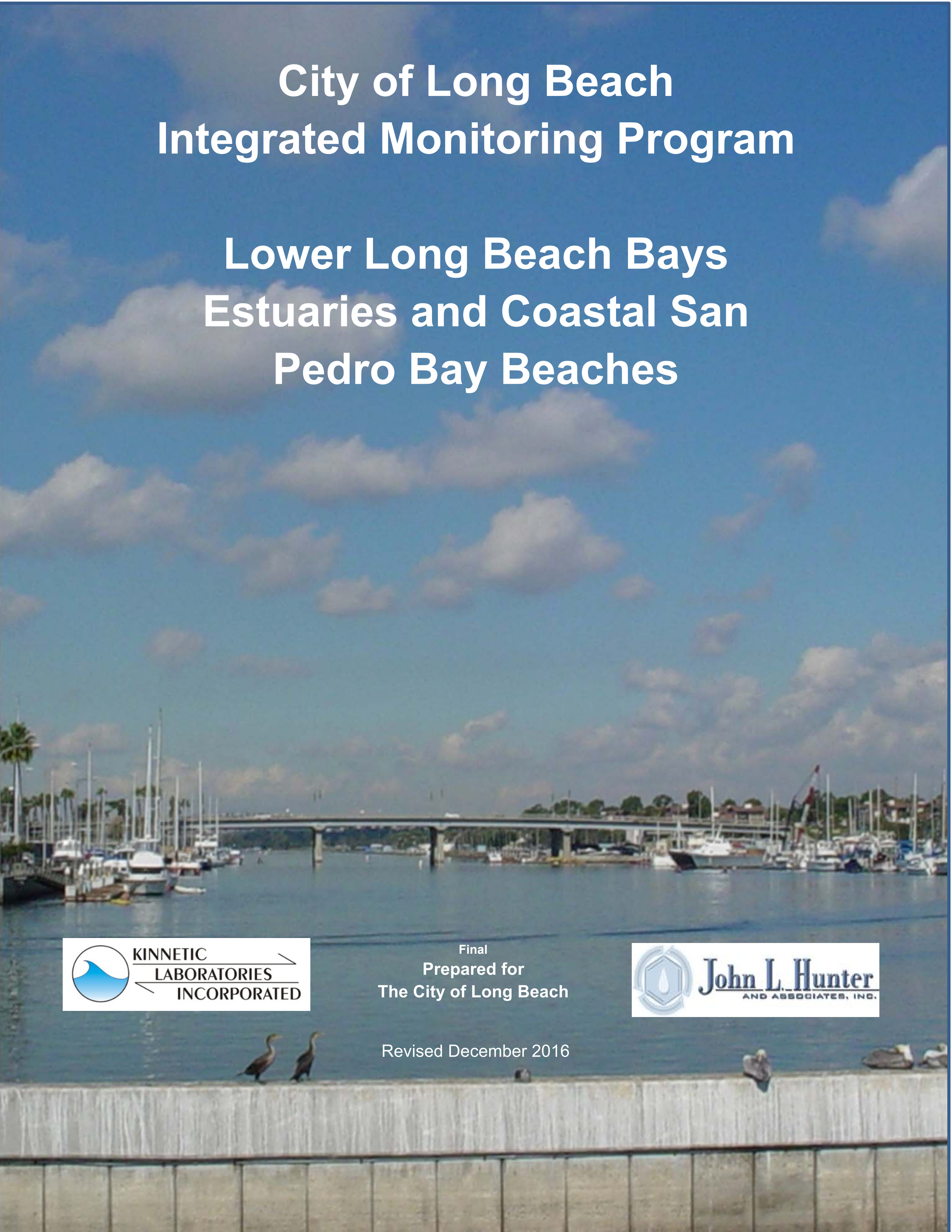

City of Long Beach Integrated Monitoring Program

Lower Long Beach Bays Estuaries and Coastal San Pedro Bay Beaches

KINNETIC LABORATORIES INCORPORATED

Final

Prepared for
The City of Long Beach

John L. Hunter AND ASSOCIATES, INC.

Revised December 2016

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APPENDICES

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ACRONYMS

ALERT	Automatic Local Evaluation in Real Time
AMEL	Average Monthly Effluent Limitation
Basin Plan	*Water Quality Control Plan for the Coastal Watersheds of Los Angeles and Ventura Counties*
BMP	Best Management Practices
BPJ	Best Professional Judgment
BOD	Biochemical Oxygen Demand 5-day @ 20 °C
BRI	Benthic Response Index
CASQA	California Stormwater Quality Association
CCR	California Code of Regulations
CD	Compact Disc
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CIMP	Coordinated Integrated Monitoring Program
CL	Control Limit
COD	Chemical Oxygen Demand
CTR	California Toxics Rule
CV	Coefficient of Variation
CWA	Clean Water Act
CWC	California Water Code
CWP	Center for Watershed Protection
Discharger	Los Angeles County MS4 Permittees
DNQ	Detected But Not Quantified
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
EFA	Effective Filtration Area
EIA	Effective Impervious Area
ERL	Effects Range Low
ERM	Effects Range-Median
ELAP	California Department of Public Health Environmental Laboratory Accreditation Program
Facility	Los Angeles County MS4s
FEB	Fluorinated Ethylene Propylene
FIB	Fecal Indicator Bacteria
GIS	Geographical Information System
gpd	gallons per day
HUC	Hydrologic Unit Code
IBI	Index of Biotic Integrity
IC50	Concentration at which the organism is 50% inhibited
IC/ID	Illicit Connection and Illicit Discharge Elimination
IMP	Integrated Monitoring Program
IWC	In-Stream Waste Concentration

LA	Load Allocations
LACFCD	Los Angeles County Flood Control District
LARWQCB	Regional Water Quality Control Board, Los Angeles
LCC	Los Cerritos Channel
LID	Low Impact Development
LOEC	Lowest Observed Effect Concentration
MAL	Municipal Action Limits
MBAS	Methylene Blue Active Substances
MCM	Minimum Control Measure
mg/L	milligrams per Liter
MDEL	Maximum Daily Effluent Limitation
ME	Mass Emission
µg/L	micrograms per Liter
MDL	Method Detection Limit
MEC	Maximum Effluent Concentration
MGD	Million Gallons Per Day
ML	Minimum Level
MRP	Monitoring and Reporting Program
MS4	Municipal Separate Storm Sewer System
MTBE	Methyl tertiary-butyl ether
NAC	Non-Stormwater Action Levels
ND	Not Detected
NOEC	No Observable Effect Concentration
NPDES	National Pollutant Discharge Elimination System
NSW	Non-Stormwater
NTR	National Toxics Rule
Ocean Plan	Water Quality Control Plan for Ocean Waters of California
ORI	Outfall Reconnaissance Inventory
PCB	Polychlorinated Biphenyls
PWS	Primary Watershed Segment
PES	Polyester-reinforced polysulfone
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QPF	Quantified Precipitation Forecast
RAP	Reasonable Assurance Program
RIVPACS	River Invertebrate Prediction and Classification System
RBI	Relative Benthic Index
Regional Water Board	California Regional Water Quality Control Board, Los Angeles Region
RL	Reporting Limit
RPA	Reasonable Potential Analysis
RWL	Receiving Water Limitations
SIP	State Implementation Policy (Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California)

SMC	Stormwater Monitoring Coalition
SMR	Self-Monitoring Reports
SQO	Sediment Quality Objective
SSC	Suspended Sediment Concentration
State Water Board	California State Water Resources Control Board
SVOC	Semi-Volatile Organic Compound
SWAMP	State's Water Ambient Monitoring Program
SWI	Sediment Water Interface
SWS	Secondary Watershed Segment
TAC	Test Acceptability Criteria
TIE	Toxicity Identification Evaluation
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TRE	Toxicity Reduction Evaluation
TSD	Technical Support Document
TSS	Total Suspended Solid
TST	Test of Significant Toxicity
TU_c	Chronic Toxicity Unit
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
WDR	Waste Discharge Requirements
WET	Whole Effluent Toxicity
WLA	Waste Load Allocations
WMA	Watershed Management Area
WMMS	Watershed Management Modeling System
WMP	Watershed Management Program
WQBELs	Water Quality-Based Effluent Limitations
WQS	Water Quality Standards
%	Percent

CITY OF LONG BEACH
INTEGRATED MONITORING PROGRAM
LOWER LONG BEACH BAYS, ESTUARIES AND COASTAL SAN PEDRO BAY BEACHES

Revised December 2016

1 Introduction

An Integrated Monitoring Program (IMP) is required to be submitted either separately or as part of a Watershed Management Plan (WMP). The IMP is required to integrate requirements of the current City of Long Beach MS4 permit, Total Maximum Daily Loads (TMDLs) and to be consistent with similar County of Los Angeles MS4 permit (LARWQCB 2012).

This plan was developed to address five primary objectives which include:

- Assess the chemical, physical, and biological impacts of discharges from the MS4s on receiving waters.
- Assess compliance with receiving water limitations and water quality-based effluent limitations (WQBELs) established to implement TMDL wet and dry weather load allocations
- Characterize pollutant loads in MS4 discharges.
- Identify sources of pollutants in MS4 discharges.
- Measure and improve the effectiveness of pollutant controls implemented under the new MS4 permits.

The approach presented in this IMP incorporates all objectives of the Monitoring and Reporting Program (MRP) but provides a customized approach to address the objectives identified in the MRP for Receiving Water and Outfall Monitoring based upon the unique characteristics of the following watersheds:

- The lower portions of the City that drain into the Los Cerritos Channel Estuary and Alamitos Bay areas.
- The small portion of the City that drains directly to San Pedro Bay Beaches.
- The portions of the City that drain into the San Gabriel River Estuary.

A drainage map of the City of Long Beach Los Cerritos Channel Estuary and Alamitos Bay watershed is shown in Figure 1-1 along with sub-watershed drainages within the overall watershed area. Also shown in Figure 1-1 is a map of the City of Long Beach drainages to the San Gabriel River Estuary, which is within the City and below the confluence of the San Gabriel River and Coyote Creek at the head of the estuary.

