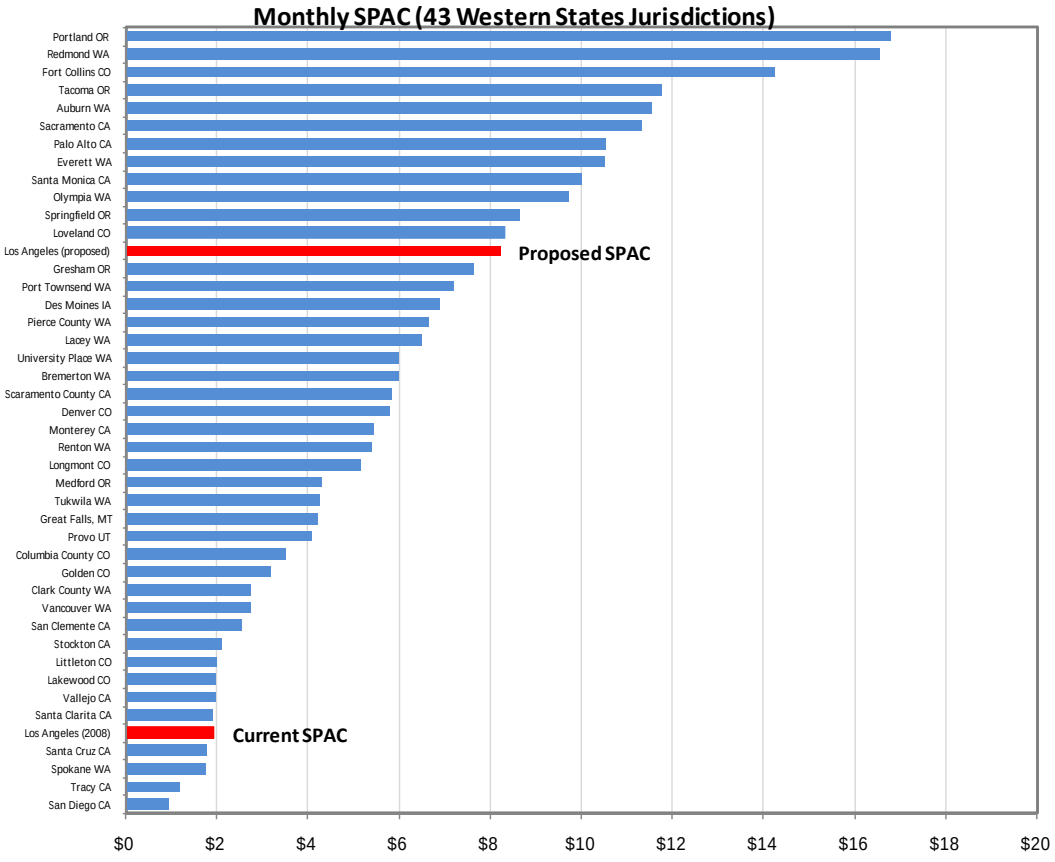


Figure 10-6
Comparison of Los Angeles Stormwater Fee with Other Western States Cities after Implementation of Possible SPAC Increase
This comparison uses current (2007) rates for other cities.

Even if the SPAC were increased to $8.25 by the end of 5 years, this rate would still be lower than the rates in many other cities in western states (*Figure 10-6).* It is expected that a SPAC rate increase would require broad political support since Proposition 218 requires either a majority vote of property owners or two thirds approval of the voters in a general election.

Figure 10-7 illustrates how revenues from increasing the SPAC could be used to eliminate the funding gap between current revenues and projected future needs by using debt financing in a 7:1 ratio. A number of types of bond programs for debt financing are available to finance the implementation of the WQCMPUR including:

- General Obligation Bonds – Proposition O is an example;
- Stormwater Revenue Bonds; and
- State Revolving Fund Loans (SRF).

A discussion on specifics of these bonds can be found in *Appendix 10-1.* Debt financing is not unlimited and is constrained by unique situations depending on the source of financing. The issuance of multiple bonds would count against debt-coverage requirements (typically viewed as the assets to debt ratio). Debt-coverage

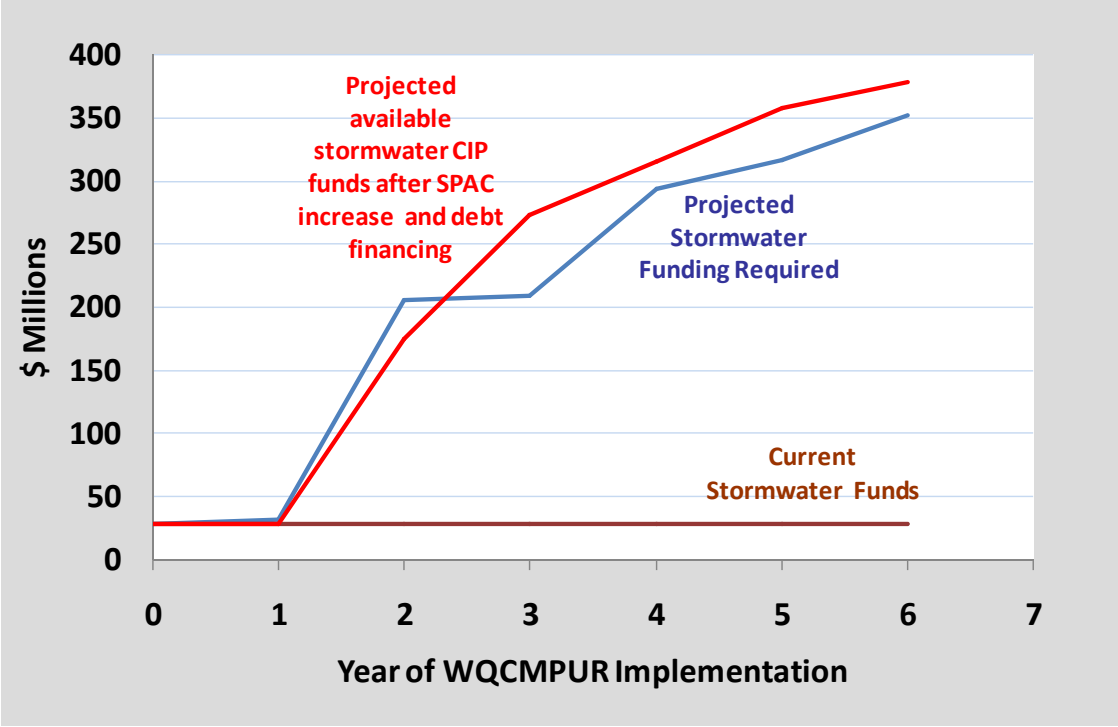


Figure 10-7
Comparison of Funding with Proposed SPAC Increase (Option 1) and Debt Financing with Projected Stormwater Funding Requirements over the first 5 Years of WQCMPUR Implementation

This chart assumes additional funds from a SPAC increase to fund stormwater programs will be distributed (1) to cover the projected O&M in *Figure 10-3* and (2) to cover debt financing of new CIP projects in a 7:1 ratio. Projected funding requirements are based upon 2007 dollars. It is assumed funds would be allocated in a graduated manner.

requirement ratios are required to meet specific credit ratings. There is the potential the SPAF could overextend itself if multiple bond issuances are sought that, in combination, decrease credit ratings and, subsequently, increase the interest payable on the bond.

Option 2, Partnership with Los Angeles County Flood Control Program: Currently, the County of Los Angeles collects fees from County property owners and uses these revenues for countywide projects that are narrowly limited by statute to support flood control programs. The City is working with the County to determine if expanding the scope of this program to address urban runoff water quality needs is viable as an additional funding source. It is believed that approval at the State level (probably with a County-sponsored Assembly Bill) will be necessary to change the allowable scope of the Flood Control Program. The City also intends to work with the County (and other cities within the County) to determine the amount of increased fees and how the funds would be administered, since any fees generated would be for programs across the County. After (1) the necessary State approval / modifications of the statute limitations and (2) determination of county-wide revenue needs, the County (and City) expect to seek approval by property owners (+50 %), probably sometime in 2010. This approach also aligns with the fact that a given impacted watershed will include many responsible parties and the cost for implementing water quality compliance projects will include multiple jurisdictions. At this point, it is not clear whether a single fee increase or a graduated fee increase could be sought. This will have a major impact on the rate of implementing water quality improvement projects.

Option 3, No Additional Funding: Without additional funding, many water quality improvements recommended by the WQCMPUR cannot be implemented. This will result in non-compliance with emerging water quality regulations, potentially subjecting the City of Los Angeles to penalties and lawsuits.

Other Funding Sources: WPD actively seeks and will continue to seek supplemental funding from federal, state and local grants and loans. Grants have previously been awarded from the California Integrated Waste Management Board, the California Coastal Commission, the Governor's Clean Beach Initiative, the Federal Transportation Equity Act for the 21st Century (TEA-21) and State Propositions A, 12, 13, 40, 50, 84 and 1E (*Appendix 10-2*). However, monies from these types of sources are limited and are distributed among numerous public and private agencies following a competitive award process. On average, the City has been awarded approximately $2 - $3 million annually in grant funds. State funding is expected to increase slightly over the next few years with the recently passed State Bond Propositions 1E (2006, for Disaster Preparedness and Flood Prevention) and 84 (2006, for Water Quality, Safety and Supply, Flood Control, Natural Resources Protection, and Park Improvements). Most grants require some percentage of matching funds, so while grants can extend funding, they often require upfront funding.

Other funding sources include additional user fees (for refuse and excess water), federal grants, subsidies and incentive programs, and State Revolving Fund loans. These alternatives will be pursued as appropriate. However, none of these funding sources are expected to provide significant funds compared to projected needs.

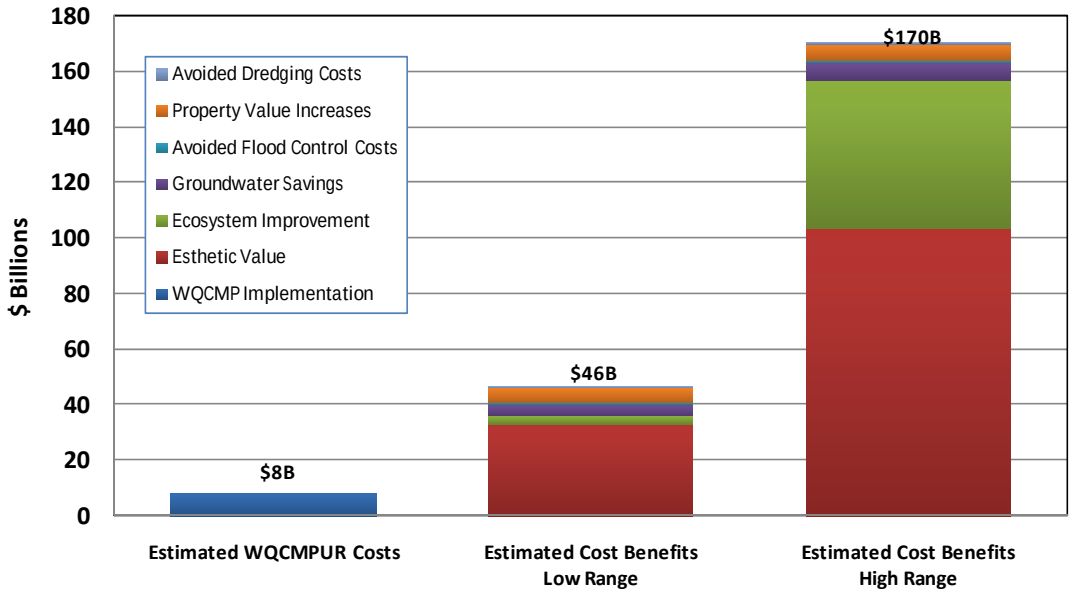
10.6 WQCMPUR Benefits

The discussion up to this point has focused upon estimates of the direct costs to fund future water quality compliance projects and the funding sources that need to be developed. While these costs may be substantial, they should be viewed against the potential benefits of implementing the WQCMPUR. The City and the surrounding region will benefit with fewer beach closures, cleaner communities, healthier ecosystems, lowered health risks, improved recreational opportunities and lowered demand for potable water. Utilizing an existing study prepared in 2004 for the LARWQCB (*Ref. 10-4;* Appendix H), a present value was estimated for the six following potential benefits:

- Aesthetic value of a clean ocean – the value or benefits of a clean ocean after removal of all ocean impairments;
- Ecosystem services – value of lost near-shore marine ecological services associated with impairments that could be potentially returned if urban runoff quality control improvements are implemented;
- Additional water supply - value of water that could potentially be infiltrated with stormwater quality control improvements;
- Flood control – total annual flood insurance premiums in the region that would be potentially no longer required with stormwater quality control improvements;
- Property value increase – high range: total increases in property values related to increases in green space associated with stormwater quality control improvements; low range: esthetic benefit of trash control associated with stormwater quality control improvements; and
- Avoided dredging costs – sediment removal costs in regional harbors that could potentially be eliminated with stormwater quality control improvements.

The values of these benefits are certainly subjective, but they are not intangible. Utilizing the data in the study and applying updated values a high and low range of costs were developed for each factor. Then the factors were summed and compared to the overall present value cost of the WQCMPUR as illustrated in *Figure 10-8*. Low and high range benefit factors are approximately 3.7 times greater and 13.8 times greater, respectively, than the estimated WQCMPUR cost. Obviously missing from the list of benefits are those that could be attributed to avoided health costs that, if it were possible to include, would skew the cost-benefit comparison even more in favor of the

activities recommended in the WQCMPUR.[3] Another benefit not included in the figure is the avoided costs of legal actions that might happen if water quality improvements are not implemented



Source: NPDES Stormwater Cost Survey, Currier, Jones, Moeller (2005) and Appendix by Devinny, Kamieniecki, Stenstrom
Estimated "Cost Savings" do not include anything for improved public health which is also thought to be substantial.

Figure 10-8
Comparison of WQCMPUR Estimated Costs with Cost Benefits Expected (2007 Basis)

10.7 Recommendations

Proposition O has provided a temporary financial reprieve that has allowed for the implementation of a number of large-scale projects. These projects will have the most impact on compliance with the dry-weather bacteria and trash TMDLs. The financial plan for the WQCMPUR has identified the gap between proposed planning level CIP and O&M costs and revenues for the next 20 years. The shortfall in revenues will require the development of additional revenue sources and incentives to fund this implementation strategy. Accordingly, it is recommended that the City evaluates an increase of the SPAC and / or additional resources from partnering with the Los Angeles County Flood Control Program as sustainable funding sources for the implementation of the WQCMPUR.

[3] In 2006, the LARWQCB included information in a Fact Sheet, part of the LA County's MS4 permit renewal process, that indicated: (1) illness associated with swimming in marine waters were estimated between 627,800 and 1,479,200 excess gastrointestinal cases annually in Los Angeles County and Orange County beaches as a result of enterococci contaminated waters, and (2) the corresponding economic loss ranged from $21 million to $51 million annually.

References

10-1. Stanley & Holman Associates (1998). Financial and Economic Impacts of Storm Water Treatment Los Angeles County NPDES Permit Area.

10-2. Brian K. Currier, Joseph M. Jones, Glenn L. Moeller (2005) "NPDES Stormwater Cost Survey." Prepared for California Water Resources Control Board, Office of Water Programs. (Report includes Alternative Approaches to Stormwater Quality Control (2004) by Joseph S. Devinny, Sheldon Kamieniecki and Michael Stenstrom as Appendix H.

10-3. John A Kuprenas, Peter Gordon, James E. Moore, Harry W. Richards, and Jin-Jen Lee (June 2003). "Analysis Methodology for Stormwater Treatment Costs." 4th Joint Annual ISPA / SCEA Conference.

10-4. ASCE (2005). "2005 Report Card for Los Angeles County Infrastructure."

10-5. James Moore, Peter Gordon, Harry W. Richardson, John Kuprenas and Jin-Jen Lee (2003). "An Economic Impact Evaluation of Proposed Storm Water Treatment for Los Angeles County." AWRA's 2003 annual Water Resources Conference.

10-6. Caltrans Water Quality Newsflash (March 14, 2005). Number 05-11. http://www.dot.ca.gov/hq/env/stormwater/publicat/newsflash/

10-7. EPA and California Regional Water Quality Control Board Los Angeles Region (2005). Staff Report for "Total Maximum Daily Load for Metals – Los Angeles River and Tributaries."

10-8. EPA and California Regional Water Quality Control Board Los Angeles Region (2004). Staff Report for "Trash Total Maximum Daily Loads for the Ballona Creek and Wetland."

10-9. EPA and California Regional Water Quality Control Board Los Angeles Region (2007). Staff Report for "Trash Total Maximum Daily Loads for the Los Angeles River Watershed."

10-10. EPA and California Regional Water Quality Control Board Los Angeles Region (2007). Staff Report for "Trash Total Maximum Daily Load for the Machado Lake in the Dominguez Channel Watershed."

10-11. EPA and California Regional Water Quality Control Board Los Angeles Region (2005). Staff Report for "Total Maximum Daily Load for Toxic Pollutants in Marina del Rey Harbor."