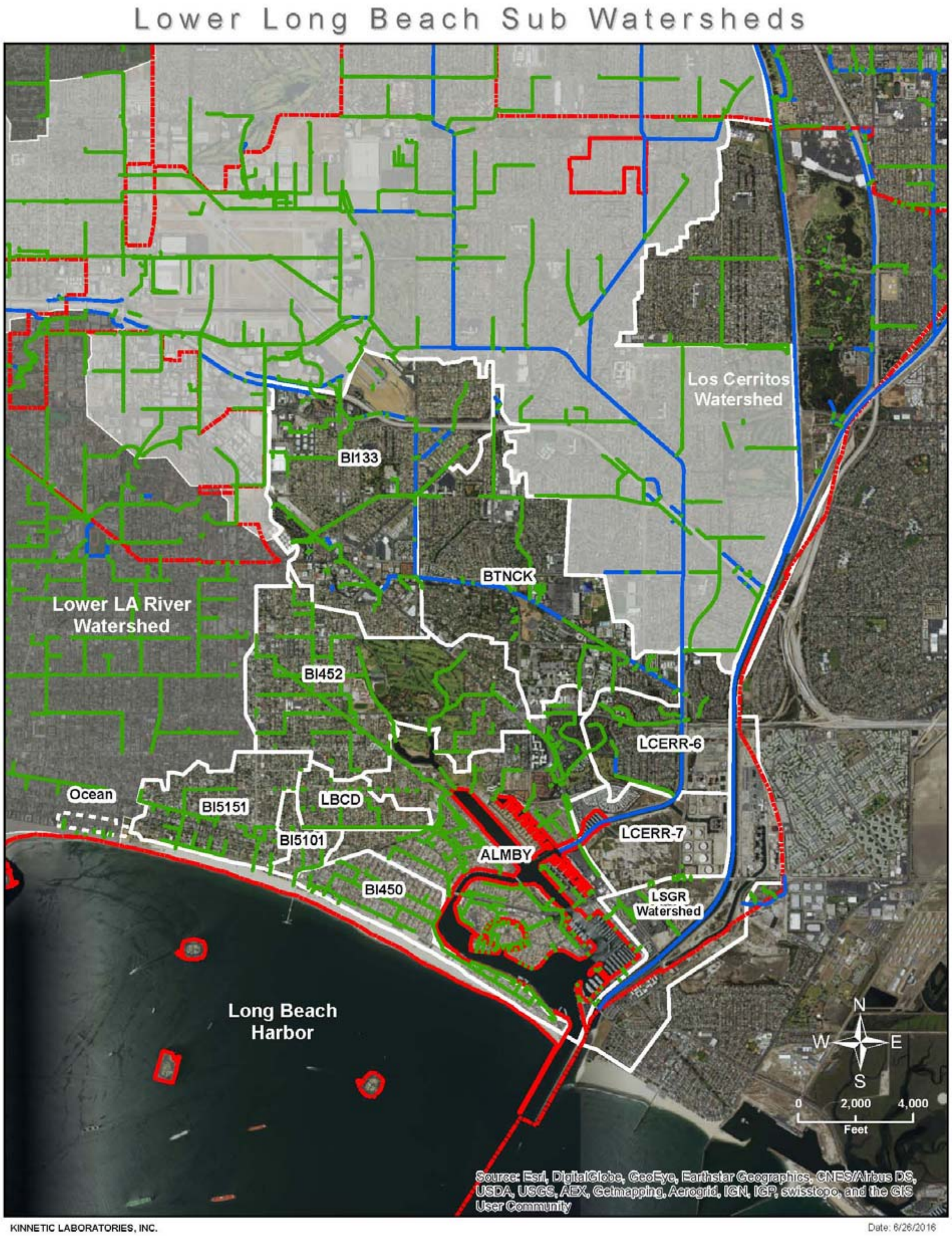

Figure 1-1. **Map of City of Long Beach Watersheds Showing Sub-Watersheds Los Cerritos Channel Estuary, Alamitos Bay, and San Gabriel River Estuary.**

The City of Long Beach is also participating in three other watershed programs that, together with this program, address all discharges from the City. Table 1-1 lists these Upper Watersheds and identifies their Receiving Water Stations that drain into the City of Long Beach Bays and Estuaries. The locations of each Receiving Water Station are also plotted in Figure 1-2. The fourth important receiving water monitoring site is on the Los Angeles River at Wardlow (S10). This latter upstream site does not drain directly into the nearshore watershed addressed by this IMP but the plume from the Los Angeles River does impact the City's ocean beaches in East San Pedro Bay. A previous Coordinated Integrated Monitoring Program (CIMP) along with a WMP have been developed for the upstream, freshwater portion of the Los Cerritos Channel (LCC) Watershed, which includes parts of the City of Long Beach but also includes other cities in the upper watershed. This upper LCC Watershed has a receiving water quality monitoring site at Stearns Street (LCC1). A short distance downstream, this water discharges to tidal waters of the Los Cerritos Channel Estuary. Another CIMP and WMP were developed for the Lower Los Angeles River Watershed, which includes drainages from the City of Long Beach and several upstream cities that drain to the Los Angeles River. Finally, a Lower San Gabriel River Watershed CIMP and WMP were prepared that cover the lower, freshwater portions of the San Gabriel River Watershed, which also complements the CIMP and WMP that cover the upper drainages to the San Gabriel River.

The watersheds covered by this present IMP are within the City. However, discharges from freshwater portion of the Los Cerritos Channel contribute the majority of flows into the Los Cerritos Channel estuary. As a result, the freshwater receiving water quality monitoring station located at Stearns Street (LCC1) will be treated as an outfall monitoring site for purposes of this IMP. Participating jurisdictions for the upstream freshwater watershed CIMP include the Cities of Long Beach, Bellflower, Cerritos, Downey, Lakewood, Paramount, Signal Hill, and the Los Angeles County Flood Control District. Likewise, receiving water monitoring sites at the lower end of the freshwater portions of the San Gabriel River and Coyote Creek will also be considered as outfall monitoring sites for purposes of the San Gabriel River Estuary. Participating jurisdictions for the Lower San Gabriel River CIMP include the Cities of Long Beach, Artesia, Bellflower, Cerritos, Diamond Bar, Downey, Hawaiian Gardens, La Mirada, Lakewood, Norwalk, Pico Rivera, Santa Fe Springs, Whittier, and the Los Angeles County Flood Control District. The City of Long Beach IMP will coordinate with each of the upstream watershed programs to share data and assure that appropriate water quality measurements are taken to meet common objectives for each program. External contributions of contaminants are limited to atmospheric deposition originating predominantly from major transportation corridors and facilities.

Table 1-1. Receiving Water Sites from Upper Watersheds.

Site Name	Latitude (N)	Longitude (W)	Upper Watershed	Location	Field Measurements	Monitored Constituents		
						Table E2	Aquatic Toxicity	Category 1-3 Pollutants and Harbor Toxics Monitoring
LCC1	33.79538	118.10361	Los Cerritos Channel Freshwater	Los Cerritos Channel at Stearns Street (Long Beach)[1]	X	X	X	**C1**-copper, lead zinc, chlordane** **C2**-ammonia*, *E. coli*, bis(2)ethylhexylphthalate, pH* **C3**-MBAS, enterococcus**
GR1	33.81163	118.81167	Lower San Gabriel River	San Gabriel River above Spring Street (Long Beach)[2]	X	X	X	**C1**-copper* **C2**- *E. coli*, pH, ammonia*, lead*, nickel*, zinc*, diazinon*, cyanide*, toxicity* **C3**- selenium, dissolved oxygen * **HARBOR TOXICS**
S13	33.80983	118.07675	Lower San Gabriel River	Coyote Creek below Spring Street (Long Beach)[2]	X	X		**C1**-copper, lead, zinc **C2**-ammonia, cyanide, diazinon, *E. coli*, pH, toxicity **C3**-dissolved oxygen, MBAS, chloride*, alpha-endosulphan* **HARBOR TOXICS**
S10	33.81900	118.20556	Lower Los Angeles River	Los Angeles River at Wardlow[3]	X	X	X	**C1**- cadmium, copper, lead, zinc, nitrogen compounds, *E. coli* **C2**-aluminum, selenium, diazinon, cyanide, MBAS **C3**- PAHs, dissolved oxygen, chloride*, mercury*, nickel*, thallium*, **HARBOR TOXICS**

*Dry weather only

**Chlordane and enterococcus included due to downstream watershed 303(d) listings

1. Kinnetic Laboratories , Inc. 2015c. Los Cerritos Channel Coordinated Integrated Monitoring Program. June, 29, 2015.
2. Kinnetic Laboratories, Inc. 2015a. Coordinated Integrated Monitoring Program for Lower San Gabriel River Watershed Group. February, 2015.
3. Kinnetic Laboratories, Inc. 2015b. Coordinated Integrated Monitoring Program for the Lower Los Angeles River Watershed Monitoring Group. June 29, 2015.

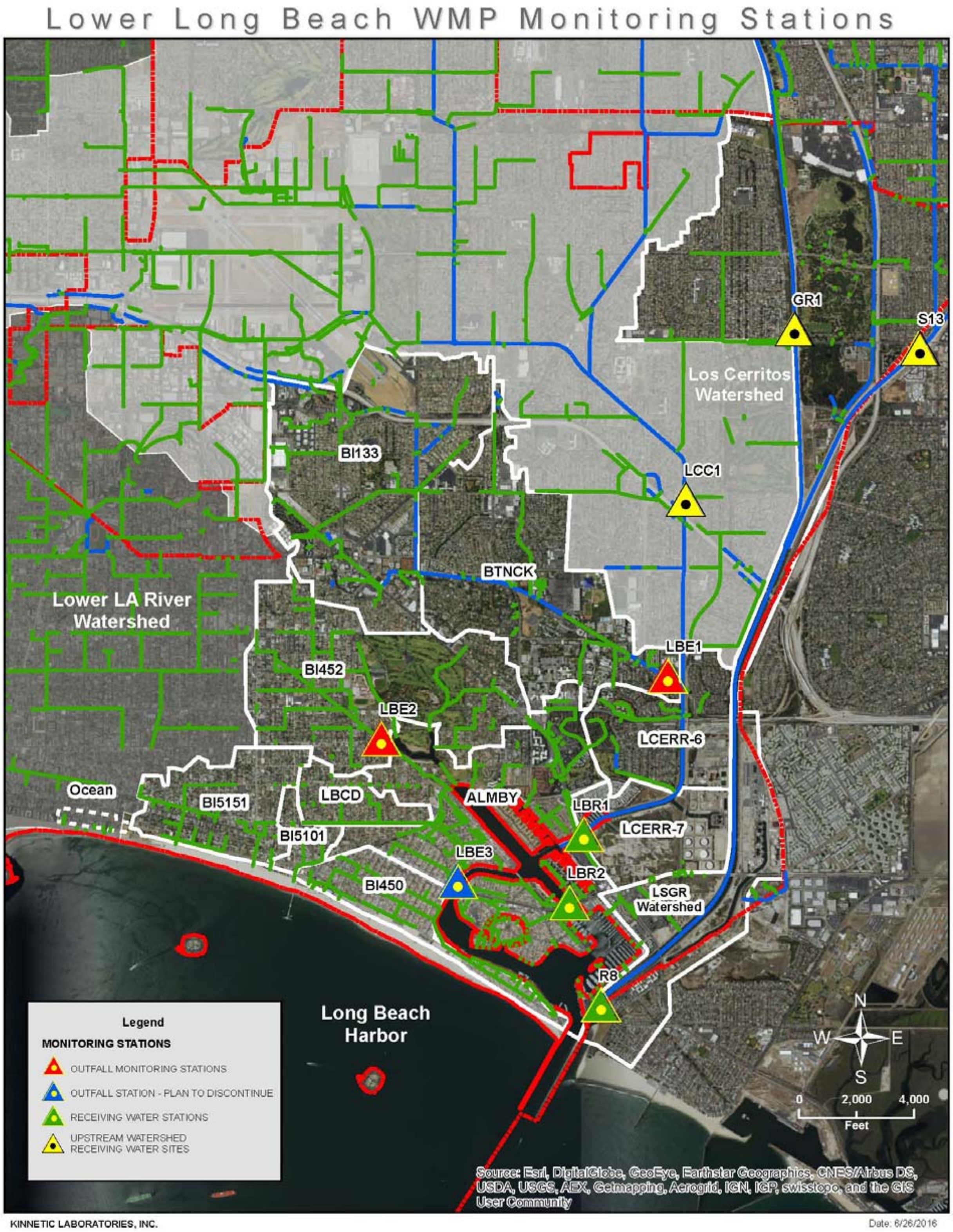

Figure 1-2. Locations of Monitoring Sites in the Los Cerritos Channel Estuary and Alamitos Bay, and in the San Gabriel River Estuary, along with Upper Watershed Receiving Water Sites.

1.1 Monitoring Objectives

The MRPs established under the Los Angeles County (LARWQCB, 2012) and the City of Long Beach (LARWQCB, 2014) NPDES permits have equivalent requirements. The City of Long Beach bay and estuarine watersheds are located in areas covered by the City of Long Beach's permit, but the requirements differ only in terms of schedules. The City has prepared a WMP under the City NPDES Permit schedule. This IMP is required to incorporate the following elements and address the established objectives under each element of the Monitoring and Reporting Program (MRP) which are specified in Appendix E of the permit.

- Receiving Water Monitoring (Wet and Dry Weather) (Part II.E.1 of the MRP)
    - Are receiving water limitations being met?
    - Are there trends in pollutant concentrations over time or during specified conditions?
    - Are designated beneficial uses fully supported as determined by water chemistry, aquatic toxicity, and bioassessment monitoring?
- Stormwater Outfall Monitoring (Part II.E. 2 of the MRP)
    - How does the quality of the permittee's discharges compare to Municipal Action Limits (MALs)?
    - Are the permittee's discharges in compliance with applicable stormwater WQBELs derived from TMDL WLAs?
    - Do the permittee's discharges cause or contribute to an exceedance of receiving water limitations?
- Non-Stormwater Outfall Based Monitoring (Part II.E.3 of the MRP)
    - Are the permittee's discharges in compliance with non-stormwater WQBELs derived from TMDL Waste Load Allocations (WLAs).
    - How does the quality of the permittee's discharges compare to Non-Stormwater Action Levels?
    - Dose the permittee's discharges cause or contribute to an exceedance of the receiving water limitations?
    - Does the permittee comply with the requirements of the Illicit Connection and Illegal Discharge Program?
- New Development/Re-Development Effectiveness Tracking (Part II.E.4 of the MRP)
    - Are the conditions established in building permits issued by the Permittee being met?
    - Are stormwater volumes associated with the design storm effectively retained on-site?
- Regional Studies
    - How does the permittee plan to participate in efforts to characterize the impact of the MS4 on receiving waters? Include participation in regional studies with the Southern California Stormwater Monitoring Coalition (SMC) and any special studies specified in TMDLs.

1.2 Monitoring Sites and Approach

The approach presented in this IMP incorporates all objectives of the MRP but provides a customized approach to address the objectives identified in the MRP for Stormwater Monitoring based upon the unique characteristics of the Lower Long Beach Bays and Estuaries as well as the small drainages from the City that discharge directly to the San Pedro Bay beaches. Monitoring sites selected for the Los Cerritos Channel Estuary and Alamitos Bay, and for the San Gabriel River Estuary are shown on Figure 1-2. Recreational beach sites to be monitored for the Long Beach City Beaches and Los Angeles River Estuary TMDL for Indicator Bacteria (2012) are shown in Figures 1-3a and 1-3b for coastal beaches.

Historical water quality monitoring for the last fourteen years has been carried out at the Los Cerritos Channel site at Stearns Street (LCC1) and, in most cases, with consistent detection limits applicable to current receiving water limitations (RWLs). This site at the head of the Los Cerritos Channel Estuary captures all runoff from the Los Cerritos Channel freshwater watershed, including runoff from a large segment of the City of Long Beach. This site is also the compliance monitoring site for the Los Cerritos Channel Metals TMDL. This site is located about 100 feet downstream of a former United States Geological Survey (USGS) gaging station and effectively marks the downstream extent of freshwater influences within the Channel. During low tides, freshwater extends down to the end of the concrete-lined channel below Atherton Street. LCC1 marks the upper extent of tidal influence for all but the most extreme high tides. The portion of the Los Cerritos Channel listed as impaired for metals was identified as the 2.1 mile freshwater portion above the tidal prism. USEPA (2010b) used data from 10 years of both wet and dry weather monitoring at LCC1 to establish the freshwater metals TMDL for the Los Cerritos Channel. Other historical monitoring sites (Figure 1-2) under the former City of Long Beach NPDES permit included a station in the intertidal channel on Bouton Creek near where water discharges to the Los Cerritos Channel Estuary below Stearns Street. Another historical monitoring site is the discharge of the Belmont Pump Station into Alamitos Bay. Monitoring sites to be used in this present IMP program are listed in Table 1-2 along with their location and their functions.

Receiving Water and Outfall Monitoring for the City of Long Beach IMP are listed in Table 1-2 and illustrated in Figure 1-2. The Los Cerritos Channel LCC1 site is part of the Los Cerritos Channel freshwater CIMP and monitoring at this site will continue to be carried out by the LCC Watershed Group. However, data from this site will be important to the evaluation of estuarine receiving waters. The Bouton Creek outfall monitoring site will be continued. A new outfall monitoring site will be established on the Termino Drain that discharges into the far northwestern end of Marine Stadium. The main reason for monitoring the Termino Drain is that it formerly drained into the Colorado Lagoon, an area subject to a TMDL for chlordane, lead, zinc, PAHs, and toxicity in sediments, as well as for DDT, dieldrin, and PCBs in tissues. Sediments located near the site where this drain formerly discharged into Colorado Lagoon were among the most contaminated in the entire lagoon.

In addition, the City's AB411 Beach Bacteria monitoring program will continue to monitor recreational beaches at the nine sites located along the ocean beaches, four sites in Alamitos Bay and two sites in Colorado Lagoon at a minimum frequency of once per week. Monitoring at the five ocean beach sites located west of Belmont Pier (Figure 1-3a) will be increased to three times a week to address TMDL requirements. However, the new permit will also require monitoring three times a week on the City's coastal beaches east of the Pier (Figure 1-3b) in San Pedro Bay because of the City of Long Beach Beaches and Los Angeles River Estuary Bacterial TMDL (USEPA, 2012). All other City beaches are subject to antidegradation criteria which requires the frequency of once a week.

The Colorado Lagoon TMDL monitoring program is separate from this present City of Long Beach IMP and is summarized in the following Section 2.

Table 1-2. Monitoring Site Designation and Monitoring Functions, City of Long Beach Nearshore Watershed.

Site Name	Site Description	Datum NAD83		Outfall Sites	Receiving Water Sites	Bacteria Monitoring
		Latitude (N)	Longitude (W)			
LCC1[1]	LCC1 at Stearns Street	33.79540	118.10366	**X**		
LBE1	Bouton Creek @ LCC Estuary Channel	33.77855	118.10554	**X**		
LBE2	Termino Drain to Marine Stadium	33.77254	118.13826	**X**		
LBE3	Belmont Pump Station to Alamitos Bay	33.75892	118.12952	To be discontinued		
LBR1	Los Cerritos Estuary Channel @ E. PC Hwy Bridge	33.76341	118.11514		**X**	
LBR2	Alamitos Bay at 2nd Street Bridge	33.75692	118.11678		**X**	
R8	San Gabriel River at Marina Bridge	33.74719	118.11299		**X**	
B5	5th Street Beach	33.76344	118.17829			**X**
B56	10th Place Beach	33.76336	118.17352			**X**
B60	Molino Ave. Beach	33.76128	118.16188			**X**
B7	Coronado Ave. Beach	33.75971	118.15454			**X**
B8	W/side Belmont Pier	33.75803	118.14909			**X**
B9	Prospect Ave Beach	33.75601	118.14391			**X**
B64	Granada Ave Beach	33.75419	118.13999			**X**
B10	55th Place Beach	33.74996	118.12981			**X**
B11	72nd Place Beach	33.74404	118.11811			**X**

1. LCC1 is located in the receiving water, it is treated as an outfall site for the purposes of this IMP in order to establish a boundary condition for the pollutant loads entering the portion of Los Cerritos Channel within the City's jurisdiction from the upstream area.