Figure 11
Monitoring Locations for Marina del Rey Harbor Mother's Beach and Back Basins Bacteria TMDL

Figure 12
Proposed Monitoring Locations for Marina del Rey Toxic Pollutants TMDL

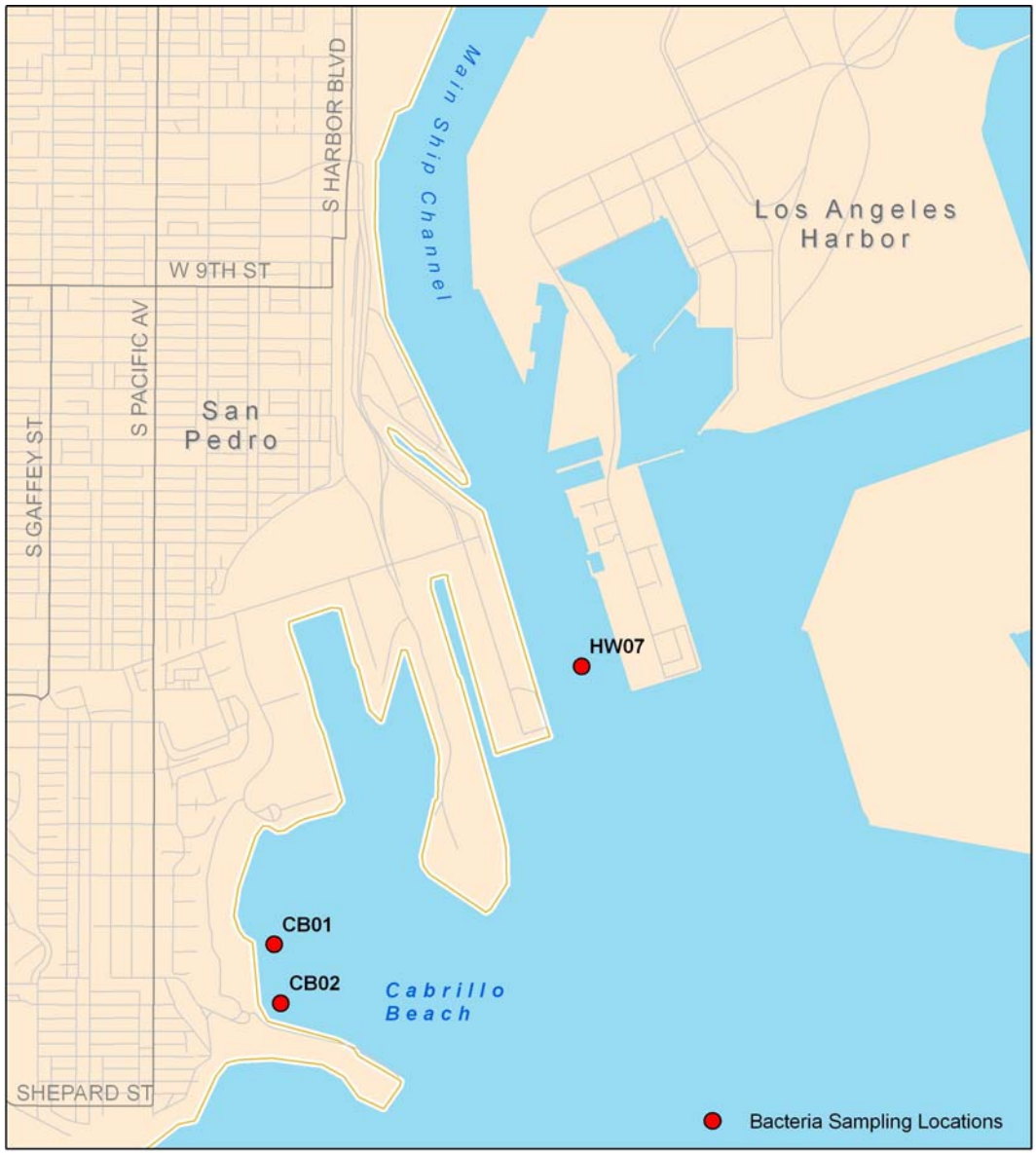


Figure 13
Monitoring Locations for Los Angeles Harbor Main Ship Channel and Inner Cabrillo Beach Bacteria TMDL

References

1. County of Los Angeles Department of Public Works (2007). Los Angeles County 2006-07 Stormwater Monitoring period (www.ladpw.org/WMD/npdes/2006-07tc.cfm).

Appendix 4-1
Pollutant Sources and Effects on Health and Environment

Pollutant	General Sources in Environment[(1)]	Runoff Sources	Health & Environmental Effects
Metals & Inorganic Chemicals			
Zinc	Coatings to prevent rust; dry cell batteries; alloys like brass, and bronze; widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments; historical uses.	Automobile tire wear; wear of galvanized metals; zinc galvanized rooftops; brake pad wear; building siding and roof.	Toxic to aquatic organisms
Copper	Brake pad wear, wire, plumbing pipes, and sheet metal; brass and bronze pipes and faucets; compounds used in agriculture to treat plant diseases, water treatment; preservatives for wood, leather, and fabrics.	Brake pad wear; architectural applications; pesticides applications; vehicle fluid leaks and dumping; industrial copper use; aerial deposition (fossil fuel combustion, industrial facilities, wildfires); soil erosion; building siding.	High acute and high chronic toxicity to aquatic organisms and marine fishes, bio- concentrate in certain aquatic species.
Lead	Automobile exhaust, release from soils, fossil fuels, mining, and manufacturing; production of metal products (solder and pipes), and devices to shield X-rays; (Lead from gasoline, paint and other historical uses has been dramatically reduced in recent years).	Aerial deposition (fossil fuel combustion, industrial facilities); construction material wear; soil erosion; building siding; lead-based paints.	Acute: variety of adverse health effects in humans interference with red blood cell chemistry, delays in normal physical and mental development in babies and young children. Chronic: Cerebro-vascular and kidney disease in humans
Selenium	Electronics industry, nutritional supplement and glass industry; as a component of pigments in plastics, paints, enamels, inks, and rubber; preparation of pharmaceuticals, nutritional feed additive for poultry and livestock; pesticide formulations; rubber production; ingredient in fungicides; diagnostic medicine.	Natural sources such as marine shales.	Short Term: Hair and fingernail changes; damage to the peripheral nervous system; fatigue and irritability. Long-term: Damage to kidney and liver tissue, and the nervous and circulatory systems.
Cadmium	Mineral fertilizers; production of pigments, metal coatings, and plastics; enters the air from mining, industry, and historical uses.	Fertilizer application; insecticide application; tire wear; wear of coated surfaces; aerial deposition.	Bioaccumulation in aquatic ecosystems and food chain, persist in the environment, chronic exposure can lead to kidney disease.
Silver	Jewelry, silverware, electronic equipment, and dental fillings; used to make photographs, in brazing alloys and solders, to disinfect drinking water and water in swimming pools, and as an antibacterial agent' used in lozenges and chewing gum to help people quit smoking; textile plant	Effluent from photographic processing industry; aerial deposition; natural sources.	Extremely toxic to aquatic plants and animals

Pollutant	General Sources in Environment[1]	Runoff Sources	Health & Environmental Effects
Pesticides			
Chlordane	Environmental Protection Agency (EPA) banned all uses of chlordane in 1983 except to control termites. In 1988, EPA banned all uses.	Historical soil/sediment contamination; their current presence in runoff is related to the release of these chemicals from sediments	Effects on the central nervous system. High acute toxicity to aquatic organisms such as fishes, crustaceans, and amphibians. Bioaccumulation in aquatic ecosystems and food chain, persist in the environment
DDT	Its use in the U.S. was banned in 1972 because of damage to wildlife.	Legacy sediments.	Probable human carcinogens. Nervous system effects in humans and animals.
Dieldrin	EPA banned all uses of dieldrin in 1987.	Legacy sediments.	Probable human carcinogens. Nervous system effects in humans and animals.
PAHs and Other Organic Compounds			
Includes: Benzo(A)Pyrene Chrysene Phenanthrene Pyrene	Incomplete burning of oil and gas, or other organic substances like tobacco or charbroiled meat; found in coal tar, crude oil, creosote, and roofing tar; used in medicines or to make dyes, plastics, and pesticides; In Southern California, predominantly from mobile sources (cars, trucks, and trains)	Combusted of fossil fuels; vehicle motor oil; aerial deposition and subsequent wash-off of combustion by-products.[2]	Probable human carcinogens. Toxic to aquatic life at low concentrations.
1,1 DCE/ Vinyldene Chloride	Production of vinyl chloride	Runoff from chemically impacted soils; solvents	Probable human carcinogens. Toxic to aquatic life at low concentrations.
PCBs	Water supply contaminated by transformer oils in which PCBs were originally used as a heat-exchange medium; The use of these compounds has been banned. (There are still numerous transformers in existence that contain PCBs)	Historical soil/sediment contamination; old, leaking equipment; their current presence in runoff is related to the release of these chemicals from sediments	Bioaccumulation in the food chain, persist in the environment, chronic exposure can lead to liver damage and congenital defects, found to be carcinogenic in laboratory animals.
Nutrients			
Nitrite/Nitrate, Ammonia and Phosphates	Fertilizers; lawn clippings; car exhaust ; animal wastes; detergents	Commercial fertilizers; detergents, domestic pet/wildlife/human waste; nitrogen in precipitation.	Promotes toxic and non-toxic algal blooms which reduces the amount of light and dissolved oxygen

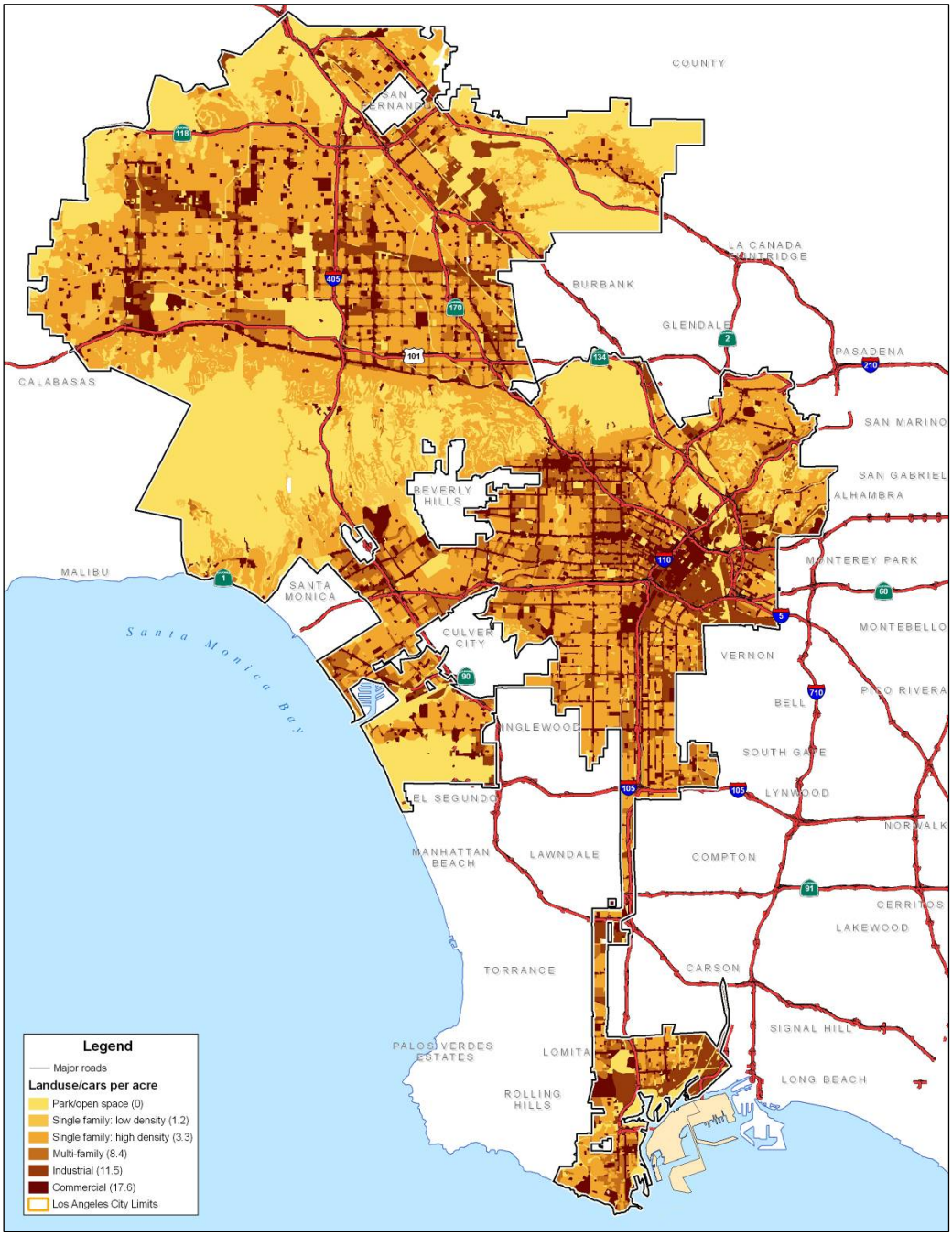
Pollutant	General Sources in Environment[1]	Runoff Sources	Health & Environmental Effects
Pathogens			
Indicator Bacteria & Enteric Viruses	Domestic pet/wildlife/human wastes deposited, stored or applied to the land; application of fertilizers, algaecides and fungicides.	Improper management of wastes, fertilizers, algaecides and fungicides; failed septic systems; boat discharges.	Public health concerns.
Trash			
Trash	Human littering of unwanted material such as plastics, paper, grass, and aluminum cans, etc.	Human littering of unwanted material such as plastics, paper, grass, and aluminum cans, etc.	Contributes all sort of pollutants to the receiving waterbodies. Aesthetically not pleasant. Environmental and public health concerns.

(1) ***Ref. 1***.
(2) ***Ref. 2***.

References

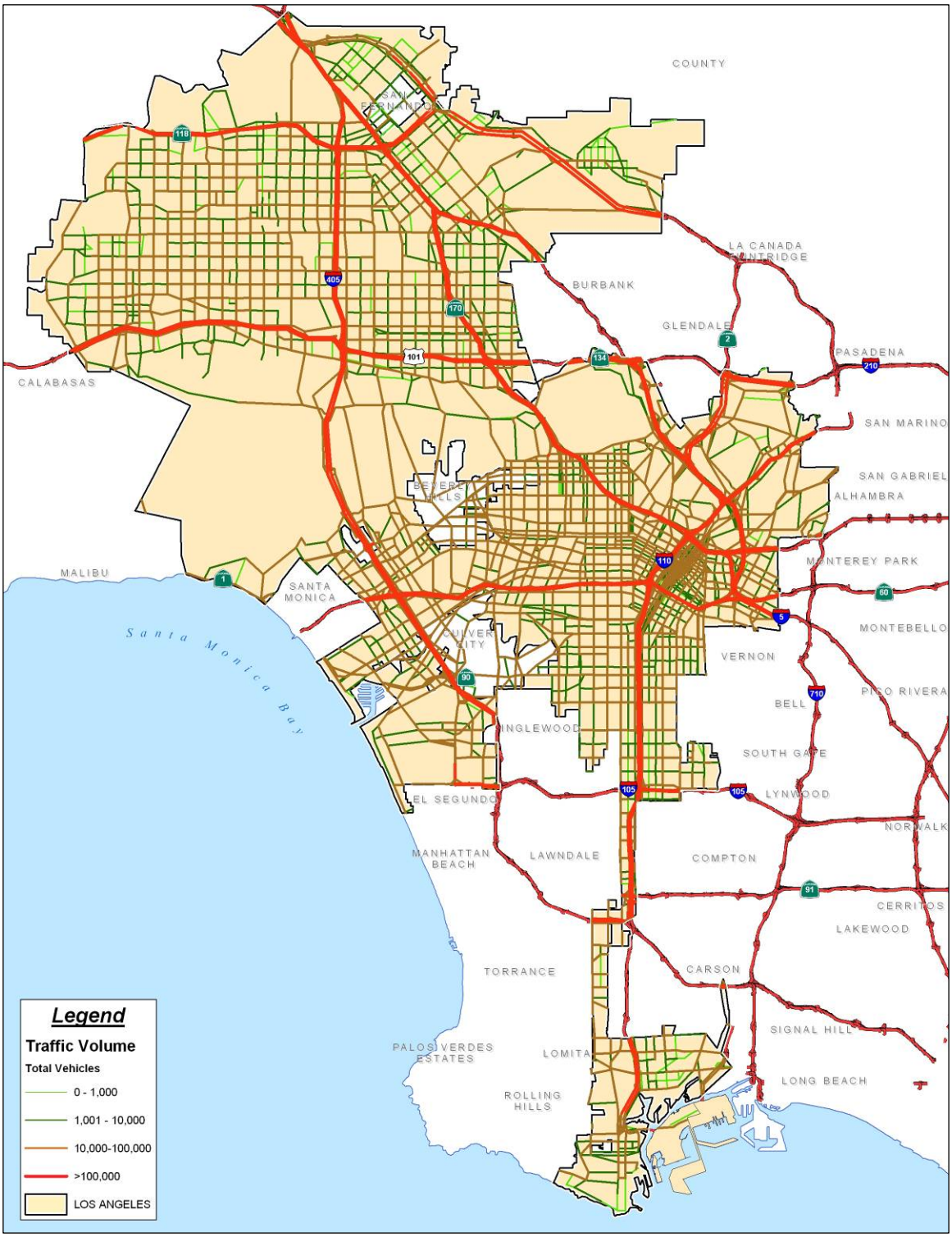
1. Watershed Protection Division (2007). Priority Pollutants and their Sources in the Environment. Los Angeles, CA (internal report).
2. Stein, E.D., Tiefenthaler, L.L., Schiff, K.C. (2007). Sources, Patterns and Mechanisms of Storm Water Pollutant Loading from Watersheds And Land Uses of the Greater Los Angeles Area; SCCWRP Report.