Finally, monitoring at the Belmont Pump Station outfall monitoring site will be discontinued for the present as there are now fourteen years of monitoring data for this site. The selection of monitoring stations was guided by previously existing data and by consideration of Sub-Basin areas and land use as discussed below.

Monitoring of outfalls into the San Gabriel River estuary will not be necessary as stormwater discharges into this estuary are from limited land areas or from wetlands. Discharges in this area of the estuary are dominated by power plant cooling water discharges into the estuary and by sanitary plant discharges from higher up in the San Gabriel River freshwater Watershed, as well as stormwater discharges from the upper freshwater watershed during storm events. Waters and sediments within this estuary are also being monitored, including the continuing San Gabriel River Regional Monitoring Program previously carried out by the Council for Watershed Health and now carried on by Aquatic Bioassay & Consulting Laboratories under a new five year contract.

Figure 1-3a. Receiving Water Beach Bacterial Monitoring Sites West of Pier on Main Beach Subject to TMDL.

Figure 1-3b. Receiving Water Beach Bacterial Monitoring Sites East of Pier on Main Beach Subject to TMDL.

1.2.1 Previously Available Data

A significant amount of data already exist for the Los Cerritos Channel, Alamitos Bay, and San Gabriel River estuaries as well as that of bacterial monitoring on the City's recreational beaches. These include data from both established monitoring programs as well as from special studies. The following sections provide a brief review of available data and comments on the results of these studies with respect to the design of this present stormwater monitoring program. This information provided the basis for decisions on the location of monitoring stations and the parameters to be monitored. Maps showing the locations of some of these sampling and monitoring sites are given in Appendix G along with data source references. A brief discussion of key findings is given below.

1.2.1.1 Los Cerritos Channel Estuary and Alamitos Bay

City of Long Beach NPDES Stormwater Monitoring Program and Beach Bacteria Monitoring. Data from three monitoring sites in the estuary (LCC1 at Stearns, Bouton Creek, and the Belmont Pump Station) are available for flow, chemical concentrations, toxicity, and contaminant load data for the past fourteen years of monitoring (Kinnetic Laboratories, 2000-2015). Of particular interest are results of a special study that tracked the freshwater plume from rain events through the estuary. Bioassay tests using the sea urchin fertilization test indicated that toxicity in these receiving waters was minimal during storm events. Another special study sampled and tested sediments within the Los Cerritos Channel Estuary and identified chlordane in sediments that exceeded Effects Range Median (ERM) screening values and a few other compounds such as metals and DDTs that exceeded the Effects Range Low (ERL) level (Long et al, 1995).

Another special study on bacterial sources along the City's main beach in San Pedro Bay (Kinnetic Laboratories, 2009) implicated the Los Angeles River plume driven by predominant diurnal winds from the west in periodic bacteria exceedances on this beach. Water quality surveys conducted to screen for potential human sources showed no evidence of human contributions using very low sample limits of detection (SLOD). Universal *Bacteriodales* measurements showed concentrations were low and comparable to numbers currently found in San Pablo Bay and San Francisco Bay (S. Wuertz, pers. comm.) In addition, no markers for adenoviruses or enterovirus were detected.

Finally, continuing analyses of the City of Long Beach's ongoing bacterial monitoring data for all of the City beaches (Kinnetic Laboratories, 2014a and 2014b) has shown a marked improvement (Table 1-3) over recent years in compliance with bacterial criteria, achieving high compliance during the summer dry season up to a maximum of 98.7% this past summer, and also marked improvement during the winter period which also is influenced by the number of winter storms. For the West Main Beach, summer 2014 compliance was 97.4 percent, and 90.0 percent overall compliance for the year including both wet and dry weather. These improvements have been directly related to dry weather (summer and winter) diversions of the Belmont and Appian Way Pump Stations, and major improvements to Colorado Lagoon that included bypassing the Termino Drain from the lagoon to Marine Stadium along with a dry weather diversion and a trash trap included in the project design.

Table 1-3. City of Long Beach Bacterial Criteria Compliance on Recreational Beaches.

ALL SITES SINGLE SAMPLE PERCENT COMPLIANCE		
Storm Year	**All Seasons**	**Summer Season**
2014	89%	99%
2013	89%	88%
2012	81%	91%
2011	70%	95%
2010	73%	81%
2009	73%	82%
2008	74%	74%
2007	68%	78%
2006	80%	67%

Colorado Lagoon Monitoring and Improvement Program. A water, sediment, and marine biological TMDL monitoring program is in place (Anchor, 2013 and 2014) and will continue in Colorado Lagoon following completion of major improvements. The LARWQCB has granted a suspension in monitoring while construction of further improvements are underway which is to include capping of contaminated sediments (LARWQCB, 2015).

Preliminary data from Colorado Lagoon sediments show that contamination is generally confined to the lagoon. Contaminants in sediment that exceed ERM values include lead and some other metals that have exceeded ERL values (cadmium, copper, mercury, zinc). Dieldrin, total DDTs, and total chlordanes are above ERM criteria and PCBs are above ERL criteria. Plans are being developed for further remediation of remaining sediment. Bacterial concentrations at the Colorado Lagoon's beaches as measured by the City's beach monitoring program are minimal and have consistently met standards ever since completion of the low flow diversions and initial dredging.

Southern California Bight Studies (2003 and 2008). Sediment data from sampling stations in the Los Cerritos Channel Estuary and in Alamitos Bay have shown chlordane to exceed ERM levels and DDTs and some metals (copper, lead, and zinc) were shown to generally exceed ERL levels in sediments. Low sediment toxicity was found in Alamitos Bay and moderate toxicity in the Los Cerritos Channel Estuary as evaluated by Sediment Quality Objective (SQO) testing.

California Environmental Data Exchange Network (CEDEN) Database. Sediment data from a Regional Water Board special study indicated one station in the upper Los Cerritos Channel exceeded ERMs for chlordane, DDTs, zinc, and total PCBs and four metals above ERLs. The Statewide Stream Pollution Trends Study in the upper San Gabriel River Estuary (Site RA2) showed chlordane exceeded the ERM and metals (copper, zinc) and total DDTs exceeded ERLs.

1.2.2 San Gabriel River Estuary

San Gabriel River Regional Monitoring Program. The Council for Watershed Health and Aquatic Bioassay & Consulting Laboratories have conducted an ongoing monitoring program since 2007 and this program is to be continued by Aquatic Bioassay and Consulting Laboratories. This San Gabriel River

Regional Monitoring Program has produced a dataset of Sediment Quality Objective (SQO) data for sediments in the estuary which includes toxicity using *Eohaustorius* (amphipod) and *Mytilus* (mussel) as test organisms. Sediment chemistry and benthic infauna are also part of the program. Water chemistry in the estuary is limited to conventional parameters by electronic probes along with bacterial analyses. Except for Site RA2 near the top of the estuary, results for sediments show metals along with total DDTs exceeding ERL values. Sediment bioassays showed no toxicity for all years except for 2012 when toxicity was characterized as low to moderate. SQO evaluations showed unimpacted or likely unimpacted conclusions. SQOs reported in a Stream Pollution Trends Program Technical Report (2014), shows a five year average of moderate toxicity for Site RA2 and associated sediment chemistry tends to confirm this result. It also needs to be noted that water chemistry as required by the new MRP has not been part of this program.

Southern California Bight Studies (2003 and 2008). Sediment chemistry reported from seven sites along the San Gabriel River Estuary in 2003 showed only nickel (one site) and total DDTs above ERL levels and no toxicity was measured with *Eohaustorius* (amphipod). In 2008, no toxicity was measured using the amphipod test and low toxicity was measured for *Mytilus* (mussel) test.

CEDEN Database. DDTs and PCBs exceeded ERM levels at only one station located near the power plant.

1.2.3 Land Use and Sub-Basin Areas

Land uses for watersheds discharging to the Long Beach bay and estuarine areas are mapped in Figure 1-4 along with sub-watershed boundaries. Land use summary tables are given in Table 1-4 for the Los Cerritos Channel Estuary and Alamitos Bay watersheds and in Table 1-5 for the San Gabriel River Estuary watershed in the City of Long Beach.

Overall, the Los Cerritos Channel Estuary and Alamitos Bay watershed covers about 6,279 acres broken into ten sub-watersheds. Within the Los Cerritos Channel Estuary and Alamitos Bay watershed, single and multifamily residential land use is the largest category, comprising a total of approximately 46.4% of the total land area, with industrial use only 5.6% and commercial use only 5.8%. Transportation and secondary roads account for about 24.2% of the land use and institutional use accounts for about 10.2%. Bay and estuarine water comprise about 7.2% of the land use and include small boat harbors.

For the San Gabriel River Estuary watershed, single and multifamily residential comprises about 20% of the land use, with the largest category being industrial at 35.3% due mostly to power plant use. Transportation and secondary roads accounts for about 5.8% of land use and commercial for about 9.1%. Water comprises about 18.3% of the area and agricultural/vacant land including wetlands comprises about 11.4% of the area.

Monitoring sites selected for the Los Cerritos Channel Estuary are shown on Figure 1-2 and are listed in Table 1-2. The Bouton Creek monitoring station drains from Sub-Basin BTNCK and portions of B1133 (Figure 1-5). Bouton Creek was chosen as part of the original City of Long Beach NPDES stormwater monitoring sites because of the large size of the drainage (2,224 acres) basin and because it discharges directly into the Los Cerritos Channel Estuary. Land use represented inside this drainage include 39.6%

residential with 8.7% of this being Multifamily. Commercial land use is 8.2% and Institutional use is 22.6%. Transportation uses comprise 27.9% of the area are largely attributable to secondary roads (20.4%). Open space is limited to 0.3% of this catchment area.

The Termino Drain Sub-Basin drains portions of Sub-Basin B1452 (Figure 1-2). This Sub-Basin covers 594 acres and drains into the Marine Stadium. Land use includes 57.8% Residential with the majority (36.7%) of residential land use being associated with Multifamily land use. Commercial land use comprises 7.8% of the drainage area and Institutional uses represent another 5.5%. Transportation land uses represent 28.8% of the total drainage area and is entirely associated with secondary roads. No major transportation corridors exist in this region.

The main reason for moving a monitoring site to the Termino Drain is because this drainage originally flowed through Colorado Lagoon, an area subject to a TMDL for chlordane, lead, PAHs, and toxicity in sediments and DDT, dieldrin, and PCBs in tissue. The most highly contaminated sediments were found at the location where this drainage previously discharged into Colorado Lagoon. The City of Long Beach has now re-routed this drain around the lagoon into the Marine Stadium along with other major lagoon improvements. In the process, the improved measures were taken to prevent further introduction of sediments and associated contaminants to the storm drain. The City wishes to verify that better management practices have now significantly improved water quality and effectively eliminated or reduced legacy contaminants from the watershed.

The Belmont Pump Station is part of Sub-Basin ALMBY and discharges into Alamitos Bay. Originally, this site was selected due to bacterial exceedances on the nearby Alamitos Bay recreational beaches but the drainage is small (213 acres). Land use is consists of 53% Residential, 35% Commercial with only 1% Industrial. Now, discharges from both this Pump Station and the nearby Appian Way Pump Station discharges have been fitted with low flow diversions (LFD) to the sanitary system. The LFDs operate year-round by diverting all non-stormwater flows. Marked improvements have been observed regarding compliance with bacterial criteria at nearby recreational beaches. Since fourteen years of monitoring data are available for this station, monitoring at this site will be discontinued and the Termino Drain monitoring site will be added.

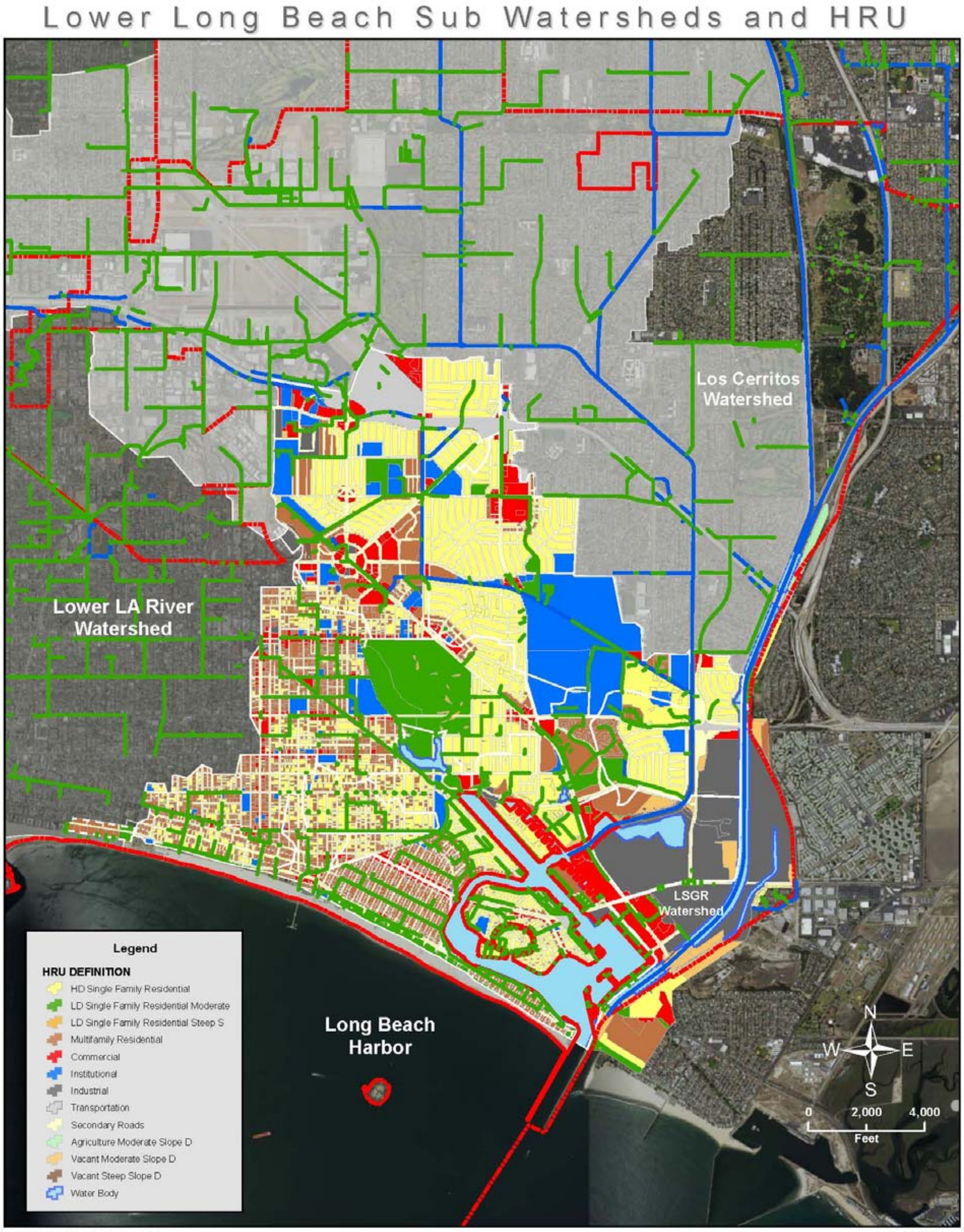

Figure 1-4. Land Uses in Sub-Basins of Long Beach Bay and Estuary Watersheds.