Appendix 4-2
Spatial Pollution Distribution Maps



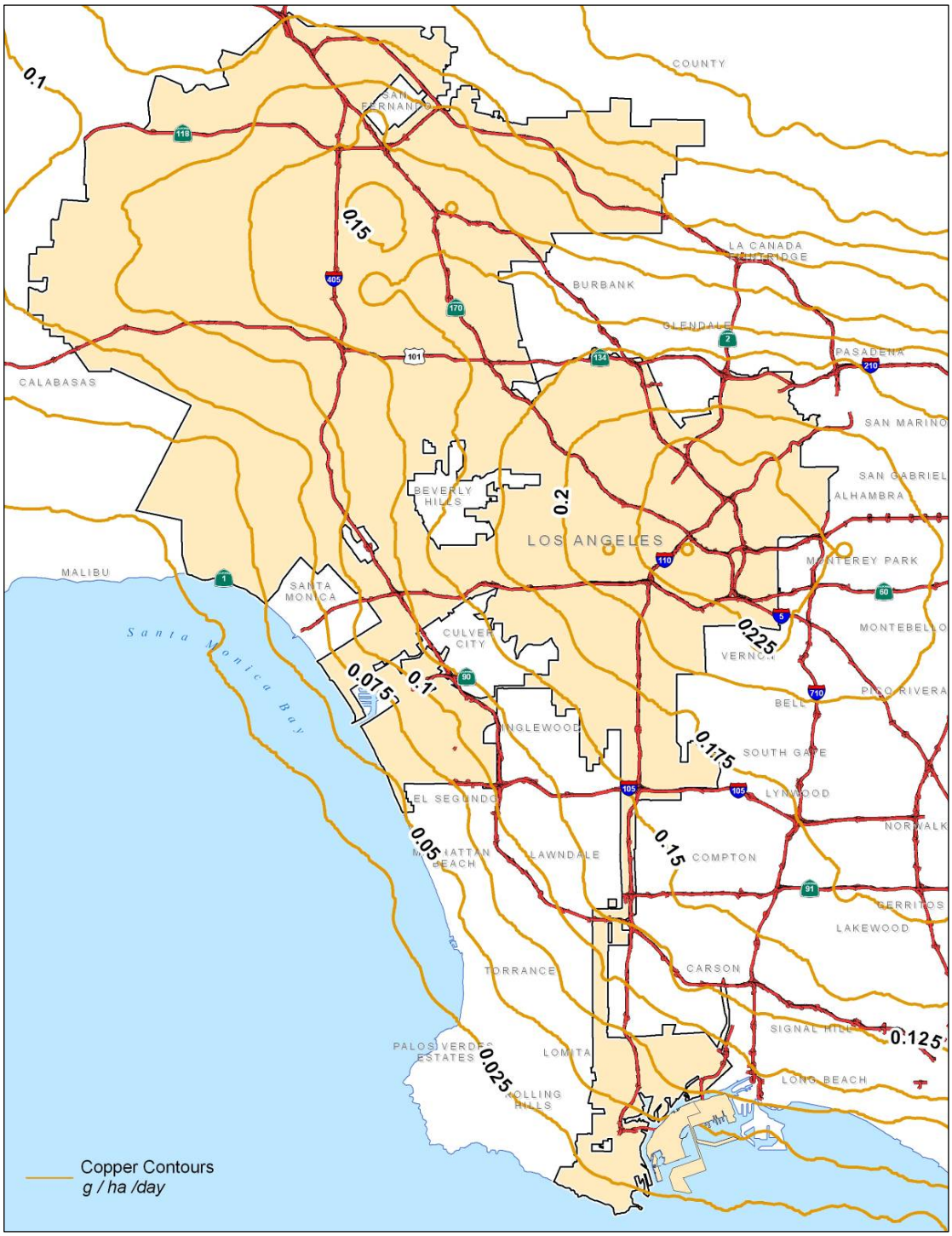
Map 1 Vehicle Density for Each Land Use

The traffic information was based on the transportation data gathered by the Southern California Association of Governments (SCAG) illustrates locations in Los Angeles with relatively high use traffic patterns.



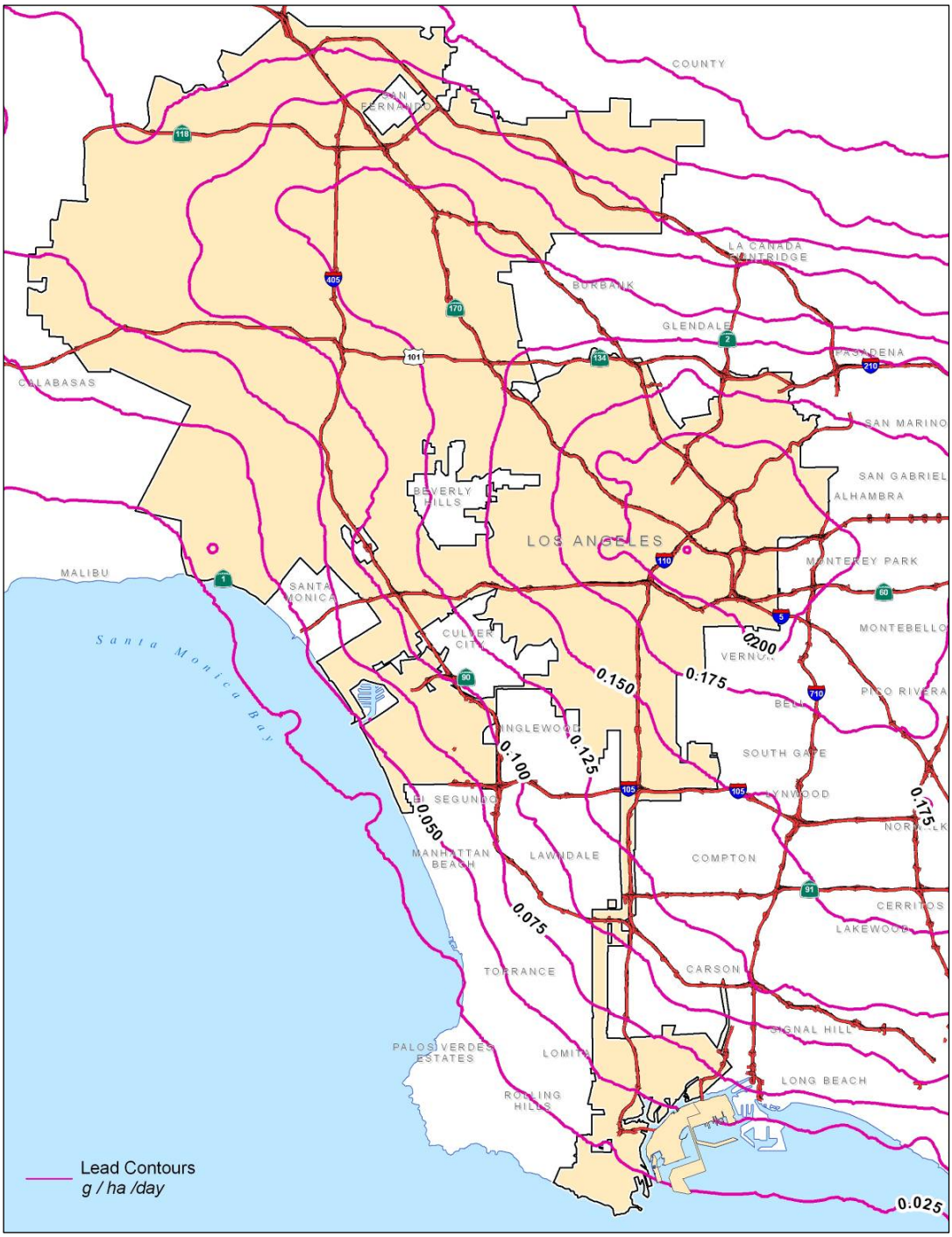
Map 2 Average Daily Traffic Count

The traffic information was based on the transportation data gathered by the Southern California Association of Governments (SCAG).



Map 3 Copper Atmospheric Deposition

The atmospheric deposition contours were developed by UCLA based on information generated by South Coast Air Quality Management District (*Ref. 1*). The map indicates that the highest deposition of copper occurs near Downtown Los Angeles.



Map 4 Lead Atmospheric Deposition

The atmospheric deposition contours were developed by UCLA based on information generated by South Coast Air Quality Management District (*Ref. 1*). The map indicates that the highest deposition of lead occurs near Downtown Los Angeles.

Watershed	Waterbody	303(d) Pollutant/Stressor	TMDL Date[1]	Consent Decree[2]
Dominguez Channel	Los Angeles Harbor – Inner Cabrillo Beach Area	Copper	2019	N
		DDT	2019	Y
		PCBs	2019	Y
	Machado Lake (Harbor Park Lake)	Ammonia	2019	Y
		Algae	2019	Y
		ChemA (tissue)	2019	Y
		Chlordane (tissue)	2019	Y
		DDT (tissue)	2019	Y
		Dieldrin (tissue)	2019	Y
		Eutrophic	2019	Y
		Odor	2019	Y
		PCBs (tissue)	2019	Y
		Trash	2019	Y
	Point Fermin Park Beach	DDT (Fish Consumption)	2019	Y
		PCBs (Fish Consumption)	2019	Y
	San Pedro Bay Near/Offshore Zones	Chlordane	2019	N
		Chromium (sediment)	2019	Y
		Copper (sediment)	2019	Y
		DDT (tissue & sediment)	2019	Y
		PAHs	2019	Y
		PCBs	2019	Y
		Sediment Toxicity	2019	Y
		Zinc (sediment)	2019	Y
	Torrance Carson Channel	Copper	2019	Y
		Lead	2019	Y
		Coliform bacteria	2007	Y
	Wilmington Drain	Ammonia	2019	Y
		Copper	2019	Y
		Lead	2019	Y
		Coliform bacteria	2007	Y

(1) Date listed for completion of TMDL (***Ref. 1***).
(2) Y – Yes, listed as impaired in the 1999 Consent Decree; N – No, waterbody not listed as impaired in the Consent Decree (Note: In a few cases current 303(d) (***Ref. 1***) listings are not listed exactly the same as the impairments to be addressed by the Consent Decree; in these cases best professional judgment was used to determine if current listing was part of 1999 Consent Decree).

References

1. State Water Resources Control Board. 2006. 2006 Clean Water Act Section 303(d) List of Water Quality Limited Segments Requiring TMDLs (http://www.waterboards.ca.gov/tmdl/303d_lists2006approved.html).

Appendix 6-1
Overview of Best Management Practices

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Outdoor Equipment Maintenance	SC-32	✓			✓		✓	✓			✓	✓	✓	✓	✓	✓		–	–
Outdoor Storage of Raw Materials	SC-33	✓	✓		✓		✓	✓			✓	✓	✓	✓	✓	✓		–	–
Waste Handling & Disposal	SC-34				✓	✓	✓	✓			✓	✓	✓	✓	✓	✓		–	–
Safer Alternative Products	SC-35		✓		✓		✓	✓			✓		✓	✓	✓	✓		–	–
Contaminated or Erodible Areas	SC-40	✓	✓		✓	✓	✓	✓			✓		✓	✓	✓	✓		–	–
Building & Grounds Maintenance	SC-41	✓	✓		✓	✓					✓	✓	✓	✓	✓	✓		–	–
Building Repair and Construction	SC-42	✓		✓	✓		✓	✓			✓		✓	✓	✓	✓		–	–
Parking / Storage Area Maintenance	SC-43	✓		✓	✓		✓	✓			✓	✓	✓	✓	✓	✓		–	–
Drainage System Maintenance	SC-44	✓		✓		✓					✓		✓	✓	✓	✓		–	–
Over Water Activities	SC-50			✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Housekeeping Practices	SC-60	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Safer Alternative Products	SC-61		✓		✓		✓	✓				✓	✓	✓	✓	✓		–	–
Road and Street Maintenance	SC-70	✓		✓	✓		✓	✓				✓	✓	✓	✓	✓		–	–
Plaza and Sidewalk Cleaning	SC-71	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Fountain & Pool Maintenance	SC-72	✓	✓	✓		✓		✓				✓	✓	✓	✓	✓		–	–
Landscape Maintenance	SC-73	✓	✓	✓								✓	✓	✓	✓	✓		–	–
Drainage System Maintenance	SC-74	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Waste Handling and Disposal	SC-75	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓		–	–
Water & Sewer Utility Maintenance	SC-76	✓	✓			✓	✓	✓				✓	✓	✓	✓	✓		–	–
Site Design & Landscape Planning	SD-10	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Roof Runoff Controls	SD-11	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Efficient Irrigation	SD-12	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Storm Drain Signage	SD-13			✓					✓				✓	✓	✓	✓		–	–
Pervious Pavements	SD-20		✓		✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Alternative Building Materials	SD-21				✓			✓	✓				✓	✓	✓	✓		–	–
Fueling Areas	SD-30				✓		✓		✓				✓	✓	✓	✓		–	–
Maintenance Bays & Docs	SD-31				✓		✓	✓	✓				✓	✓	✓	✓		–	–
Trash Storage Areas	SD-32		✓	✓		✓	✓	✓	✓				✓	✓	✓	✓		–	–
Vehicle Washing Areas	SD-33	✓	✓		✓		✓	✓	✓				✓	✓	✓	✓		–	–
Outdoor Material Storage Areas	SD-34	✓	✓	✓	✓		✓	✓	✓				✓	✓	✓	✓		–	–
Outdoor Work Areas	SD-35	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–
Outdoor Processing Areas	SD-36	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓		–	–

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Treatment Control BMPs																			
Infiltration Trench	TC-10	H	H	H	H	H	H	H	✓		✓	✓	✓	✓	P	P	✓	Slopes>15%, sites with risk of groundwater contamination.	P
Infiltration Basin	TC-11	H	H	H	H	H	H	H	✓		✓	✓	✓	✓	P	P	✓	Slopes>15%, sites with risk of groundwater contamination.	P
Retention / Irrigation	TC-12	H	H	H	H	H	H	H	✓		✓	✓	✓	✓	✓	✓	✓	<100 ft from wells, septic systems, natural wetlands; <12" soil.	P
Wet Pond	TC-20	H	M	H	H	H	H	H	✓		✓	✓	✓	✓	✓	✓		Steep unstable soils, not sustainable in arid climates.	P
Constructed Wetlands	TC-21	H	M	H	H	H	H	H	✓		✓			✓	✓	✓		Steep unstable soils.	P
Extended Detention Basin	TC-22	M	L	H	M	M	M	M	✓		✓	✓	P	✓	✓	✓	✓	Tight spaces; areas without hydraulic head, minimum 5 acre site.	P
Vegetated Swale	TC-30	M	L	L	M	L	M	M	✓		✓	✓	✓	✓	✓	✓		Slopes>6%. Steep topography. Heavily gopher-populated areas. Certain industrial.	P
Vegetated Buffer Strip	TC-31	H	L	M	H	L	H	M	✓		✓	✓	✓	✓	✓	✓		Slopes>15%; Tight spaces; Certain industrial.	P
Bioretention	TC-32	H	M	H	H	H	H	H	✓		✓	✓	✓	✓	✓	P	✓	Slopes >20%. Unstable soil stratum.	P
Media Filter	TC-40	H	L	H	H	M	H	H	✓		✓	✓	✓	✓	✓	✓	✓	unstable soils lead to clog. Large sites >25 acres. <4ft heads	P
Water Quality Inlet	TC-50	L	L	M	L	L	M	L	✓		✓	✓	✓	✓	✓	✓		Unvegetated areas.	P
Multiple Systems	TC-60	H	L	H	H	M	H	H	✓		✓	✓	P	P	P	P		Tight land areas.	P
Wetland	MP-20	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓						–	P
Media Filter	MP-40	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		Unstable soils lead to clog.	P
Wet Vault	MP-50	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓		–	P
Vortex Separator	MP-51	M	L	✓	L		✓	✓	✓		✓	✓	✓	✓	✓	✓		–	P
Drain Inlet	MP-52	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓	✓	✓		Large areas. Areas with trash / leaves	P
Non-Stormwater/Material Management BMPs																			
Water Conservation Practices	NS-1	✓								✓			–	–	–	–		–	–
Dewatering Operations	NS-2	✓								✓			–	–	–	–		–	–
Paving and Grinding Operations	NS-3	✓								✓			–	–	–	–		–	–
Temporary Stream Crossing	NS-4	✓								✓			–	–	–	–		–	–
Clear Water Diversion	NS-5	✓								✓			–	–	–	–		–	–
Illicit Connection / Discharge	NS-6		✓	✓	✓	✓	✓	✓		✓			–	–	–	–		–	–
Potable Water / Irrigation	NS-7	✓	✓		✓			✓		✓			–	–	–	–		–	–
Vehicle and Equipment Cleaning	NS-8	✓	✓				✓	✓		✓			–	–	–	–		–	–
Vehicle and Equipment Fueling	NS-9						✓			✓			–	–	–	–		–	–
Vehicle & Equipment Maintenance	NS-10		✓	✓			✓	✓		✓			–	–	–	–		–	–
Pile Driving Operations	NS-11	✓					✓			✓			–	–	–	–		–	–