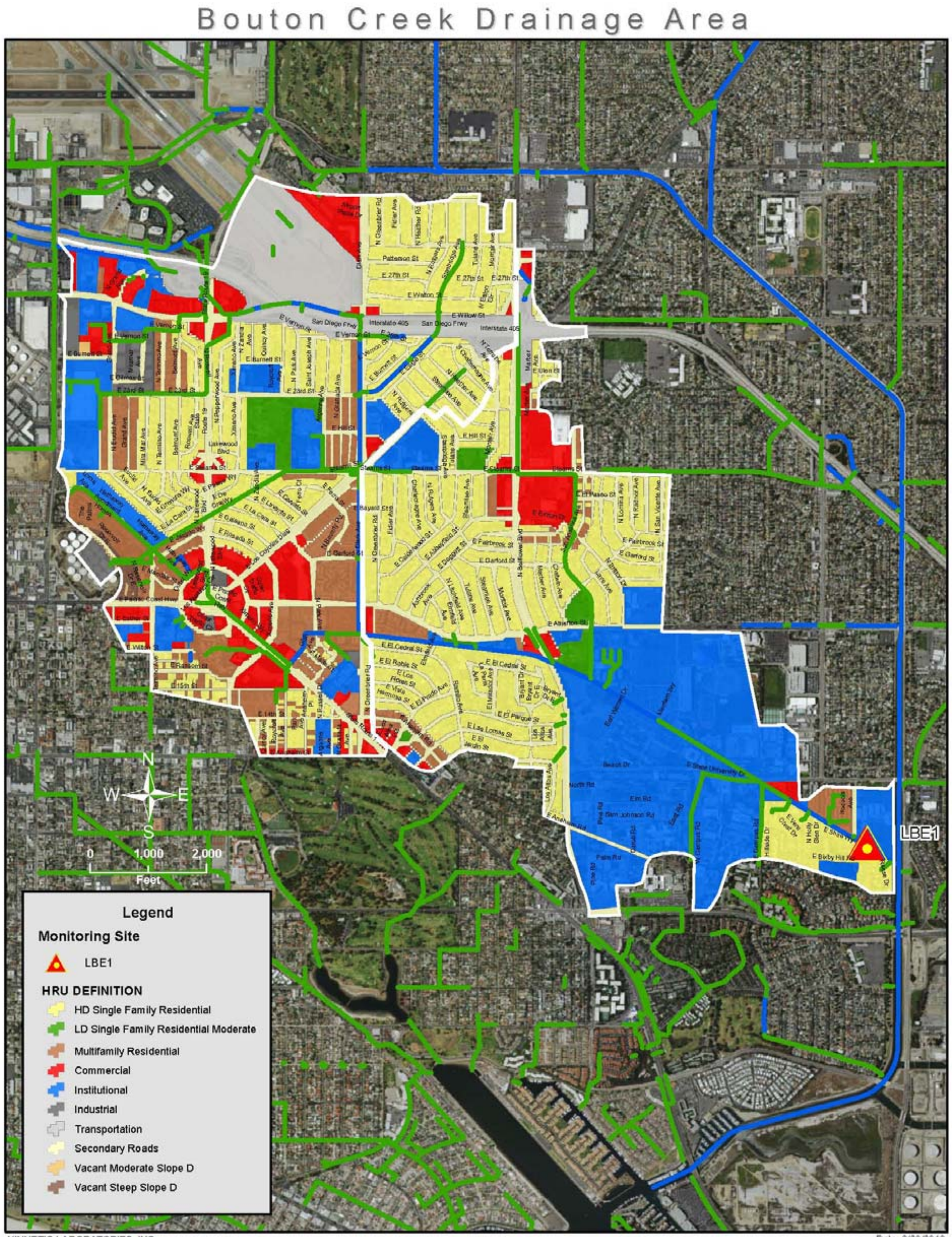

Figure 1-5. Bouton Creek Drainage Area

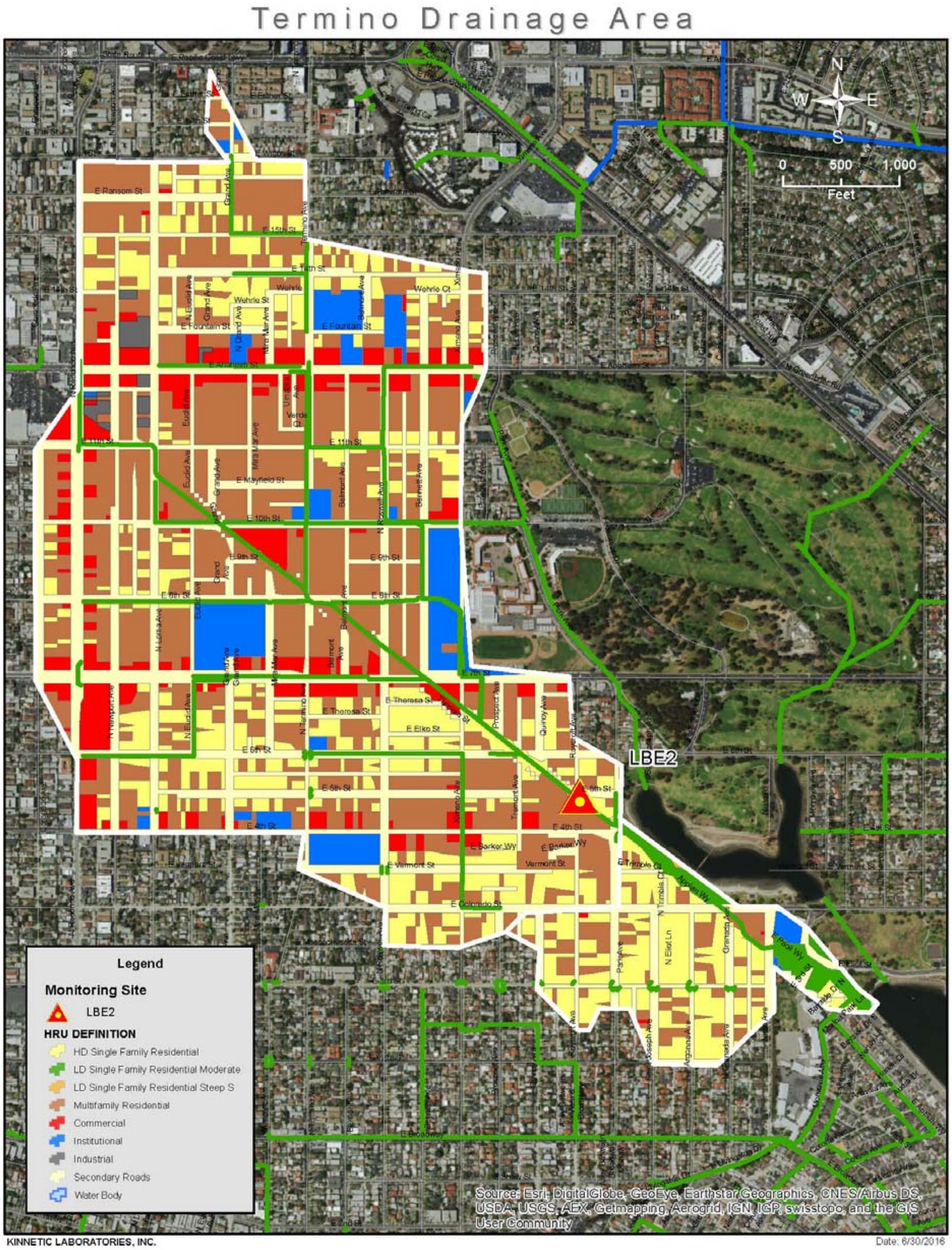

Figure 1-6. Termino Drain Discharge Area

Table 1-4. Land Use Data and Areas for each Sub-Basin of the Los Cerritos and Alamitos Estuary Bay Watershed (HUC-12).

	Subwater Number/Acreage											
Land Use	***HRU CODE***	**BI515**	**BI452**	**BI133**	**BTNCK**	**LCERR-6**	**LCERR-7**	**ALMBY**	**BI450**	**BI5101**	**LBCD**	**TOTAL**
HD single family residential	1	74.1	199.9	292.2	357.5	140.0	0.7	301.6		14.3	63.1	1443.4
LD single family residential moderate	2	6.6	204.4	20.0	17.8	17.1	2.8	120.8	34.2			423.7
LD single family residential steep slope	3		4.3			0.6	1.8	4.1	0.4			11.2
Multifamily residential	4	150.9	226	157.8	35.7	42.3	25.2	189.7	133.6	34.2	37.4	1032.8
Commercial	5	15.6	55.4	123.3	58	11.3	13	71.9	11.4	3.4	0.8	364.1
Institutional	6	10.4	52	120.9	380.6	27.0		42.4	1.9	0.3	2.3	637.8
Industrial	7		3.8	30.1	1.3	80.3	223.3	13.6	0.8			353.2
Transportation	8			150.1	16.4	8.1		5.6				180.2
Secondary Roads	9	120.9	239.4	275.1	179.2	90.3	16	254.3	87.5	26.3	48.3	1337.3
Agriculture moderate slope	13					0.5						0.5
Vacant moderate slope	15			2.0		3.1	25.8	4.3				35.2
Vacant steep slope	19			6.2			2.1	0.2				8.5
Water	20					6.5	51	393.9	0.1			451.5
Total Acres		**378.5**	**985.2**	**1177.7**	**1046.5**	**427.1**	**361.7**	**1402.4**	**269.9**	**78.5**	**151.9**	**6279.4**
	Subwater Number / %											
HD single family residential	1	19.58	20.29	24.81	34.16	32.78	0.19	21.51		18.22	41.54	22.99
LD single family residential moderate	2	1.74	20.75	1.70	1.70	4.00	0.77	8.61	12.67			6.75
LD single family residential steep slope	3	0.00	0.44	0.00		0.14	0.50	0.29	0.15			0.18
Multifamily residential	4	39.87	22.94	13.40	3.41	9.90	6.97	13.53	49.50	43.57	24.62	16.45
Commercial	5	4.12	5.62	10.47	5.54	2.65	3.59	5.13	4.22	4.33	0.53	5.80
Institutional	6	2.75	5.28	10.27	36.37	6.32		3.02	0.70	0.38	1.51	10.16
Industrial	7	0.00	0.39	2.56	0.12	18.80	61.74	0.97	0.30			5.62
Transportation	8	0.00		12.75	1.57	1.90	0.00	0.40				2.87
Secondary Roads	9	31.94	24.30	23.36	17.12	21.14	4.42	18.13	32.42	33.50	31.80	21.30
Agriculture moderate slope	13					0.12		0.00				0.01
Vacant moderate slope	15			0.17		0.73	7.13	0.31				0.56
Vacant steep slope	19			0.53			0.58	0.01				0.14
Water	20					1.52	14.10	28.09	0.04			7.19
		100	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 1-5. Land Use and Area for San Gabriel River Estuary.

San Gabriel Estuary HRU Totals			
DEFINITION	*HRU CODE*	*ACRES*	*%*
HD single family residential	1	56	8.33%
LD single family residential moderate	2	22.2	3.30%
Multifamily residential	4	56.2	8.36%
Commercial	5	61.4	9.13%
Industrial	7	237.2	35.29%
Transportation	8	11.1	1.65%
Secondary Roads	9	28.4	4.22%
Agriculture moderate slope	13	9.6	1.43%
Vacant moderate slope	15	63.8	9.49%
Vacant steep slope	19	3.4	0.51%
Water	20	122.9	18.28%
TOTAL		**672.2**	**100%**

The City of Long Beach also has two small areas on the west side of the Los Angeles River one of which drains to the Dominguez Channel Estuary (below Willow Street), and one other that may have some drainage to the Dominguez Channel Estuary below Willow Street (Figure 1-7). The upper area above Willow Street drains a small portion of freeway and about 40 acres of City of Long Beach residential land and goes to the Dominguez Channel Estuary. The right of way area of about 112 acres below this area down to Willow Street drains to the Los Angeles River.

The area below Willow Street (Figure 1-7) totals about 257 acres. In addition, there is about 58 acres of a utility corridor. Land use in this area includes a large area of institutional use (School, 77 acres) and Park land use (22 acres) along with Commercial (67 acres). The rest of the area in question consists of right of way and roads (91 acres). Field verification of drainages in this second area below Willow Street will be carried out to verify the direction of flows.

Since these two areas are small and both areas resemble land use that will be monitored by the Bouton Creek monitoring station and by the Termino Drain monitoring station, no monitoring is proposed for these two small drainages on the west side of the Los Angeles River at this time.