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Concrete Curing	NS-12	✓			✓		✓			✓			–	–	–	–		–	–
Concrete Finishing	NS-13	✓			✓			✓		✓			–	–	–	–		–	–
Material Over Water	NS-14	✓	✓	✓	✓	✓	✓	✓		✓			–	–	–	–		–	–
Demolition Adjacent to Water	NS-15	✓	✓	✓	✓	✓	✓	✓		✓			–	–	–	–		–	–
Temporary Batch Plants	NS-16	✓	✓	✓	✓					✓			–	–	–	–		–	–
Material Delivery and Storage	WM-1	✓	✓	✓	✓		✓	✓		✓			–	–	–	–		–	–
Material Use	WM-2	✓	✓	✓	✓		✓	✓		✓			–	–	–	–		–	–
Stockpile Management	WM-3	✓	✓	✓	✓		✓	✓		✓			–	–	–	–		–	–
Spill Prevention and Control	WM-4	✓	✓	✓	✓		✓	✓		✓			–	–	–	–		–	–
Solid Waste Management	WM-5	✓	✓	✓	✓		✓	✓		✓			–	–	–	–		–	–
Hazardous Waste Management	WM-6		✓	✓	✓	✓	✓	✓		✓			–	–	–	–		–	–
Contaminated Soil Management	WM-7		✓	✓	✓	✓	✓	✓		✓			–	–	–	–		–	–
Concrete Waste Management	WM-8	✓			✓					✓			–	–	–	–		–	–
Sanitary / Septic Waste Management	WM-9		✓	✓		✓		✓		✓			–	–	–	–		–	–
Liquid Waste Management	WM-10	✓	✓	✓	✓		✓			✓			–	–	–	–		–	–
Erosion & Sediment Control BMPs																			
Scheduling	EC-1	✓								✓			–	–	–	–		–	
Preservation of Existing Vegetation	EC-2	✓								✓			–	–	–	–		–	
Hydraulic Mulch	EC-3	✓								✓			–	–	–	–		–	
Hydroseeding	EC-4	✓								✓			–	–	–	–		–	
Soil Binders	EC-5	✓								✓			–	–	–	–		–	
Straw Mulch	EC-6	✓								✓			–	–	–	–		–	
Geotextiles and Mats	EC-7	✓								✓			–	–	–	–		–	
Wood Mulching	EC-8	✓								✓			–	–	–	–		Not suitable for use on slopes steeper than 3:1 (H:V).	
Earth Dikes and Drainage Swales	EC-9	✓								✓			–	–	–	–		–	
Velocity Dissipation Devices	EC-10	✓								✓			–	–	–	–		–	
Slope Drains	EC-11	✓								✓			–	–	–	–		Maximum drainage area per slope drain is 10 acres.	
Streambank Stabilization	EC-12	✓								✓			–	–	–	–		–	
Polyacrylamide	EC-13	✓								✓			–	–	–	–		–	
Silt Fence	SE-1	✓								✓			–	–	–	–		Streams, Channels, Drain Inlets	
Sediment Basin	SE-2	✓		✓						✓			–	–	–	–		Not appropriate for drainage areas greater than 75 acres.	
Sediment Trap	SE-3	✓		✓						✓			–	–	–	–		Not appropriate for drainage areas greater than 5 acres.	
Check Dams	SE-4	✓								✓			–	–	–	–		Not appropriate in channels that drain areas greater than 10 acres.	
Fiber Rolls	SE-5	✓								✓			–	–	–	–		–	
Gravel Bag Berm	SE-6	✓								✓			–	–	–	–		May not be appropriate for drainage areas greater than 5 acres.	
Street Sweeping and Vacuuming	SE-7	✓		✓			✓			✓			–	–	–	–		–	
Sandbag Barrier	SE-8	✓								✓			–	–	–	–		Drainage area upstream of the barrier limited to 5 acres.	
Straw Bale Barrier	SE-9	✓								✓			–	–	–	–		Are suitable only for sheet flow on slopes of 10 % or flatter.	
Storm Drain Inlet Protection	SE-10	✓		✓						✓			–	–	–	–		Drainage area should not exceed 1 acre.	

Control Measure	Reference	Targeted Constituents Removal							Application				NRCS Hydrolic Soils Group				APPLICABILITY		
	CA BMP Handbook (2003)	Sediment	Nutrients	Trash	Metals	Bacteria	Oil & Grease	Organics	New Development & Redevelopment	Construction	Industrial & Commercial	Municipal	A (Gravel/Sand)	B (Loam)	C (Silt Loam)	D (Clay Loam, Sandy Clay, Clay)	Groundwater Level a Concern?	Locations to Avoid	Potential for Mosquito/Vector Concerns
Chemical Treatment	SE-11									✓			–	–	–	–		–	
Stabilized Construction Entrance / Exit	TR-1	✓								✓			–	–	–	–		–	
Stabilized Construction Roadway	TR-2	✓								✓			–	–	–	–		–	
Entrance / Outlet Tire Wash	TR-3	✓								✓			–	–	–	–		–	
Wind Erosion Control	WE-1	✓								✓			–	–	–	–		–	

References:

1. California Stormwater Quality Association (2003). Stormwater Best Management Practice Handbook (www.cabmphandbooks.com).
2. Santa Clara Valley Urban Runoff Pollution Prevention Program (2004). Stormwater Handbook (www.scvurppp-w2k.com).

Notes:

H High
M Medium
L Low
P Potential
✓ Yes

Appendix 6-2
BMP Performance Data

Example of variability of BMP performance data: this table summarizes effluent concentrations of various pollutants that have been observed at detention basins.

Source: Data from Geosyntec Consultants.

Effluent Statistics					Effluent Percentiles						
BMPID	Parameter	Count	NDCount	%ND	5th	10th	25th	50th	75th	90th	95th
Detention Basins	Cadmium, Dissolved (ug/L as Cd)	75	43	57%	0.012	0.020	0.050	0.144	0.566	1.830	2.167
Detention Basins	Cadmium,Total (ug/L as Cd)	97	29	30%	0.083	0.110	0.248	0.568	1.313	2.359	3.145
Detention Basins	Copper, Dissolved (ug/L as Cu)	152	0	0%	1.947	2.526	4.864	8.117	13.727	24.263	28.125
Detention Basins	Copper, Total (ug/L as Cu)	184	14	8%	2.870	3.697	7.180	13.016	21.922	32.357	42.223
Detention Basins	Lead, Dissolved (ug/L as Pb)	111	52	47%	0.061	0.093	0.185	1.031	3.353	5.731	7.519
Detention Basins	Lead, Total (ug/L as Pb)	146	18	12%	0.837	1.639	4.902	12.725	28.191	52.553	97.903
Detention Basins	Nitrate + Nitrite, Total (mg/L as N)	27	18	67%	0.002	0.003	0.010	0.048	0.142	0.575	1.020
Detention Basins	Nitrate Nitrogen, Total (mg/L as N)	103	10	10%	0.133	0.174	0.270	0.578	0.918	1.684	2.150
Detention Basins	Nitrogen, Ammonia Total (mg/L as N)	13	3	23%	0.016	0.019	0.029	0.048	0.098	0.208	0.289
Detention Basins	Nitrogen, Kjeldahl, Total (mg/L as N)	97	14	14%	0.436	0.542	0.781	1.242	1.951	3.162	3.918
Detention Basins	Nitrogen, Total (mg/L as N)	12	0	0%	0.528	0.575	0.775	1.272	2.431	3.856	4.495
Detention Basins	Phosphorous, Dissolved (mg/L as P)	49	12	24%	0.028	0.035	0.049	0.085	0.143	0.251	0.329
Detention Basins	Phosphorous, Total (mg/L as P)	174	20	11%	0.014	0.019	0.037	0.108	0.283	0.460	0.670
Detention Basins	Solids, Total Dissolved (mg/L)	81	1	1%	9.083	19.536	45.677	73.510	111.402	233.722	379.539
Detention Basins	Solids, Total Suspended (mg/L)	177	8	5%	2.114	3.043	9.192	21.958	43.145	76.742	117.692
Detention Basins	Zinc, Dissolved (ug/L as Zn)	153	1	1%	3.585	7.232	20.610	34.267	60.530	101.297	146.808
Detention Basins	Zinc, Total (ug/L as Zn)	207	2	1%	12.097	17.843	34.930	60.976	105.574	197.697	263.675

Appendix 7-1
Summary of TMDL Implementation and Proposition O Projects

Table 1
Non-Structural and Structural BMPS Recommended for Implementation for Santa Monica Bay Beaches TMDLs and Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Description of Recommendation	Santa Monica Bay Beaches (J2/3)	Marina Del Rey Mother's Beach & Back Basins	Comments
Green Solutions			
Infiltration/Reduction of Runoff			
Infiltration BMPs (inf. basin, inf. trench, culvert, porous pavement, grass/gravel pavers, dry well, mulching, planters, rain gardens, retention grading, tree wells, permeable catch basin bottoms, etc.)	V	V	At parks, open areas, abandoned alleys, vacant lots, schools and government facilities.
Vegetated swale/basin or bioswale	V	V	
Redirecting downspouts	V	V	
Green roofs	V	V	
Stormwater Use			
Cisterns/Rain Barrels	V	V	
Onsite Storage and Use of Stormwater	V		Includes: cisterns, rain barrels, driveway dry wells, redirected downspouts.
Source Control			
Source control	V	V	
Localized Treatment			
Constructed Wetlands and bioretention	V	V	Bay Restoration Plan - not specific to water quality but can have water quality improvement effects. J2/3 and J1/4 TMDL IPs specifically call out subsurface wetlands instead of the general constructed wetland
Dry Weather Diversions	V	V	
Local storage, treatment (chlorination) and use of stormwater	V	V	
Regional Solutions			
Treatment and Discharge at Urban Runoff Plants (URPs); End of Pipe Treatment	V		
Treatment and Reuse at Urban Runoff Plants		V	
Storage (multi-use retention basin, extended detention basin, underground retention/infiltration, and underground detention)	V	V	DCWMMP and LARRMP refer to detention/retention basins for flood control, could expand to include runoff water quality improvement. Includes diverting runoff to the basins
Treatment Options			
Catch basin inserts		V	
Oil absorbing bilge pads to capture and recycle used oil from boats		V	
Education and Outreach			
General Public Education			
Public Education and Outreach (k-12, coordinated between jurisdictions)	V	V	

Table 1 (Continued)
Non-Structural and Structural BMPS Recommended for Implementation for Santa Monica Bay Beaches TMDLs and Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Description of Recommendation	Santa Monica Bay Beaches (J2/3)	Marina Del Rey Mother's Beach & Back Basins	Comments
Reduce non-point source pollutants through public education	V	V	Note: the Bay Restoration Plan seeks a focus on household toxins
Catch basin/storm drain stenciling program		V	
Public signage		V	
Industry Education			
Industry/BMP/Activity/Pollutant/Community specific BMP outreach	V	V	
Planning and Design BMPs			
Street Planning and Design			
Incorporate green streetscapes and public landscapes	V	V	
Street Cleaning			
Street and storm drain maintenance	V	V	
Increase and coordinate street cleaning with trash pickup schedule		V	
Pre-wet weather storm drain flushing	V		
Other			
Business Improvement District outreach	V		
Waste Collection			
Trash Collection			
Increase number of public receptacles in high priority areas (trash, cigarette, recyclable containers)	V	V	
Improved restaurant and grocery store trash management	V	V	
Litter			
Increased litter removal	V		
Other			
Portable toilets	V		J2/3 Imp Plan calls out as a way to reduce pollution from homeless population.
Training			
Employees			
Support NPDES program - inspections, training of staff/number of staff, legal support, etc.		V	

Table 2
Recommended Policy Changes in TMDL Implementation Plans Prepared for Santa Monica Bay Beaches TMDLs and Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Description of Recommendation	Santa Monica Bay Beaches (J2/3)	Marina Del Rey Mother's Beach & Back Basins
Green Solutions		
Evaluate BMP requirements for special/holiday events and suggest enhancement, if needed.		V
Pollution Prevention Partner pledge program		V
Planning and Design		
Plans and Guidelines		
Development planning		V
Coordination		
Jurisdictions and Agency Coordination		
Inter-agency coordination		V
Investigate the potential to form Business Improvement Districts		V
Ordinances and Codes		
Land Use		
Changes to zoning/land use to accommodate runoff management options	V	
Infiltration, Conservation, Habitat		
Evaluate impacts of the County and City ordinances requiring down spouts from rooftops to discharge into landscape planters, swales, dry wells, and cisterns		V
Pet Waste		
"Pooper-scooper" ordinance strengthening		V
Consider dog restrictions in problematic areas		V
Incentives		
Rewards		
Incentives for private implementation of cisterns/rain barrels, porous pavement, water efficient landscaping, and similar practices	V	
Incentives for multi-objective projects		V
Fines/Penalties		
Enforcement actions	V	
Existing Program Expansion		
SUSMP		
Require priority development projects to treat stormwater runoff in accordance with SUSMP guidelines		V
Other		
Recommend the LARWQCB consider amending the point discharge permit's constituent requirements to include bacteria indicators and 303(d) list pollutants for industrial and commercial facilities		V

Table 3
Wet Weather BMPs Planned for Construction to Support TMDL Implementation for Santa Monica Bay Beaches

No.	Project Name	Project Sponsor	Project Components	Estimated Cost	Status
1	Grand Ave. Tree Wells Project	City of LA	Installation of 20 stormwater bioretention filtration BMPs. Dry weather flow and a portion of the wet weather flow along Abbot Kinney Blvd. and Grand Ave. will be diverted and treated using Filterra Stormwater Bioretention Filtration System before it enters the storm drain, eliminating trash, bacteria, metals and TSS discharges to the Bay. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedances days by 10% July 15, 2009	$1,075,927	Pre-design
2	Imperial Highway Sunken Median Stormwater Best Management Practices Project	City of LA	Retrofit 1.3 miles of the highway median by installing infiltration trenches and a vegetated buffer strip to capture and infiltrate the runoff from Imperial Highway. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% July 15, 2009	$2,723,403	Pre-design
3	Westminster Dog Park Stormwater Best Managements Practices Project	City of LA	Installation of a vegetated swale and modular biofiltration (StormTreat) system to capture and treat runoff from the dog park. The treated water will be reused for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009	$1,438,755	Pre-design
4	Westchester LAX	City of LA	Installation of various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from North Westchester. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009	$32,722,000	Approved
5	Temescal Canyon	City of LA	Installation of various BMPS, including hydrodynamic separators and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Temescal Canyon. Treated stormwater runoff will be re-used for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacterial TMDL milestones of reducing exceedance days by July 15, 2009	$18,646,000	Approved
6	Penmar Canyon Park	City of LA/ City of Santa Monica	Installation of various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Rose Avenue near Penmar Golf Course. Treated storm water runoff will be infiltrated and partially re-used for irrigation. The project will assist the City in meeting SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% July 15, 2009	$23,585,000	Approved
7	Santa Ynez Park	City of LA	Subsurface constructed wetland.	$1,500,000	Under Construction

Table 3 (Continued)
Wet Weather BMPs Planned for Construction to Support TMDL Implementation for Santa Monica Bay Beaches

No.	Project Name	Project Sponsor	Project Components	Estimated Cost	Status
8	Main Library	City of Santa Monica	Cistern/Rain barrel. Stormwater will be used for local storage and use	$700,000	Completed
9	Big Blue Bus Phase I	City of Santa Monica	Infiltration pits	$16,000	Completed
10	Big Blue Bus Phase II	City of Santa Monica	Infiltration pits	$500,000	Under-design
11	Civic Center Parking Structure	City of Santa Monica	Separation-screening, catch basin insert	$60,000	Completed
12	Fire Station #2	City of Santa Monica	Infiltration pits, permeable pavement	$14,000	Completed
13	Clover Park	City of Santa Monica	Infiltration	$27,000	Completed
14	Virginia Ave. Park	City of Santa Monica	Infiltration	$35,000	Completed
15	Memorial Park	City of Santa Monica	Bioretention, infiltration trench or basin, dry wells, pervious pavement	$1,117,551	Under-design
16	Crescent Bay Park	City of Santa Monica	Infiltration	$1,117,551	Under-review
17	Civic Center Village Housing	City of Santa Monica	Infiltration, storage/stromwater use, or permeable pavement	$1,117,551	-
18	Storm Water Stations #16	City of El Segundo	Cistern/rain barrel and local storage and stormwater use	$250,000	Under Construction
19	Storm water stations #17	City of El Segundo	Cistern/rain barrel and local storage and stormwater use	$250,000	Under Construction

Table 4
Santa Monica Bay Beach J2/J3 Low-Flow Diversion Projects

No.	Locations of Low-Flow Diversions	Lead Agency	Construction Completion Date
Jurisdiction 2			
1	Castlerock/Parker Canyon	LA County	4/10/2007
2	Santa Ynez Canyon	LA County	6/22/2006
3	Palisades Park	City of Los Angeles	10/1/2000
4	Pulga Canyon	LA County	10/5/2004
5	Bay Club Drive	City of Los Angeles	1/24/2001
6	Temescal Canyon	City of Los Angeles	6/23/2003
7	Santa Monica Canyon	City of Los Angeles	6/10/2003
8	North Westchester	LA County	10/5/2004
9	Playa del Rey	LA County	4/15/2001
10	Imperial Highway (2 LFDs)	City of Los Angeles / LA County	4/15/2006
11	Marquez Avenue	City of Los Angeles	6/15/2006
Jurisdiction 3			
12	Montana Ave.	City of Santa Monica	7/31/2007
13	Wilshire Blvd	City of Santa Monica	1/31/2008
14	Santa Monica Pier	City of Santa Monica	10/1/1997
15	Pico-Kenter	City of Los Angeles/ City of Santa Monica	10/1/2001
16	Ashland Ave.	LA County	4/15/2006
17	Rose Ave.	LA County	11/11/2005
18	Brooks Ave.	LA County	4/15/2001
19	Venice Pavilion	City of Los Angeles	6/10/2003
20	Thornton Avenue	City of Los Angeles	6/22/1999