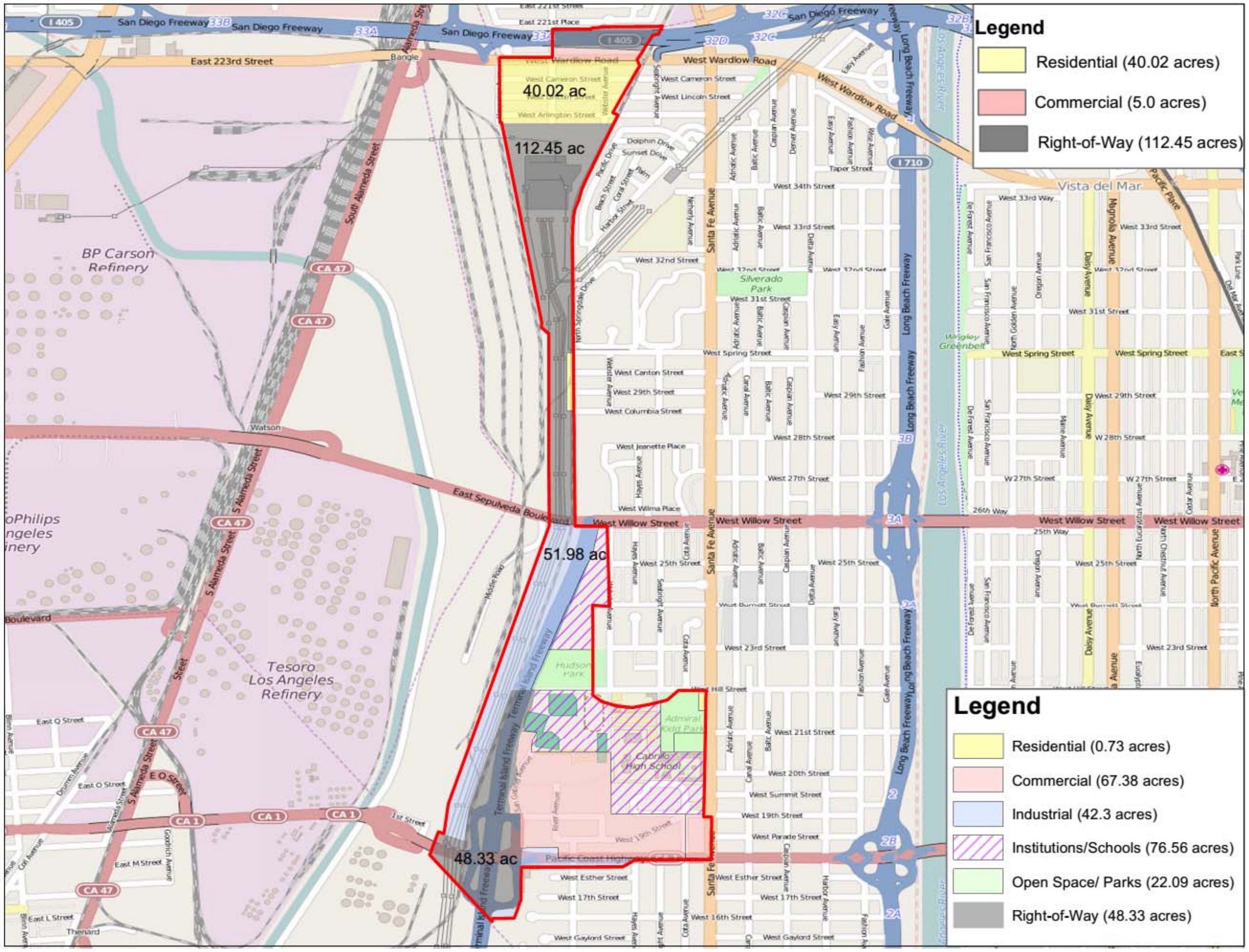

Figure 1-7. City of Long Beach Drainages to the Dominguez Channel Estuary.

1.2.4 Receiving Water Monitoring

Receiving water monitoring stations are shown in Figure 1-2 for the Los Cerritos Channel Estuary, Alamitos Bay and for the San Gabriel River Estuary. These stations and their function are also described in Table 1-2. Receiving water stations will be at Site LBR1 located at the Los Cerritos Channel Estuary at East Pacific Highway Bridge, Site LBR2 located in Alamitos Bay at the Second Street Bridge and Site R8 at the mouth of the San Gabriel River Estuary.

LBR1, located in the lower end of the Los Cerritos Channel Estuary will only be used to monitor sediment quality using SQO Part 1 processes. This site receives runoff from the Los Cerritos Channel freshwater watershed which is managed as a separate entity. It also receives runoff from the large (2,224 acres) Bouton Creek drainage as well as local runoff from low and high density residential, multifamily residential, and commercial land uses at locations downstream of where the Bouton Creek drainage discharges to the Los Cerritos Channel Estuary. This site does not capture and reflect discharges from the entire City of Long Beach MS4 but was selected for sediment sampling based upon elevated levels of certain metals and chlordane in previous sampling efforts. In addition, the elevated levels of chlordane in the sediments resulted in a TMDL listing.

LSBR2 was selected for conducting receiving water monitoring since it enables monitoring the combined effects of discharges of MS4 discharges from the City of Long Beach MSR discharging to the Los Cerritos Channel Estuary and Alamitos Bay (Belmont Pump Station, Appian Pump Station, Alamitos Pump Station, various harbor facilities and other local discharges surrounding Alamitos Bay). In addition, this site captures the effects of runoff from the new Termino Drain discharge, Colorado Lagoon and various small discharges to Marine Stadium. Overall this site allows for representative measurement of MS4 discharges from the entire IMP area shown in Figure 1-4 except for a few small storm drains that discharge directly to the City beaches along San Pedro Bay. LSBR2 was not selected for sediment monitoring since this region was recently dredged for Harbor improvements.

The monitoring station at R8, located at the mouth of the San Gabriel River Estuary at the Marina Bridge, allows assessment of the effects of all discharges to the San Gabriel River Watershed including 100% of the very minor drainages (620 acres) that discharge from the City of Long Beach to the Estuary. This site is occupied by the ongoing San Gabriel River Monitoring Program for dry weather water and for sediment data. This program will augment these data by conducting wet weather monitoring at this site. Land use in this region is dominated by industrial (oil production facilities) and water that together represent more than 53% of this area. Historically, most of this land consisted of wetlands. Current efforts are underway to re-establish sustainable wetlands in most of this area as oil production declines.

1.2.5 Non-Stormwater Outfall Monitoring

Non-Stormwater (NSW) Outfall Monitoring will be conducted throughout the major open channels of the Los Cerritos Channel Estuary, Alamitos Bay and in the San Gabriel River Estuary. Appendix E presents a list of major and minor outfalls within the estuarine study area, their size, and the location coordinates. Appendix E also includes a location map for each category of outfalls.

The City will first implement a screening process to determine which outfalls exhibit significant NSW discharges and those that do not require further investigations. These outfall screening data will be recorded on Outfall Reconnaissance Investigation (ORI) forms and in the associated database. The outfall screening process will be implemented during the spring, summer, and fall months (dry weather periods) of 2016. Identification of obvious illicit discharges will be immediately addressed. Otherwise, the outfall screening process will be completed prior to starting source investigations.

In the case of outfalls discharging into an estuary or directly to San Pedro Bay, inspection methods will need to be modified somewhat as many of these discharges are intertidal in nature. For estuarine outfalls, inspections, flow estimates, and any water quality measurements may have to be taken at an upstream manhole or other suitable upstream site in the drainage as sampling a mixture of salt and freshwater of unknown proportions will not yield the desired information. Some upstream sampling sites may require partial street closures to access.

Outfalls with significant NSW flows will be identified on the basis of all three outfall screening surveys. Outfalls will be prioritized for source identification studies. Source investigations will then be conducted on prioritized outfalls, with 25% to be conducted by March 28, 2017 and 100% by March 28, 2019. Further monitoring will commence on significant NSW discharges comprised of either unknown or conditional exempt non-essential discharges, or illicit discharges that cannot be abated.

1.2.6 New Development/Re-Development Effectiveness Tracking

The City of Long Beach has developed mechanisms for tracking information related to new and re-development projects that are subject to post-construction Best Management Practice (BMP) requirements in Part VII.K.xi of the MS4 Permit.

1.2.7 Regional Studies

On behalf of the participating agencies, the Los Angeles County Flood Control District (LACFCD) will continue to provide financial and/or monitoring resources to the Southern California Stormwater Monitoring Coalition Regional Watershed Monitoring Program, also known as the Regionally Consistent and Integrated Freshwater Stream Bioassessment Monitoring Program (Bioassessment Program). The Bioassessment Program was initiated in 2009 and is structured to occur in cycles of five years. Sampling under the first cycle concluded in 2013. The next five-year cycle is scheduled to begin in 2015, with additional special study monitoring scheduled to occur in 2020.

Permittee representatives will also participate in the Southern California Stormwater Monitoring Coalition (SMC) meetings and assist in development and implementation of selected and appropriate regional studies designed to improve stormwater characterization and impact assessment.

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2 Overview of the Schedule and Sampling Frequencies for each IMP Element

The IMP will be implemented in a phased process. Existing monitoring at LCC1 will continue to be conducted as part of the Los Cerritos Channel Watershed CIMP, and the dry weather screening of major outfalls will be conducted. Implementation of new monitoring programs and modifications to the existing monitoring program at LCC1 will be implemented beginning July 1, 2016 or 90 days after the approval of the IMP, whichever is later.

The schedule for implementation of monitoring activities in the Los Cerritos Channel Estuary, Alamitos Bay, and the San Gabriel River Estuary is given in Table 2-1. The separate Colorado Lagoon TMDL monitoring activities are shown in Table 2-2 with stations shown in Figure 2-1.

Receiving Water Quality Monitoring

- The City of Long Beach IMP receiving water quality monitoring sites are not located in areas suitable for conventional sampling using autosamplers to collect flow-rated composite samples. Thus water samples will be taken as grab samples for both wet and dry weather sampling requirements.
- Monitoring of the Los Cerritos Channel Estuary and Alamitos Bay receiving waters will be conducted at one location, LBR2. This site will be accessed from the 2nd Street Bridge in Alamitos Bay. Three wet weather and two dry weather events will be monitored each year in accordance with the schedule in Table 2-1. Separately, the Colorado Lagoon monitoring sites and frequencies are given in Table 2-2 with station locations shown on Figure 2-1.
- Monitoring of the San Gabriel River Estuary will be conducted at Site R8 located near the mouth of the Estuary. This site is located where the Marina Bridge crosses the mouth of the Estuary. Four wet weather and two dry weather events will be monitored each year. Monitoring parameters at this site will include Table E-2 constituents during the first wet weather and first dry weather event. Subsequently sampling will be limited to constituents identified as Category 1, 2 and 3 priorities along with field water quality measurements and ancillary parameters necessary to interpret the data. These parameters include total suspended solids (TSS), suspended sediment concentration (SCC), and hardness.
- SQO testing will occur at both receiving water stations LBR1 in Alamitos Bay and R8 located at the mouth of the San Gabriel River Estuary. This monitoring will be carried out at a frequency of once every two years and will be scheduled, if possible, to coincide with the work in East San Pedro Bay on the Harbor Toxics Program. SQO testing at Station R8 is presently part of the San Gabriel River Regional Monitoring Program.
- Monitoring of the two dry weather events will start in July 2016 or 90 days after approval of the IMP, whichever is later. Wet season monitoring will follow during the 2016/2017 wet season pending timely approval of this IMP.

Table 2-1. Schedule for Implementation of Monitoring Activities in the Los Cerritos Channel Estuary, Alamitos Bay, and the San Gabriel River Estuary.