Table 5
BMPs to Support Marina Del Rey Mother's Beach and Back Basins Bacteria TMDL

Project	Jurisdiction Areas	Structural BMPs	Status	Cost
Storm Drain No. 5243 and 3872	City of Los Angeles/Culver City	Low flow diversion	No. 5243 Completed; No. 3872 not completed, location is being changed	Project 5243: $800,000 Project 3872: $1,000,000
Storm Drain No. 3874	City of Los Angeles	Low flow diversion	Completed	Project 3874: $1,000,000
Small parcel and road drains	County Unincorporated	Source identification and control	Completed	—
Basin D circulation	County Unincorporated	Increase circulation in Basin D	Completed	$2,000,000

Table 6
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
Dominguez Channel Watershed							
01-35	Rosecrans Recreational Center Storm Water Enhancements	WQ improvement project that will capture and treat runoff through redirection to bioswales and a vegetated retention basin, install permeable paving for parking lots, an infiltration cistern, a synthetic turf soccer field, and "smart" irrigation systems. Includes site grading, tree planting and landscaping.	Trash Metals TSS Bacteria	Metals: 100% TSS: 99% Bacteria: 15%	$4,829,119	3	Design
01-36a	Wilmington Drain Multiuse Project	WQ and habitat improvement project that is the first phase of the Machado Lake Project. This project will install trash booms and habitat improvements in the Wilmington Channel to reduce the amount of pollutants discharged into the lake. Includes channel re-alignment, grading and wetland restoration.	Trash Metals Bacteria TSS O&G	Trash: 100% Metals: 82% Bacteria: 78% TSS: 91% O&G: 90%	$2,200,613 (pre-design/design) $15,741,921 (set aside)	1 and 3	Design
01-36b	Machado Lake Ecosystem Rehabilitation Project	WQ and habitat improvement project that will rehabilitate the lake and surrounding riparian areas. Project includes removal and reuse of sediment from the lake, habitat improvements including wetland restoration, installing outlet devices and dam spillways, treating runoff, installing trash capture devices, installing a pump and pipe system, installing pervious paving, bioswales, smart irrigation and cisterns.	Trash Metals Bacteria TSS O&G	Trash: 100% Metals: 82% Bacteria: 78% TSS: 91% O&G: 90%	$10,124,312 (pre-design/design) $89,399,585 (set aside)	1 and 3	Design
01-40	Peck Park Canyon Enhancement Project	Flood control and WQ improvements will be provided through the infiltration of stormwater and associated pollutants. The project will use a combination of in-stream, source control and over-bank BMPs, including bioswales, catch basin and rock slope protection measures, native planting, educational enhancements and restoration and extension of trails.	Trash TSS Metals O&G Bacteria TKN	All: 100%	$6,190,000	3	Design

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
01-41	Inner Cabrillo Beach Bacterial Water Quality Improvement Project	WQ improvement project that will install wave generators among other measures to improve the WQ of the inner Cabrillo beach that has been historically polluted. This project will target bacteria removal in stormwater and urban runoff and improve the WQ in the nearby beach by providing recirculation. This project will assist the City in meeting the goals of the Harbor Bacteria TMDLs, particularly since many elements of this project are identified in the TMDL Implementation Plan.	Bacteria	100% compliance with AB411	$8,000,000	1	Construction
Los Angeles River Watershed							
01-9	Los Angeles Zoo Parking Lot: Demonstration on Environmental Sustainability Project	WQ)improvement project that will install various Best Management Practices (BMPs), including trash screens, porous pavement and bioswales, to reduce trash, sediments, heavy metals, oil and grease in parking lot runoff to assist the City in complying with the Los Angeles River Trash and Metals Total Maximum Daily Loads (TMDLs). The project will also provide educational benefits to zoo patrons.	Trash TSS Metals O&G	Trash: 90% TSS: 99% Metals: 99% O&G: 80%	$13,904,242	1	Design
01-10	Strathern Pit Multiuse Project	WQ and flood control protection project that will convert a 30-acre gravel pit into a multi-purpose facility that includes a retention basin and constructed wetland to capture and treat flow using BMPs.	TrashTSSMetals O&GBacteriaTKN	Compliance with WQ objectives of the Basin Plan, Ocean Plan, and California Toxics Rule	$17,800,000	3	Land Acquisition

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
01-11	Cesar Chavez Ground Water Improvement Project	Groundwater improvement project that will install and increase gas transport piping to allow gas to be removed from underground to create space for the aquifer to receive more recharge water. Recharging underground aquifers with stormwater and urban runoff will reduce runoff, and its associated pollutants such as trash, nutrients, total suspended solids, and heavy metals, from reaching the Los Angeles River. This project will assist the City in complying with the Los Angeles River Trash, Nutrients/Odor, and Metals TMDLs.	Trash TSS Metals O&G Bacteria TKN	100% of the tributary storm water from the sub-drainage area will be percolated into the ground.	$3,040,000	2	Post-Construction
01-12	Cabrito Paseo Walkway / Bike Path Project	WQ improvement project that will convert an unimproved street into a bike path/walkway that is graded to direct flow into bioswales and tree wells for infiltration. The project will also install trash collectors at storm drain inlets and install "smart" irrigation.	Trash TSS Metals O&G Bacteria TKN	TSS: 62% Metals: 75% O&G: 88% TKN: 17%	$1,337,696	3	Pre-design
01-14	Hansen Dam Recreational Area Parking Lot and Wetlands Restoration Project	WQ improvement project that will create treatment wetlands to capture, treat and use wet and dry-weather flows from three parking lots. The project will redirect flow from three lots into the treatment wetlands for pollutant removal, groundwater recharge and have environmental education and recreation benefits. This project will assist the City in complying with the Los Angeles River Trash, Nutrients/Odor and Metals TMDLs.	TSS TP TKN Metals O&G Bacteria	TSS: 95% TP: 58% TKN: 48% Metals: 80% O&G: 81% Bacteria: 80%	$2,220,702	3	Design

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
01-16	South Los Angeles Wetlands Park	WQ improvement project that will convert a MTA maintenance yard into a constructed wetlands habitat to capture, treat, and reuse the polluted runoff from the surrounding sub-basins. The cleansed runoff will be recycled through the wetlands to provide a constant flow in the habitat. The proposed wetlands habitat will remove bacteria, trash, total suspended solids, and heavy metals. The project will assist the City in complying with the Los Angeles River Trash, Nutrient, Metals and future Bacteria TMDLs.	Metals O&G TKN Bacteria	Metals: 50% Bacteria: 75%	$8,100,000	3	Design
01-28	Oros Green Street	WQ improvement project that installed 30 rain gardens to capture, treat and reuse polluted runoff generated by Oros Street and residential dwellings. The treated runoff will be released into a park at Oros Street. This project targets trash, nutrients and heavy metals to assist the City in meeting the Trash, Nutrients/Odor, and Metals TMDLs for the Los Angeles River.	Metals O&G TKN Bacteria	All: 80%	$386,000	4	Completed
01-29	Echo Park Lake Restoration Project	WQ and flood control project that will include draining the lake to remove contaminated sediments, repairing or replacing storm drain pipes to prevent water loss, reconstructing concrete inlet structures, installing devices to capture sediments, trash, and oil and grease, reconstructing walking paths with permeable surfaces, installing "smart" irrigation systems, and providing educational signage and kiosks.	Trash Metals Bacteria TSS O&G TKN	Trash: 100% Metals: 100% Bacteria: 80% TSS: 100% O&G: 82% TKN: 43%	$10,997,899 (pre-design/design) $73,265,414 (set aside)	1 and 3	Design
	Taylor Yard River Park - Parcel G2 Land Acquisition	Acquire a parcel of land adjacent to the LA River as part of Revitalization Master Plan. $25M in Prop O funds must be augmented. CD 1 leads purchase negotiations (coordination with Trust for Public Land	Nutrients Bacteria Trash Metals	---	$25,000,000	1	Land Acquisition

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
	Albion Dairy Park	Acquire a parcel of land adjacent to the LA River as part of LA River Revitalization Master Plan.	Nitrogen Metals Trash Bacteria O&G	---	$5,000,000	2	Land Acquisition
Los Angeles River & Ballona Creek Watersheds							
n/a	Catch Basin Inserts and Coverings Phase I	WQ improvement project installed 8,000 catch basin inserts and 6,000 catch basin screens in the high trash generation areas of the City. This project assisted the City in meeting the first milestone of reducing trash by 20% by September 2006.	Trash	Achieved compliance with 20% reduction milestone	$17,000,000	1	Completed
01-52a	Catch Basin Opening Screen Covers Phase II	WQ improvement project that will install 6,000 catch basin screens to remove trash and debris from stormwater and urban runoff. This project will assist the City in meeting the goals of the Los Angeles River and Ballona Creek Trash TMDL 30% reduction target of September 30, 2007.	Trash	90%	$10,000,000	1	Completed
01-52b	Catch Basin Opening Screen Covers Phase III	WQ improvement project that will install 34,000 catch basin screens in medium and low trash generation areas of the City to remove trash and debris from stormwater and urban runoff. This project will assist the City in meeting the goals of the Trash TMDL.	Trash	100% compliance with water quality objectives of the Los Angeles River and Ballona Creek Trash TMDLs	$44,500,000	1 and 3	Contstruction

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
Santa Monica Bay Beaches Watershed							
01-20a	La Cienega/Fairfax DWP Power Line Easement Stormwater BMP Project	WQ improvement project that will install a stormwater lift station, flow diversion facility, hydrodynamic separator, underground detention tank (800,000 gallons), bioretention area, effluent detention tank, final effluent pump station, recirculation pump, and overflow pipes. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Metals Bacteria TP TN TSS	Metals: 75%-82% Bacteria: 75% TP: 50% TN: 50%	$7,667,888		Design
01-20b	Mar Vista Recreation Center Stormwater BMP Project	WQ improvement project that will divert dry weather flows and the "first flush" from the Sawtelle Channel to the adjacent Mar Vista Rec. Center and Park. The project will include the installation of a stormwater lift station, flow diversion facility, hydrodynamic separator, 500,000-gallon underground detention tank, chlorination facility, final effluent pump station, recirculation pump, and overflow piping. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Metals Bacteria TP TN TSS	Metals: 75%-82% Bacteria: 75% TP: 50% TN: 50%	$4,556,186	1	Construction

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[1]	Status[2]
01-20c	Grand Avenue Tree Wells Project	WQ improvement project that will install twenty (20) stormwater bioretention filtration BMPs. Dry weather flow and a portion of the wet weather flow along Abbot Kinney Blvd. and Grand Blvd. will be diverted and treated using a Bioretention Filtration System before it enters the storm drain, thus eliminating trash, bacteria, metals, and TSS discharges to the Bay. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Metals Bacteria TP TN TSS	Metals: 75%-82% Bacteria: 75% TP: 50% TN: 50%	$1,075,927		Post-Construction
01-22a	Imperial Highway Sunken Median Stormwater Best Management Practices Project	WQ improvement project that will retrofit 1.3 miles of the highway median by installing infiltration trenches and a vegetated buffer strip to capture and infiltrate the runoff from Imperial Highway. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	BacteriaMetalsTSSO&GTPTN	100% compliance with AB411	$2,723,403	1	Bid & Award

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category[(1)]	Status[(2)]
01-22c	Westminster Dog Park Stormwater Best Management Practices Project	WQ improvement project that will install a vegetated swale and modular biofiltration system to capture and treat runoff from the dog park. The treated water will be reused for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Bacteria TSS TP TN	100% compliance with AB411	$1,438,755	4	Construction
01-22e	Temescal Canyon Recreation Center Stormwater Best Management Practices Project	WQ improvement project that will install various BMPs, including hydrodynamic separators and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Temescal Canyon. Treated stormwater runoff will be re-used for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Bacteria TSS Metals TP TN	100% compliance with first milestone (by 2009) of the Santa Monica Bay Beaches Wet Weather Bacteria TMDL	$18,646,000	4	Bid & Award (Phase I)
01-22f	Westchester Stormwater Best Management Practices Project	Installation of various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from North Westchester. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Bacteria TSS Metals TP TN	100% compliance with first milestone (by 2009) of the Santa Monica Bay Beaches Wet Weather Bacteria TMDL	$32,722,000	2	Design

Table 6 (Continued)
Summary of Approved Proposition O Projects

Project No.	Title	Description	Targeted Pollutants	Estimated Reduction in Pollutants	Funding Approved by Council and Mayor	Proposition O Funding Category(1)	Status(2)
01-22g	Penmar Water Quality Improvement & Runoff Reuse Project	WQ improvement project that will install various BMPs, including hydrodynamic separators, infiltration basins and underground detention tanks, to reduce bacteria and other pollutants in storm drain runoff from Rose Avenue near Penmar Golf Course. Treated storm water runoff will be infiltrated and partially re-used for irrigation. The project will assist the City in meeting the SMB Beaches Wet Weather Bacteria TMDL milestone of reducing exceedance days by 10% by July 15, 2009.	Bacteria TSS Metals TP TN	100% compliance with first milestone (by 2009) of the Santa Monica Bay Beaches Wet Weather Bacteria TMDL	$23,585,000	2,4	Bid & Award (Phase I)
01-51	Santa Monica Bay Beaches Low Flow Diversions Upgrades Project	WQ improvement project that will upgrade eight low flow diversion structures to remove bacteria from dry weather flow, thereby assisting the City in meeting the SMB bacteria TMDL winter dry weather conditions by July 15, 2009.	Bacteria	100% compliance with AB411	$5,980,000 (pre-design/design) $29,020,000 (set aside TBD)	1	Bid & Award

(1) Proposition O Funding Categories and Bond Approved Amounts:
Category 1 - Rivers Lakes, Beaches, Bays and Ocean Water Quality Protection Projects - $250 million
Category 2 - Water Conservation, Drinking Water and Source Protection Projects - $75 million
Category 3 - Flood Water Reduction, River and Neighborhood Parks That Prevent Polluted Runoff and Improve Water Quality Projects - $100 million
Category 4 - Storm Water Capture, Clean-up and Re-Use Projects - $75 million
(2) As of March 2009.

Appendix 7-2
Proposition O Project Selection Criteria (adopted by the Board of Public Works)

Proposition O, a $500M General Obligation Bond that was approved by 76% of the City of LA voters, says "*all projects shall provide water quality benefits and have as their primary purpose the reduction of pollutant loads to the impaired waters of Los Angeles to meet water quality standards.*"

The project selection criteria, below, will help meet the intent of the bond language and will be applicable to all projects in order to meet Water Quality Standards set by the RWQCB. Proposition O projects must demonstrate that they will alone, or with other proposed or existing projects, result in attainment of one or more Water Quality Standards (WQS).

The Purpose of These Criteria

These criteria are provided as a guide for City staff to use as they review projects proposed to receive funding from Proposition O funds.

The project selection criteria have been developed so that staff can select projects that meet the intent of the bond language that appears above.

Proposed projects found to be consistent with these criteria will be evaluated in detail. Those projects that are evaluated in detail will then be scored. Staff will present proposed projects that exceed specified scores to the Proposition O Citizens Advisory Committee (COAC) and the Proposition O Administrative Oversight Committee (AOC).

Eligibility to be Scored

The project must demonstrably reduce pollutant loads to the impaired waters of Los Angeles to comply with Water Quality Standards as identified in the 303(d) list. Funds can be used for project planning, design, construction and monitoring. The project shall avoid or mitigate negative impacts including: flood control, loss of habitat hardening of creeks or rivers, and shall not exacerbate any existing environmental problems in the vicinity or downstream of the project.

Eligibility for Presentation to the COAC and AOC

Projects can be judged eligible for presentation to the COAC and AOC if projects receive a total of 75 points from any of the project selection criteria. *Any project that does not obtain a minimum of 75 points will not be considered for further investigation.*

Adopted Project Evaluation Criteria:

Project Significance	
5 points	1. Is the project located in a high priority catchment area? 2. Are the pollution problem and the loads for the drainage area served by the project site Best Management Practices (BMPs) treatment train significant?
Compliance with Water Quality Goals	
30 points	1. Does the project BMP treatment train help achieve water quality standard compliance for the impaired waters? 2. Can compliance objectives be quantified? 3. During which seasons (wet and/or dry) would compliance be achieved? (year-round improvement is the preferred goal)
Pollution Reduction	
10 points	1. Does the project result in reduction of loads/concentrations of more than one impairing pollutant? 2. What are the number and types of impairing pollutants that can be reduced? Trash, bacteria, toxic sediment, and metals have highest priority. 3. Does the project cause positive or negative impacts to other pollution problems? (Up to 4 pts for positive and minus 4 pts for negative)
10 points	1. Is the BMP a proven BMP for pollutant removal of this type based upon available ASCE, USEPA, or site-specific BMP scientific data? 2. What are the magnitude and percent of overall load/concentration reduction predicted by the BMP treatment train? The magnitude/removal percentage is very significant.
Multiple Objectives	
25 points (maximum)	***These criteria are intended to serve as guidelines for awarding points to a proposed project. Other environment enhancements not found in this list may be used.*** (5 pts. maximum for each criteria) 1. Does the project augment local water supply? Quantify. 2. Does the project significantly reduce flood risk? Quantify. 3. Does the project provide stream restoration? Quantify. 4. Does the project provide recreational open space? Quantify. 5. Does the project provide significant habitat value? Quantify. 6. Does the project address an environmental justice issue? How? 7. Is the project visible (i.e. can it be visually seen)? 8. Is the project environmentally sustainable? How? 9. Does the project integrate with IRP, IRWMP, TMDLs Implementation plans, LA River Revitalization Plan, and other existing watershed management plan? How? 10. Does the project have a strong community support? 11. Does the project involve a multi-agency and stakeholder partnership? 12. Does the project provide educational or demonstrational functions?
Project Cost Effectiveness	
10 points	1. Do the project capital and O&M costs meet industry wide standards? How long does the project remain in operation before its replacement? 2. What is cost per unit of pollutant reduction? (example – cost per pound of pollutant reduced) 3. Can the project be cost effectively adapted to changing conditions (regulatory, pollution, land-use, etc)? 4. Does the project leverage any existing or potential funds from state and other sources? How much and from where?

Project Readiness	
10 points	1. How ready is the project for construction? 2. How complete are the project plans and specifications? When will the project be completed? 3. What is the status of CEQA and other permitting requirements? Is it CEQA ready? 4. Is there a site available for the project? Or, does a clear process exist for attainment (the parcel size, proximity to an impaired water body, soil condition, permeability, etc. are some characteristics considered when identifying a candidate parcel.)? What is the project's construction duration?
Total points	**100 points**

Note (1): In evaluating the different categories, an adopted plan or a validated and calibrated computer model would be used in the assessment.

Note (2): The breakdown of points in each category is for the ease of project evaluation and scoring. Even though summation of each category's sub-points may exceed the category maximum allowable points, only maximum allowable points for the category will be allocated.

Note (3), Legend: American Society of Civil Engineer (ASCE), United States Environmental Protection Agency (USEPA) , Integrated Resources Planning (IRP), Integrated Regional Water Management Plan (IRWMP), Total Maximum Daily Load (TMDLs), Operation and Maintenance (O&M), California Environmental Quality Act (CEQA), Best Management Practices (BMP).

Appendix 7-3
Proposition O Project Selection Criteria (revised draft, not adopted)

Proposition O, a $500M General Obligation Bond, that was passed by 76% of the City of LA voters says "all projects shall provide water quality benefits and have their **primary purposes** the reduction of pollutant loads to the impaired waters of Los Angeles to meet Water Quality Standards."

The **proposed** project selection criteria below will help meet the intent of the above bond language and will be applicable to all projects in order to meet Water Quality Standards set by the RWQCB. Proposition O projects must demonstrate that they will alone, or with other proposed or existing projects, result in attainment of one or more Water Quality Standards (WQS).

The Purpose of These Criteria

These criteria are provided as a guide for City staff to use as they review projects proposed to receive funding from Proposition O funds.

The project selection criteria have been developed so that staff can select projects that meet the intent of the bond language that appears above.

Proposed projects found to be consistent with these criteria will be evaluated in detail. Those projects that are evaluated in detail will then be scored. Staff will present proposed projects that exceed specified scores to the Proposition O Citizens Advisory Committee (COAC) and the Proposition O Administrative Oversight Committee (AOC).

Eligibility to be Scored

The project must demonstrably reduce pollutant loads to the impaired waters of Los Angeles to comply with Water Quality Standards as identified in the 303(d) list. Funds can be used for project planning, design, construction and monitoring. The project shall avoid or mitigate negative impacts including: flood control, loss of habitat hardening of creeks or rivers, and shall not exacerbate any existing environmental problems in the vicinity or downstream of the project.

Eligibility for Presentation to the COAC and AOC

Projects can be judged eligible for presentation to the COAC and AOC if projects receive a total of 75 points from any of the project selection criteria. *Any project that does not obtain a minimum of 75 points will not be considered for further investigation.*

Proposed Project Evaluation Criteria (Not Adopted):

Project Significance	
5 points	Is the project located in a high priority catchment area? Are the pollution problem and the loads for the drainage area served by the project site Best Management Practices (BMPs) treatment train significant? Note: Where possible, an adopted plan or a validated and calibrated computer model supports these characterizations.
Compliance with Water Quality Goals	
30 points	Does the project BMP treatment train help achieve water quality standard compliance for the impaired waters? Can compliance objectives be quantified? During which seasons does compliance achieve (where year round improvement is the preferred goal and regular seasonal improvements are preferred to erratic improvements)? Note: Where possible, a validated and calibrated computer model supports these compliance conclusions.
Pollution Reduction	
10 points	Does the project result in reduction of loads/concentrations of more than one impairing pollutant? What are the number and types of impairing pollutants that can be reduced? Trash, bacteria, toxic sediment, and metals have highest priority. Does the project cause positive or negative impacts to other pollution problems? (Up to 4 pts for positive and minus 4 pts for negative) Note: A validated/calibrated computer model can quantify the load reductions.
10 points	Is the BMP a proven BMP for pollutant removal of this type based upon available ASCE, USEPA, or site-specific BMP scientific data? What are the magnitude and percent of overall load/concentration reduction predicted by the BMP treatment train? The magnitude/removal percentage is very significant. Note: Where possible, a validated and calibrated computer model supports these conclusions.
Multiple Objectives	
25 points (maximum)	These criteria are intended to serve as guidelines for awarding points to a proposed project. Other environment enhancements not found in this list may be used. (5 pts. maximum for each criteria) Does the project augment local water supply? Quantify. Does the project significantly reduce flood risk? Quantify. Does the project provide stream restoration? Quantify. Does the project provide recreational open space? Quantify. Does the project provide significant habitat value? Quantify. Does the project address an environmental justice issue? How? Is the project visible (i.e. can it be visually seen)? Is the project environmentally sustainable? How? Does the project integrate with IRP, IRWMP, TMDLs Implementation plans, LA River Revitalization Plan, and other existing watershed management plan? How? Does the project have a strong community support? Does the project involve a multi-agency and stakeholder partnership? Does the project provide educational or demonstrational functions?

Proposed

Proposed

Project Cost Effectiveness	
10 points	Do the project capital and O&M costs meet industry wide standards? How durable is the project? What is cost per unit of pollutant reduction? (example – cost per pound of pollutant reduced) Can the project be cost effectively adapted to changing conditions (regulatory, pollution, land-use, etc)? Does the project leverage any existing or potential funds from state and other sources? How much and from where?
Project Readiness	
10 points	How ready is the project for construction? How complete are the project plans and specifications? When will the project be completed? What is the status of CEQA and other permitting requirements? Is it CEQA ready? Is there a site available for the project? Or, does a clear process exist for attainment (the parcel size, proximity to an impaired water body, soil condition, permeability, etc. are some characteristics considered when identifying a candidate parcel.)?
Total points	100 points

Note: The points' breakdown in each category is for the ease of project evaluation and scoring. Even though summation of each category's sub-points may exceed the category maximum allowable points, only maximum allowable points for the category will be allocated.

Legend: American Society of Civil Engineer (ASCE), United States Environmental Protection Agency (USEPA) , Integrated Resources Planning (IRP), Integrated Regional Water Management Plan (IRWMP), Total Maximum Daily Load (TMDLs), Operation and Maintenance (O&M), California Environmental Quality Act (CEQA), Best Management Practices (BMP).

Appendix 9-1
Approved and Funded Projects (Capital Improvement Program)

Table 1
Proposition O Projects

Project Name	Council District	Responsible Office	Total Project Budget
Oros Green Street	13	BSS	$972,651
Catch Basin Inserts / Covers – Phase I	1, 4, 8, 9, 10, 13, 14, 15	BOS	$17,000,000
Catch Basin Inserts / Covers – Phase II	1, 4, 5, 8, 9, 10, 13, 14, 15	BOS	$10,000,000
Catch Basin Inserts / Covers – Phase III	1, 2, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15	BOS	$44,500,000
Inner Cabrillo Beach Bacterial Water Quality	15	Harbor	$16,000,000
Cesar Chavez Recreation Complex	6	DWP	$9,841,230
Grand Avenue Tree Wells	11	BOE	$1,075,927
Strathern Pit Multiuse	6	LA County	$22,505,000
La Cienega / Fairfax Power Line Easement	10	BOE	$7,667,887
Mar Vista Recreation Center	10	BOE	$4,556,186
Imperial Highway Sunken Median	11	BOE	$2,723,403
Westminster Dog Park	11	BOE	$1,438,755
Los Angeles Zoo Parking Lot	4	BOE	$13,904,243
Temescal Canyon BMP (Phases I and II)	11	BOE	$18,646,000
Westchester BMP	11	BOE	$32,722,000
Penmar BMP (Phases I and II)	11	BOE	$23,585,000
Rosecrans Recreational Center	15	BOE	$6,754,033
Peck Park Canyon	15	BOE	$8,231,118
Santa Monica Bay Beaches Low Flow Diversion Upgrades	11	BOE	$37,119,028
Cabrito Paseo Walkway / Bike Path	6	BOE	$4,463,009
Hansen Dam Recreational Area	7	BOE	$2,220,702
South Los Angeles Wetlands Park	9	BOE	$25,328,910
Wilmington Drain Restoration Multiuse	15	BOE	$17,942,534
Machado Lake	15	BOE	$99,523,897
Echo Park Lake Restoration	13	BOE	$84,263,313
Taylor Yard Park (G2) – Land Acquisition	1	BOE	To be determined
Albion Dairy Park – Land Acquisition	1	BOE	To be determined
Total			**$512,984,826**

STORMWATER POLLUTION ABATEMENT FUND (SPAF) PROJECTS										
PROJECT NAME	**WORK ORDER**	**CD**	**RESPONSIBLE OFFICE**	**PROJECT* ESTIMATE**	**YEAR 2006-07**	**YEAR 2007-08**	**YEAR 2008-09**	**YEAR 2009-10**	**YEAR 2010-11**	**YEAR 2011-12**
					SPA Funded	**SPA Funded**	**SPA Funded**	**SPA Funded**	**SPA Funded**	**SPA Funded**
Maintenance Hole Resetting	SSDMHADJ	ALL	BOS	$ 1,253,000	$ 196,000	$ 203,000	$ 210,000	$ 217,000	$ 210,000	$ 217,000
Menlo Avenue - Vermont SD S/O 69th	SZS11297	8	BOE	$ 700,000	$ 700,000					
11th Street Sd - Maple Ave to Wall St	SZS11296	9	BOE	$ 1,015,000	$ 1,015,000					
Vermont Ave S/O PCH SD Improvements	SZS11275	5,11	STREET							
Santa Monica Transit Pkwy Drainage Improvement	SZS11279	2	BOE							
Mulholland Dr. at Allenwood Rd. Slope Repair	NOT OPEN	15	STREET	$ 840,000	$ 840,000					
Vermont Ave S/O Pch SD Improvements	NOT OPEN	1	BOE	$ 665,000	$ 665,000					
Evadale Drive Phase II Emergency SD	SZS11264	14	BOE	$ 98,000	$ 98,000					
Avenue 44 SD Emergency Replacement Phase II	SZS11370	15	BOE	$ 462,000	$ 462,000					
Carolina St Emergency Replacement	NOT OPEN	15	BOE	$ 1,400,000		$ 420,000	$ 980,000			
Lakme Ave SD	SZS11298	2	BOE	$ 1,400,000			$ 1,400,000			
Lennox Ave - Riverside Dr to LA River SD	NOT OPEN	14	BOS	$ 1,400,000			$ 1,400,000			
Garvanza Park BMP	NOT OPEN	10	BOE	$ 770,000			$ 770,000			
Pico Wilton SD	NOT OPEN	14	BOE	$ 903,000			$ 903,000			
Burwood S/O Figueroa SD	NOT OPEN	3	BOE	$ 1,190,000			$ 1,190,000			
Sherman Way & Capps SD	SZS11276	2	BOE	$ 420,000			$ 420,000			
Bessemer St SD Alcove Ave to Tujunga Wash	NOT OPEN	11	BOE	$ 448,000			$ 448,000			
Swarthmore Avenue Storm Drain	NOT OPEN	2	BOE	$ 84,000			$ 84,000			
McGroarty St. SD	NOT OPEN	8	BOE	$ 1,680,000			$ 700,000	$ 980,000		
Century Boulevard & Gramercy Pl SD	NOT OPEN	2	BOE	$ 1,680,000				$ 1,680,000		
Wheatland E/O Debris Basin N/O Foothill	NOT OPEN	5	BOE	$ 1,068,200				$ 1,068,200		
Waring Ave SD	NOT OPEN	12	BOE	$ 1,820,000				$ 1,820,000		
White Oak Avenue SD - Nordhoff St to Plummer St	NOT OPEN	3	BOE	$ 1,642,200				$ 1,642,200		
Oakdale Avenue - Redwing Street SD	NOT OPEN	7	BOE	$ 1,274,000				$ 1,274,000		
Sayre Garrick SD	NOT OPEN	14	BOE	$ 1,008,000				$ 1,008,000		
Hawley Avenue S/O Sinova St	NOT OPEN	6	BOE	$ 1,358,000					$ 1,358,000	
Laurel Canyon Bl - Kagel Cyn to Osborne St	NOT OPEN	5,2	BOE	$ 1,400,000					$ 1,400,000	
Fulton Av LA River to 150 Feet S/O Ventura Bl	NOT OPEN	7	BOE	$ 980,000					$ 980,000	
S.F. Mission And Laurel Cyn. Bl. SD	NOT OPEN	6	BOE	$ 315,000					$ 315,000	
Roscoe Dora SD	NOT OPEN	14	BOE	$ 448,000					$ 448,000	
Kenneth Drive & Huntington Drive SD	NOT OPEN	2	BOE	$ 1,330,000					$ 1,330,000	
Commerce Valmont SD	NOT OPEN	7	BOE	$ 1,680,000					$ 1,680,000	
Roxford St Herrick Av to Stetson Cyn Ch	NOT OPEN	2	BOE	$ 1,680,000					$ 700,000	$ 980,000
Moorpark Tujunga SD	NOT OPEN	9	BOE	$ 385,000						$ 385,000
City Hall Main Street Storm Drain	NOT OPEN	3	BOE	$ 504,000						$ 504,000
Collier Street SD - E/O Quakertown Ave To Winnetka	NOT OPEN	15	BOE	$ 1,355,200						$ 1,355,200
Hawaiian and Opp Storm Drain	NOT OPEN	15	BOE	$ 1,680,000						$ 1,680,000
Anaheim Street W/O I Street	NOT OPEN	7	BOE	$ 665,000						$ 665,000
Foothill SD-Pacoima Cyn Ch to Sump S/O Maclay	NOT OPEN	15	BOE	$ 2,450,000						$ 2,450,000
SUBTOTAL				**$ 39,450,600**	**$ 3,976,000**	**$ 623,000**	**$ 8,505,000**	**$ 9,689,400**	**$ 8,421,000**	**$ 8,236,200**

Appendix 9-2
Development of BMP Alternatives for Water Quality Management Plans

The identification of BMP alternatives and selection of the best alternative is built on the information developed in the characterization and potential strategies sections of each Water Quality Management Plan. Following completion of these sections, the focus shifts to the development of BMP alternatives in the watershed. This effort will result in a list of recommended and prioritized BMPs for implementation throughout the watershed. Critical to this effort is the establishment of an acceptable methodology and reliable performance criteria for the design and selection of BMPs. The following sections describe the steps that will be taken to establish criteria and the methodology that will be used to develop BMP alternatives.

Methodology

Siting, Design and Implementation Criteria for Screening BMPs

Prior to the planning, siting, selection, design and the implementation of any structural BMP the following information will be gathered:

- Delineation of drainage areas throughout the watershed;
- Hydrologic characteristics of drainage areas;
- Data relating to land use and activities within the drainage areas;
- Pollutant concentrations (land use based or monitoring) and known loadings estimates throughout the watershed;
- Delineation of the storm drain system;
- The targeted pollutants and required removal efficiencies; and
- Water quality standards of receiving waters.

Based on this information the following questions will be evaluated as part of the BMP screening process:

- Where are there opportunities to implement BMPs in the targeted drainage area?
- What is the expected pollutant load and flow reduction into the impaired waterbody from urban runoff sources after implementation of the BMP?

- What is the estimated resultant change in concentration and flow expected in the receiving waterbody after the implementation of a BMP?

To evaluate these questions two key technical issues will need to be decided:

- **Establishment of Design Criteria** – The design of a BMP is dependent on the hydrologic objectives established for urban runoff management. These objectives affect the sizing of the BMP facility and the types and design of selected treatment controls. Methods for selecting a design storm may be volumetric (e.g., capturing the first 0.5 inches of runoff or capturing some percentage of the runoff volume from an average year), flow-rate based (e.g., capturing the amount of flow equivalent to the pre-development runoff from selected storm size), or a combination of the two.

- **Establishment of BMP Performance Criteria** – The degree of pollution reduction (a measure of BMP performance) generally depends on the BMP that is selected and the pollutant that is being targeted. For example, a BMP that is effective at removing suspended solids may be less effective at removing metals. Several databases have been developed that list the expected pollutant removal for several combinations of BMPs and pollutants. These databases can be used to select BMPs that meet the minimum criteria of expected BMP performance, for example, the 75th percentile performance value as determined from the most current data available in the EPA-ASCE BMP database (*Ref. 1*).

Given the importance of these technical issues, prior to the development of Water Quality Management Plans, the City will establish design criteria and BMP performance criteria. These decisions will guide the development of all BMP alternatives. Ultimately, a BMP project will be selected for implementation only if:

- A "quantitative nexus" exists between implementation of the BMP(s) and water quality standards attainment, i.e., implementation of the BMP(s) will have a positive impact on the water quality in the receiving water body and support compliance with TMDL wasteload allocation requirements (*Appendix 5-1* for waste load allocations applicable to each TMDL and *Appendix 9-3* for determining whether a quantitative nexus exists);

- Implementation of the BMP or series of BMPs will result in a substantial and measurable reduction in the pollutant concentration, e.g., the BMP effluent concentration meets the targeted performance value for pollutant reduction, e.g., the 75th percentile performance value as determined from the most current data available in the EPA-ASCE BMP database;

- The BMP design is consistent with the selected design criteria;

- The BMP project would receive a score of at least 75 points from the criteria used to select Prop O projects (*Appendices 7-2 and 7-3* for selection criteria);

- The primary purpose of the project is urban runoff management-related;
- Flood control is achieved through peak flow reduction and infiltration; and
- Where possible, other benefits are optimized, including groundwater recharge, increased recreational opportunities and habitat improvements.

BMP Prioritization

Rather than develop an entirely new methodology for the development of alternatives, the City will rely on the conceptual framework of the *Los Angeles County-wide Structural BMP Prioritization Methodology Guidance Manual* ("BMP Prioritization Methodology", ***Ref. 2***). The BMP Prioritization Methodology is useful for watershed planning, integrated regional water management planning, and TMDL planning. One of its primary strengths is that it can be used to evaluate alternative BMP implementation strategies ranging from the use of small-scale local or distributed BMPs to implementation of large-scale sub-regional or regional BMPs. The BMP Prioritization Methodology is under development. Phase 1 has been completed and included the development of a prioritization method for the implementation of structural BMPs to manage wet weather runoff. Phase 2, which is ongoing, is focused on the development of a GIS tool and incorporation of an uncertainty analysis to support use of the methodology.

The BMP Prioritization Methodology uses a stepwise approach for prioritizing structural BMPs and fits between a watershed-planning phase and an on-the-ground project design and implementation phase (***Figure 1, right side of figure)***. As can be seen from ***Figure 1***, the prioritization process is functionally equivalent to the development of BMP alternatives. The ultimate goal of this prioritization process is to achieve pollutant reduction targets in the most cost-effective manner possible.

Development of BMP Alternatives

Development of BMP alternatives involves the implementation of four steps.

Step 1 - Catchment Prioritization

The first step in the development of alternatives is to prioritize where within a watershed BMPs need to be located to achieve the target water quality improvements. This effort will rely primarily on the use of watershed data and GIS as tools to develop a Catchment Prioritization Index (CPI) for each catchment. The outcome of this effort is a watershed divided into catchments that have been prioritized for the implementation of BMPs.

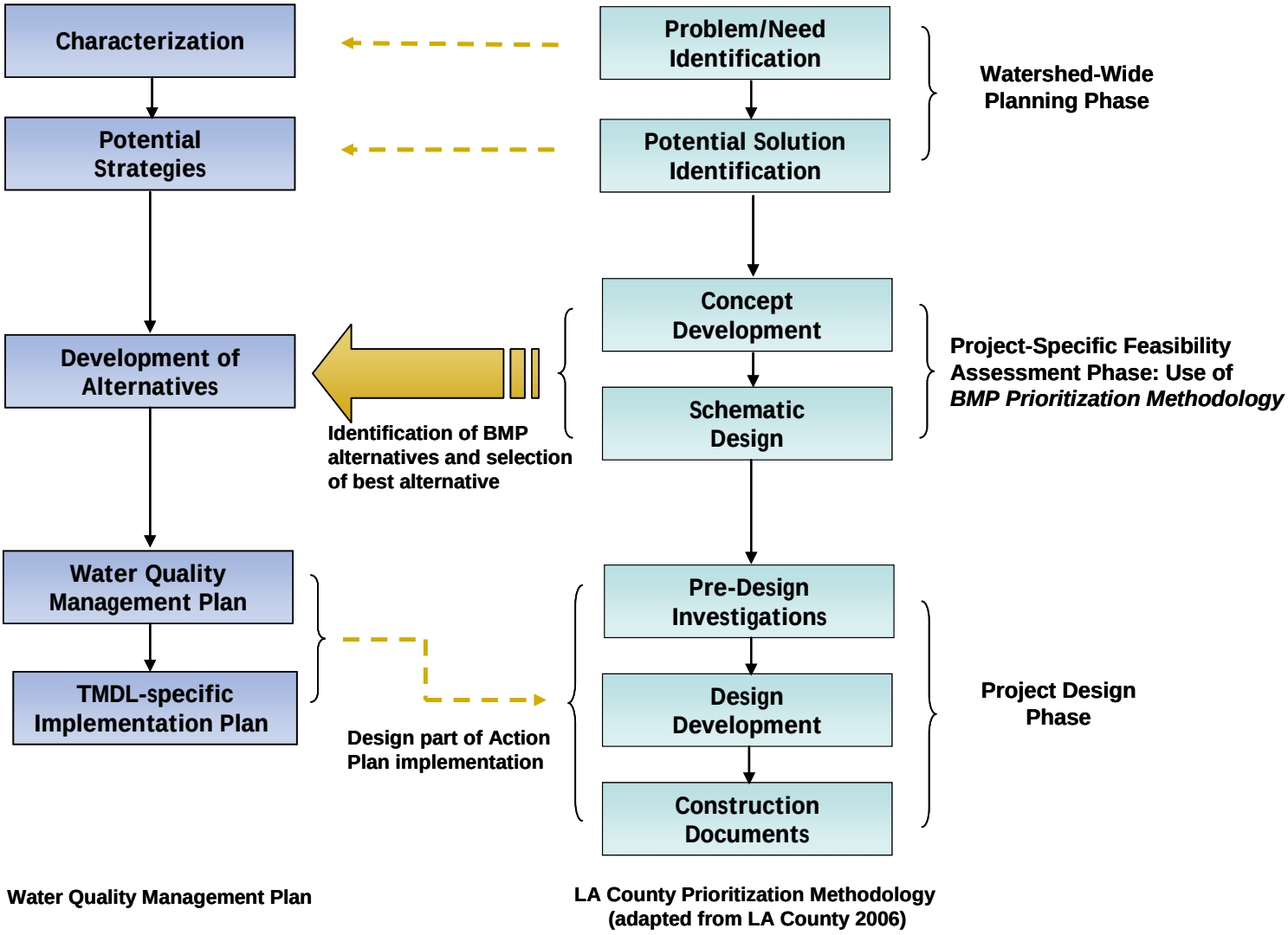


Figure 1
Relationship between Los Angeles County BMP Prioritization and the Water Quality Management Plan

Each watershed will be divided into manageable catchment units to allow for the development of BMP alternatives that are tailored to the needs of each localized area. The size of each catchment depends on the characteristics of each drainage area. For example, a small headwater drainage or area encompassed by a single small storm drain could comprise a catchment if water quality data show that the catchment is a significant contributor of pollutants to a downstream impaired water. In contrast, where several small contiguous small drainages are not contributing pollutants to downstream receiving waters, then these contiguous drainage areas could be combined into a single, but larger, catchment.

The BMP Prioritization Methodology provides a detailed explanation regarding how CPI values may be calculated using the following factors:

- Estimation of the relative pollutant contribution from each catchment;
- Location of the catchment discharge points relative to an impaired water; and
- Location of the catchment discharge points relative to an impaired water with a completed TMDL.

Step 2 - Identification of BMP Alternatives

The purpose of Step 2 is to identify opportunities for the placement and implementation of BMPs in each catchment within a given watershed using the following process:

- **Categorize BMP Opportunities** – This activity is to identify the types of BMPs by category that may be implemented in the catchment (see Text Box for BMP categories).
- **Identify BMP Opportunities within Categories** – This activity focuses on identifying where BMPs representing different categories may be implemented in each catchment. This analysis is best suited for the identification of areas where distributed and sub-regional/regional BMPs may be located in and downstream of high priority catchments.
- **Rank BMP Opportunities** - The selected list of BMP opportunities are initially assumed to have equal chance of implementation. However, additional analysis is required to rank the various BMPs based on factors such as land ownership (public vs. private) and locations where pollutant load reductions are needed the most.

The primary product of this last step is the preparation of maps showing both where the greatest needs are for BMPs (outcome of Step 1) and where the greatest opportunities are for BMP implementation (outcome of Step 2). Coupled, these two

key pieces of information form the basis for the beginning of the selection of projects for implementation under the Water Quality Management Plan.

Step 3 - Screening of BMP Alternatives

The purpose of this step is to assess the BMP opportunities identified in Step 2 and identify specific BMPs that could be implemented within targeted areas for each BMP category, e.g., non-structural, distributed and sub-regional / regional. The following process is implemented to screen BMP alternatives:

Â **Screening Criteria** - The BMP Prioritization Methodology recommends the use of primary screening criteria and sub-criteria, such as:

- Cost;
- BMP effectiveness;
- Feasibility;
- Other environmental benefits / impacts; and
- Other selected factors, e.g., required jurisdictional partnerships or consistency of BMPs with other goals of the WQCMPUR.

Â **Criteria Weights** - All of the screening criteria established for this step must have associated weighting factors so that various alternatives can be scored. The BMP Prioritization Methodology suggests weighting factors, but also recommends that these weights be evaluated by the user, as appropriate.

Â **BMP Opportunity Assessment** - The outcome of Step 3 is a BMP comparison matrix for each BMP category (non-structural, distributed, subregional / regional) with preliminary BMP scores for each evaluated catchment.

Up to this point, the assessment has relied on regional data and literature information. No site-specific data have yet to be incorporated, which is only considered in the next step.

Step 4 - Selection of the Best BMP Alternative

This step involves a site-specific analysis of the preliminary BMP assessment conducted under Step 3. This analysis will mostly apply to distributed and subregional / regional BMPs. Selection of the best alternative relies on the following process:

Â **Site-Specific Screening** - Three levels of screening will be used to identify site-specific opportunities and constraints associated with potential BMPs:

- **GIS-Level Screening** – This screening focuses on site-related constraints such as areas designated as landslide or liquefaction zones, liquefaction, areas with

poor soil infiltration and special concerns such as environmentally sensitive areas;

- **Desktop-Level Screening** – This screening primarily involves use of aerial and catchment maps to identify locations for siting BMPs, e.g., available open areas including rooftops and parking lots that can be targeted for stormwater capture; and

- **Field-Level Screening** – Field investigations as the final screening effort will verify or identify additional constraints and opportunities previously unnoticed. Examples of constraints that may be observed on the ground include limitations associated with public safety, jurisdiction, flood control or proximity issues such as closeness of planned urban runoff retention BMP to where stormwater runoff could be used.

Â **Fatal Flaws Analysis** - The information generated from the site-specific screening is used to conduct a fatal flaw analysis. Based on the constraints identified in the site-specific analysis, some BMPs that were previously recommended may no longer be feasible. When this information is factored into the preliminary analysis completed in Step 3, updated BMP scores will be developed.

Â **BMP Project Selection** - The products from Step 4 include the following:

- Updated and final BMP comparison matrix with the fatal flaws analysis factored into it;

- Field-screening analysis developed for each catchment; and most importantly

- BMP recommendations summary, which list all recommended projects (structural and non-structural) for consideration in the development of the Water Quality Management Plan.

As noted previously, the final selection of BMP projects for implementation needs to satisfy the requirements described above under the Siting, Design and Implementation Criteria for Screening BMPs section.

References

1. International Stormwater BMP Database (www.bmpdatabase.org).

2. *Los Angeles County-wide Structural BMP Prioritization Methodology Guidance Manual* (2006), prepared by Geosyntec Consultants for the County of Los Angeles, Department of Public Works, Heal the Bay, and City of Los Angeles, Bureau of Sanitation.

Appendix 9-3
Developing a Quantitative Nexus between BMP Selection and Water Quality Standards Attainment

A key challenge facing the City is the development of a quantitative nexus between implementation and water quality standards attainment. Development of this quantitative nexus is critical for a number of reasons:

1. To provide a technical basis to estimate the water quality benefits associated with implementation of selected BMPs.

2. To help ensure that City funds and resources are being allocated efficiently.

3. To quantify the uncertainties that must be considered – these include both natural variability (e.g., rainfall patterns and volumes) and uncertainties with respect to BMP performance and constituent-specific loading rates.

The following paragraphs describe the conceptual approach the City will follow to evaluate the quantitative relationship between what is proposed for implementation and our expectations for meeting water quality standards. This approach is focused on land use based solutions appropriate for planning studies and the improvement of the quality of water discharges *into* receiving waters.

Given the objectives above, the City's approach will utilize some of the most technically-defensible tools and data that are representative of the state of the practice. However, it is recognized that technologies are evolving, better information and tools will become available, and as potential projects move forward, site-specific information will be available to enhance the precision of the model. These factors will be continually incorporated into the performance models.

Within one year the City, in conjunction with key partners in the environmental and technical communities, will develop a planning tool (Phase II of the Los Angeles County-Wide Structural BMP Prioritization Methodology, discussed in *Appendix 9-2*) to quantify water quality benefits of proposed structural BMPs in selected drainage areas.

Key input parameters for this quantitative nexus will include the following, see *Figure 1*:

Â Proposed BMP parameters (structural BMP types, locations of structural BMPs, sizes of structural BMPs);

- Known parameters related to drainage areas (land use types, runoff-response characteristics, potential pollutant concentration loadings, and existing infrastructure, tributary drainage areas of structural BMPs); and

- Variable parameters (rainfall patterns, pollutant concentrations, structural BMP effectiveness).

The following figures provide an overview of the anticipated methodology:

- *Figure 1* provides a description of how the quantitative nexus methodology is currently envisioned, given the state of supporting studies and ongoing efforts.

- *Figure 2* provides an illustration of how the quantitative nexus output could guide implementation activities so that there would be a reasonable expectation that water quality standards can be attained.

- *Figure 3* provides an example of output as a management tool, supporting the upsizing of a structural water quality BMP.

Upon completion of the watershed-wide quantitative analyses, and with acceptable probabilities of meeting water quality standards, additional implementation (e.g., pre-design) steps will be initiated. As site-specific data are developed during subsequent steps, uncertainties in the data will be reduced.

Upon completion of the initial evaluations conducted during development of the Water Quality Management Plans, there may be some areas where the probability of meeting water quality standards may be unacceptably low. It is also conceivable that the suite of BMPs required to meet water quality standards are not acceptable to the City and its stakeholders (e.g., BMPs without multiple benefits, or that require extensive cost, power, maintenance, etc.). Should these types of scenarios arise, the City will review alternative technologies, and should the regulatory, environmental, and technical communities so agree, a preferred approach may involve *presumptive compliance* with water quality standards, utilizing a preferred suite of acceptable BMPs (e.g., multi-benefit) that are dictated by historical BMP performance. An example of this approach could be a stipulation that, “natural treatment system” BMPs must include design and long term maintenance provisions such that resulting effluent water quality meets or exceeds the historically observed 75th percent upper confidence level, and that should a BMP systems perform at this level, it would not deemed out of regulatory compliance.

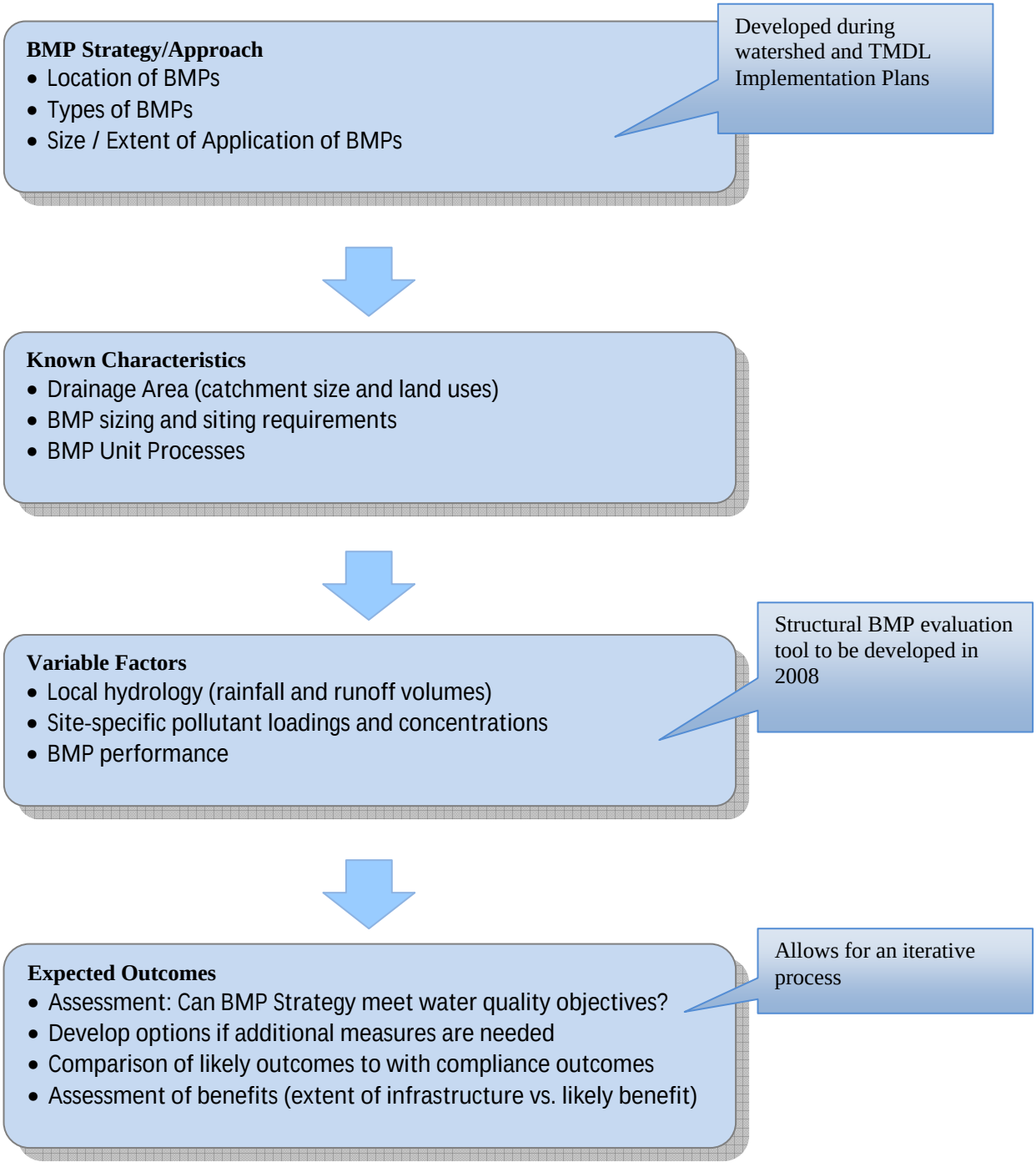


Figure 1
Overview of Quantitative Nexus Process

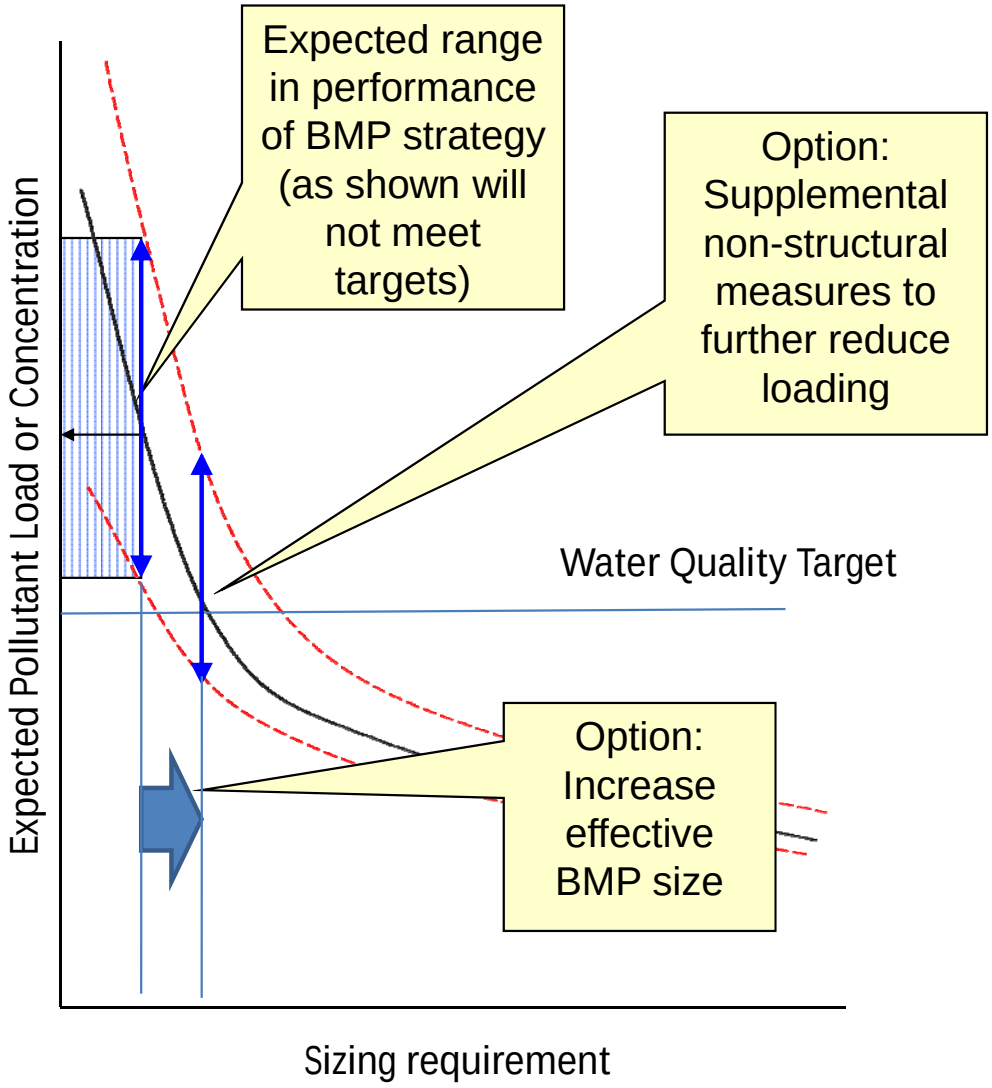


Figure 2
Potential Outcomes – Examples of Options for Iterative Process
Note: The vertical axis represents the expected pollutant load or concentration in the receiving water or, similarly, in the effluent of the BMP.

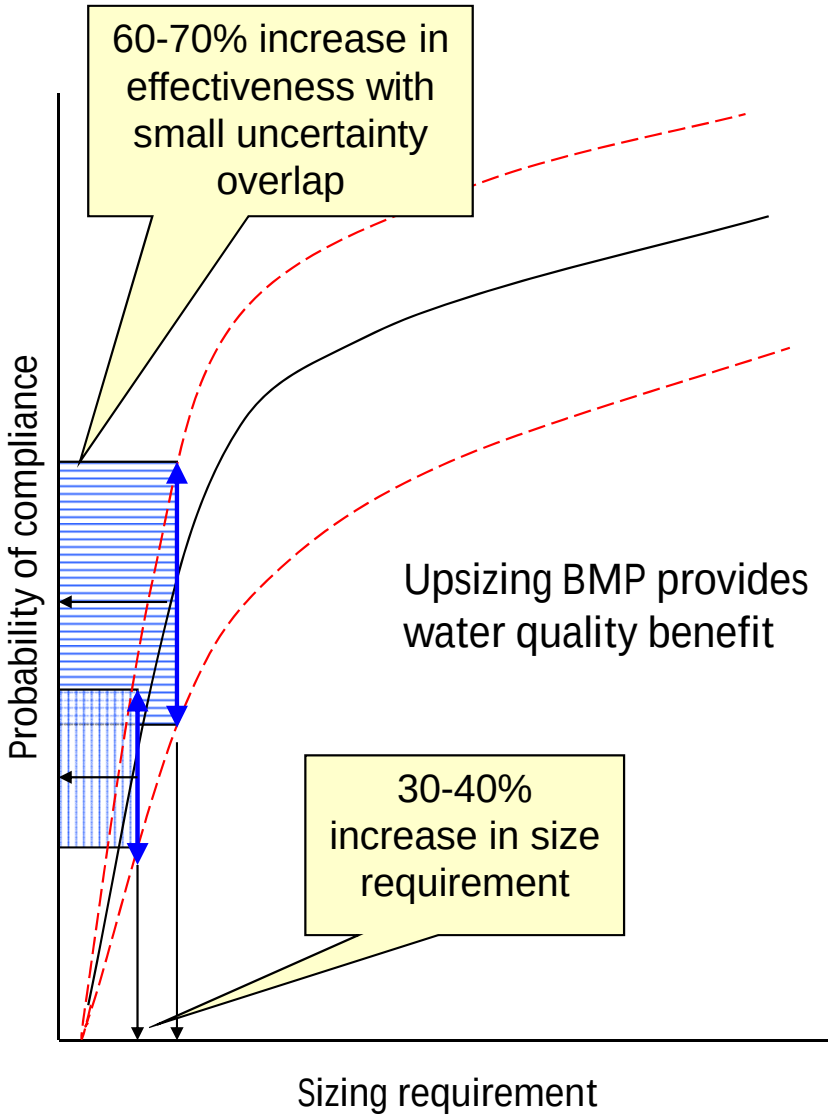


Figure 3
Potential Outcomes – Structural BMP Example

Appendix 9-4
Examples of Local and Regional Urban Runoff Management Programs

Many organizations are directly or indirectly involved in urban runoff management and improving the water quality in the City of Los Angeles. This appendix lists many of the organizations, City agencies and programs that were consulted for the development of WQCMPUR. Additional sources of information can be found in the "References" section at the end of each chapter.

Organization/Program	Website
(Non)-Governmental Organizations in Los Angeles area	
Ballona Wetlands Land Trust	http://www.ballona.org
Community Coastal International	http://www.ccint.org/index.html
Heal the Bay	http://healthebay.org
LA Conservation Corps	http://www.lacorps.org/index .html
Los Angeles Community Garden Council	http://www.lagardencouncil.org
Los Angeles Neighborhood Land Trust	http://www.lanlt.org
Mountains Recreation & Conservation Authority	http://mrca.ca.gov
National Resources Defense Council	http://nrdc.org
North East Trees	http://www.northeasttrees.org
Northeast LA Open Space Coalition	http://www.nelaopenspace.org
San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy	http://www.rmc.ca.gov/index.html
Santa Monica Mountains Conservancy	http://smmc.ca.gov
TreePeople	http://treepeople.org
Santa Monica Baykeeper	http://www.smbaykeeper.org
City of Los Angeles agencies and programs	
Office of the Mayor	http://lacity.org/mayor
SustainLA	http://www.sustainla.org
Green LA	http://www.ladwp.com/ladwp/cms/ladwp010314.pdf
Million Trees LA	http://milliontreesla.org
Community Redevelopment Agency	http://crala.net
Department of City Planning	http://cityplanning.lacity.org
General Plan	http://www.ci.la.ca.us/PLN/Cwd/GnlPln/Index.htm
Department of Environmental Affairs	http://www.lacity.org/ead/environmentla/
Green Roofs – Cooling Los Angeles	http://fypower.org/news/?p=458
Los Angeles Brownfields Program	http://www.lacity.org/ead/labf
Bureau of Streets Services Special Projects	http://www.cityofla.org/BOSS/SpecialProjects/index.htm
Urban Forestry Division	http://www.cityofla.org/BOSS/UrbanForestryDivision/index.htm
Department of Water and Power (DWP)	http://www.ladwp.com
Securing L.A.'s Water Supply (DWP)	http://www.ladwp.com/ladwp/cms/ladwp010588.jsp

Stormwater Capture Program (DWP)	http://ladwp.com/ladwp/cms/ladwp001617.jsp
Water Conservation Program (DWP)	http://ladwp.com/ladwp/cms/ladwp001257.jsp
LA River Revitalization	http://www.lariver.org
Other cities and programs	
Chicago's Water Agenda	http://www.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/wateragenda_1.pdf
Kansas City 10,000 Rain Gardens	http://www.rainkc.com
New York City's PlaNYC	http://www.nyc.gov/html/planyc2030/html/home/home.shtml
Philadelphia's Next Great City Initiative	http://www.nextgreatcity.com
City of Portland Bureau of Environmental Services	http://www.ortlandonline.com/BESindex.cfm?c=31892
City of Portland Office of Sustainable Development	http://www.portlandonline.com/OSD/index.cfm?c=42113
San Francisco's SFEnvironment Toxics Reduction Program	http://www.sfenvironment.org/index.html
City of Seattle Department of Planning and Development	http://www.seattle.gov/dpd/

Appendix 10-1
Potential Bonds

General Obligation Bonds

General obligation bonds can be issued by a municipal or county government to fund capital projects of the jurisdiction. General obligation bonds are secured by the general taxing power of the local jurisdiction. If planned revenues, usually property taxes, but in some jurisdictions, income and sales taxes, fall short of the amount needed to meet bond payments, the jurisdiction may raise taxes to generate needed revenue. Debt service terms and interest rates vary depending on the terms established at issuance.

Stormwater Revenue Bonds

Generally, stormwater revenue bonds provide the funding for building infrastructure, the physical assets of a stormwater system. In most cases, a stormwater utility identifies a dedicated revenue stream to demonstrate ability to repay the bonds. Revenue bond credit agencies, such as Moody's or Standard & Poor's, review the utility's ability and willingness to repay the debt.

Revenue bonds are reviewed according to four guidelines:

- Â Current and future debt position;
- Â Experience of financial performance;
- Â Economic strength of the service area; and
- Â Management's abilities to operate the system and conduct payback of the debt.

To successfully secure stormwater revenue bonds, the utility should have a stormwater master plan, a capital improvement plan, and a history of reliable revenue collection. These three factors will demonstrate the calculated need and identify the net revenues required to repay the acquired debt. Reliable revenue collection should indicate the City has the ability to increase rates to pay debt service by demonstrating past success at increasing rates as needed. Debt service usually is structured to be paid back over a period of 10-20 years. A desired debt service coverage ratio (operating revenue divided by debt service payments) is required by financial markets to maintain bond ratings.

The tax-exempt stormwater revenue bonds are backed by stormwater service fees and charges paid by system customers. Bond investors are paid from revenues from the service fees and charges. Bonds are issued (sold) through an investment banking company or through private placement with large financial institutions.

California Revolving Fund Loan Programs

Loans are available from the State Revolving Fund Loan (SRF) program, including the Clean Water State Revolving Fund (CWSRF) administered by the State Water Resources Control Board (see http://www.swrcb.ca.gov/funding/srf.html) and the California Infrastructure SRF (ISRF) administered by the California Infrastructure and Economic Development Bank (I-Bank).

The CWSRF (established under the authority of the Federal CWA) provides low interest loans to public agencies for stormwater treatment and other point source projects, as well as other wastewater, non-point source, and conservation management projects. The intent of the program is to provide financial assistance for constructing facilities or implementing measures to reduce water quality programs and prevent pollution of state waters with the goal of achieving compliance with the CWA and state laws. Funding for the program is provided by Federal grants and state bond funds, as opposed to local bonds that are funded by taxpayers, such as Proposition O. CWSRF loans are issued for 20-year terms. Interest rates are equal to one-half of the most recent state general obligation bond rate. There is cap of $25 million in disbursements per year to a single agency.

The ISRF (see http://www.calepa.ca.gov/Border/Documents) provides low-cost financing to public agencies for a wide variety of infrastructure projects including drainage, flood control and environmental mitigation. Funding for each approved application ranges from $250,000 to $10 million under a 30-year repayment term. Interest rates are set at the issuance of the loans based on 67% of an “A” rated tax-exempt issuance with a weighted life similar to the I-Bank financing. Interest rates are fixed for the life of rates fixed for the life of the loan. Aggregate financing approval cannot exceed $20 million for a city as a whole or $10 million for an agency in a city.

Appendix 10-2
Grant Funding to City of Los Angeles

Table 1
Grant Funding to the City of Los Angeles for Water Quality Improvement, 2003-2007

Project Title	Grant Source	Year Completed	Awarded Amount
AF Hawkins Wetland	State WRCB	2005	$100,000
Machado Lake Assessment Study	State WRCB	2003	$137,000
Upper LAR Watershed Urban Runoff Pollution Removal	State WRCB	2004	$675,000
Thurman Avenue Trash Capture	State IWMB	2003	$430,000
Transportation contaminants Reduction Program	Federal TEA-21 Program	2006	$280,000
8th Street Low Flow Diversion (LFD)	State IWMB	2003	$450,000
Temescal Canyon LFD	State WRCB	2003	$800,000
Imperial Hwy LFD	State WRCB	2003	$810,000
Santa Monica Canyon LFD	State WRCB	2003	$1,020,000
Ballona Creek Stormwater Trash Capture System	State WRCB	2007	$500,000
Los Angeles River - TMDL Project	US EPA	2007	$150,000
Marquez Canyon LFD	State WRCB	2007	$870,000
IRWMP Development	State WRCB	2007	$600,000
		Total	**$6,822,000**

Table 2
Grant Funding to Proposition O Projects

Project	Grant Source	Amount
Catch Basin Inserts and Coverings Phase I	Proposition 40	$600,000
Echo Park Lake Rehabilitation	Proposition K	$600,000
Grand Boulevard Tree Wells	Proposition 50 (SMBRP)	$350,000
La Cienega Fairfax Stormwater BMP	Proposition 50 (SMBRP)	$2,000,000
Machado Lake Phase I (Wilmington Drain)	Proposition 50 (IRWMP)	$4,387,500
Machado Lake Ecosystem Rehabilitation	Proposition K	$1,000,000
Mar Vista Recreation Center Stormwater BMP	Proposition 50 (SMBRP)	$2,000,000
Oros Green Street	Proposition 13 and CWA 319th	$586,651
Peck Park Canyon Enhancement	Proposition 50 Rec & Trails Grant	$1,921,118 $120,000
Rosecrans Recreation Center Stormwater Enhancements	Proposition K	$568,690
Santa Monica Bay Low Flow Diversion Upgrades	Proposition 50 (CBI)	$5,000,000
South Los Angeles Wetlands Park	Proposition 50 (IRWMP) Proposition 12 (RZH) Proposition 40 (RZH) Proposition K	$3,300,000 $2,000,000 $1,344,221 $1,000,000