Task	Dry 2016	Wet 2016-17	Dry 2017	Wet 2017-18	Dry 2018	Wet 2018-19	Dry 2019
Receiving Water							
LBR1 E. Pacific Coast Hwy Bridge							
SQO SedimentTesting[7]	1				1		
LBR2 Alamitos Bay, 2nd St. Bridge							
Chemistry[1]	2	3	2	3	2	3	2
Aquatic Toxicity	1	2	1	2	1	2	1
Bacterial Indicators (Marine)	2	3	2	3	2	3	2
R8 San Gabriel River at Marina Bridge							
Chemistry[1]	2	3	2	3	2	3	2
Aquatic Toxicity	1	2	1	2	1	2	1
Bacterial Indicators (Marine)	4	3	4	3	4	3	4
SQO Sediment Testing[7]	1				1		
San Pedro Bay/Coastal Beaches							
West of Pier: Bacterial Indicators (Marine)	3/week	3/week	3/week	3/week	3/week	3/week	3/week
East of Pier: Bacterial Indicators (Marine)	1/week	1/week	1/week	1/week	1/week	1/week	1/week
Stormwater Outfalls							
LCC1 Stearns Street[5]	2	4	2	4	2	4	2
LBE1 Bouton Creek	2	3	2	3	2	3	2
LBE2 Termino Drain	2	3	2	3	2	3	2
Non-Stormwater Outfall							
Inventory & Screen[2]	3						
Source ID[3]	Ongoing		Ongoing		Ongoing		Ongoing
Monitoring[4]			2		2		2

1. Table E-2 chemical analyses will be performed once during the first wet weather event and once during the first critical dry weather monitoring event at the receiving water sites. Constituents that exceed MDLs and available water quality objectives will continue to be monitored along with all constituents included as Category 1, 2 or 3 water body/pollutant classifications for the subject water body. Wet and dry weather chemical constituents will be separately assessed for purposes of continued monitoring. All constituents classified as category 1, 2, and 3 water body/pollutant in the water body will continue to be monitored during the permit cycle unless the constituents (primarily category 3 constituents) are shown to not be present at levels of concern on a consistent basis.
2. Initial Inventory and Screening will be completed in three surveys before the end of 2016. One re-assessment of the Non-Stormwater Outfall Monitoring Program will be conducted prior to March 28, 2019.
3. Investigations designed to track and classify discharges will start during the 2016 dry season. Source tracking and classification work depend upon the number of sites categorized as Suspect outfalls with evidence of significant flow.
4. Monitoring will be implemented if significant dry weather flows are identified at discharge points that are cannot be identified, are non-essential exempt flows, or identified as illicit flows that are not yet controlled. These sites will be initially monitored twice a year in conjunction with dry weather monitoring of the receiving water site.
5. Monitoring at LCC1 will continue to be conducted by the Los Cerritos Channel Watershed Group not by this present program. However, data will be available for this site.
6. The fourth storm event is only for the purpose of fulfilling the TMDL requirements. Only metals, TSS, SSC, and hardness will be analyzed.
7. SOQ sediment testing will be done once every 2 years and will be scheduled the same as the Harbor Toxic Monitoring Program if possible. SQO testing relies on multiple lines of evidence to determine either Unimpacted/or Impacted. City reserves the right to achieve compliance using anyone of the three methods specified in the Permit.

Table 2-2. Colorado Lagoon Station Sampling Matrix and Sampling Frequency.

Station	Station Description[1,6]	Water Sampling[2]	Sediment Quality and Toxicity Sampling[3]	Benthic Community Analysis[4]	Fish Tissue Sampling[5]	Mussel Tissue Sampling
F1a	Western Arm				Annually	
F1b	Central Arm				Annually	
F1c	Northern Arm				Annually	
F2	Marine Stadium				Annually	
WS1	Outfall Sub-Basin A	Quarterly	Annually	Annually		
WS2	Outfall Sub-Basin B	Quarterly	Annually	Annually		
WS3	Outfall Sub-Basin C	Quarterly	Annually	Annually		
WS4	CL Outfall to MS	Quarterly	Annually	Annually		
M1	CL Footbridge					Annually
M2	CL near Tide Gates					Annually
M3	Termino Ave. Drain - MS					Annually

1 CL: Colorado Lagoon; MS: Marine Stadium

2 After one year water sampling is to be performed semi-annually unless water quality objectives are exceeded. If objectives are exceeded, sampling will revert to quarterly until objectives are not exceeded.

3 Sampling is to be accelerated to semi-annually if sediment quality objectives are exceeded. Sampling reverts to annual sampling when objectives are not exceeded.

4 Benthic Community analysis is ***optional*** and would not be implemented until two years after the start of the monitoring program.

5 Sampling is to be accelerated to semi-annually if fish tissue quality objectives are exceeded. Sampling reverts to annual sampling when objectives are not exceeded. Sampling reverts to a semi-annual schedule when tissue objectives are again achieved.

6 Note that monitoring stations associated with Outfall Sub-basins D and E identified in the TMDL have been eliminated due to the fact that outfalls associated with these two sub-basins were removed as part of the Termino Drain Project. Water from these sub-basins no longer discharge to Colorado Lagoon.

Sampling Sites within Colorado Lagoon and Marine Stadium

Figure 2-1. CLTMP Sampling Station Locations for Colorado Lagoon and Marine Stadium.

- For the Los Cerritos Channel and Alamitos Bay receiving water sites, water quality testing during the critical dry weather flows (July) and during the first significant storm event of the year will incorporate the water quality parameters listed in Table E-2 of the MRP. Water quality testing during the remaining two wet weather events and one dry weather event will incorporate all constituents identified in Table 3.3 (See Section 3) for the receiving waters.
- If Table E-2 constituents are not detected at the specified Method Detection Limit (MDL) for their respective test method or if the results are below the lowest applicable water quality objective and are not otherwise identified as being 303(d) listed or part of an ongoing TMDL, these analytes will not be further analyzed. In accordance with the minimum requirements established in the Permit MRP (page E-16), parameters exceeding the lowest applicable water quality objective will continue to be analyzed for the remainder of the Order at the respective receiving water monitoring station. For the R8 receiving water site in the San Gabriel River estuary, if dioxins are not detected at the specified Method Detection Limit (MDL), the permittee will remove this analyte from further sampling with the approval of the Regional Board. Although dioxin is 303(d) as a category 2C pollutant, it has not exceeded criteria in the past 5 years.

Outfall Stormwater Monitoring

- The LCC1 Station at Stearns Street is already installed and will be operated by the LCC Watershed group during the 2015/2016 wet season. Station LBE1 at Bouton Creek, which discharges into the Los Cerritos Channel Estuary, is a specially designed intertidal monitoring station that was also previously installed as part of the City of Long Beach's previous NPDES monitoring program. This station will also be prepared to start monitoring storm events under the current IMP during the 2015/2016 wet season. Station LBE2 located on the Termino Drain will need to be installed and will be operational for the 2016/2017 wet season pending timely approval of this IMP. Permanent equipment will not be installed at the two receiving water stations (LBR2 and R8), so monitoring of these sites can be done in the 2015/2016 wet season as well.
- When possible, outfall sampling will be conducted concurrently with stormwater monitoring at LCC1.
- Water quality testing at outfall sites will initially incorporate a list of general and conventional pollutants, *E. coli*, nutrients, and metals. A detailed list of analytes to be initially tested at outfall sites is addressed in Section 3.
- Table E-2 constituents for the first significant storm event in critical weather event will be carried out for the first year at the receiving water sites. If a parameter is not detected at the Method Detection Limit (MDL) for its respective test method or the result is below the lowest applicable water quality objective, and is not otherwise identified in Attachment E Part VI.C.1.d & VI.D.1.c of the City of Long Beach Permit, it need not be further analyzed. If a parameter is detected exceeding the lowest applicable water quality objective then the parameter shall be

analyzed for the remainder of the Order during wet weather at the receiving water monitoring station where it was detected. The same applies to dry weather.

- Monitoring Stations for separate Colorado Lagoon monitoring program are shown in Figure 2-1 and the frequency and monitoring requirements are summarized in Table 2-2. The approved Colorado Lagoon Monitoring Plan is included as Appendix J.

City Beach Bacterial Monitoring Program

- The City of Long Beach has been active with planning and installing diversions (Figure 2-2) of stormwater discharges from outfalls influencing beach water quality with respect to bacterial indicator exceedances. Low flow diversions have been installed to the sanitary system at the Appian Way and Belmont Pump Stations. Since these diversions were installed exceedances of bacterial indicators have substantially declined at Mother's Beach. Similarly, construction of the Termino Drain eliminated discharges previously going to Colorado Lagoon, with dramatic improvement of the interior beach (Figure 2-3). A dry weather diversion was also installed to the sanitary system from Termino Drain to improve water quality in Marine Stadium. Thus the direct discharges to the Lagoon from the Termino Drain were eliminated along with that of smaller outfalls on the west side of the Lagoon. Separately, dry weather flows from the three smaller outfalls to the north and east side were also diverted to the sanitary system. Dry weather diversions to sanitary have also been designed and are being implemented on two outfalls that discharge to East San Pedro Bay beaches west of Belmont Pier (9^{th} Place and Redondo Ave). A previous City of Long Beach study also has implicated the discharge of the Los Angeles River plume with bacterial violations along the City's San Pedro Bay beaches. A new project has recently been funded to design and build dry weather and first flush diversions from the City's pump stations and large drains located on both sides of the Los Angeles River. This water is to be treated and reused for irrigation.
- The City's Recreational Beach Monitoring Program needs to increase the frequency of bacterial indicator monitoring on City beaches located from the mouth of the Los Angeles River Estuary to the Belmont Pier from once a week to three times a week to comply with the City of Long Beach Beaches and Los Angeles River Estuary Bacterial TMDL. Over the long term, recreational water quality improvements all the East San Pedro Bay Beaches will require significant improvements in the quality of water being discharged by the Los Angeles River. Due to this fact, the very good recent compliance record on these beaches and the efforts of the City of Long Beach to eliminate non-stormwater discharges to the beach, it proposed to conduct bacterial indicator monitoring on these San Pedro Bay beaches three times a week at all sites west of Belmont Pier that are subject to reference system criteria. Sites located to the east of the Belmont Pier will continue to be monitored at a frequency of once per month. Three of the sites located east of the Belmont Pier (B9, B64 and B10) are subject to antidegradation criteria.

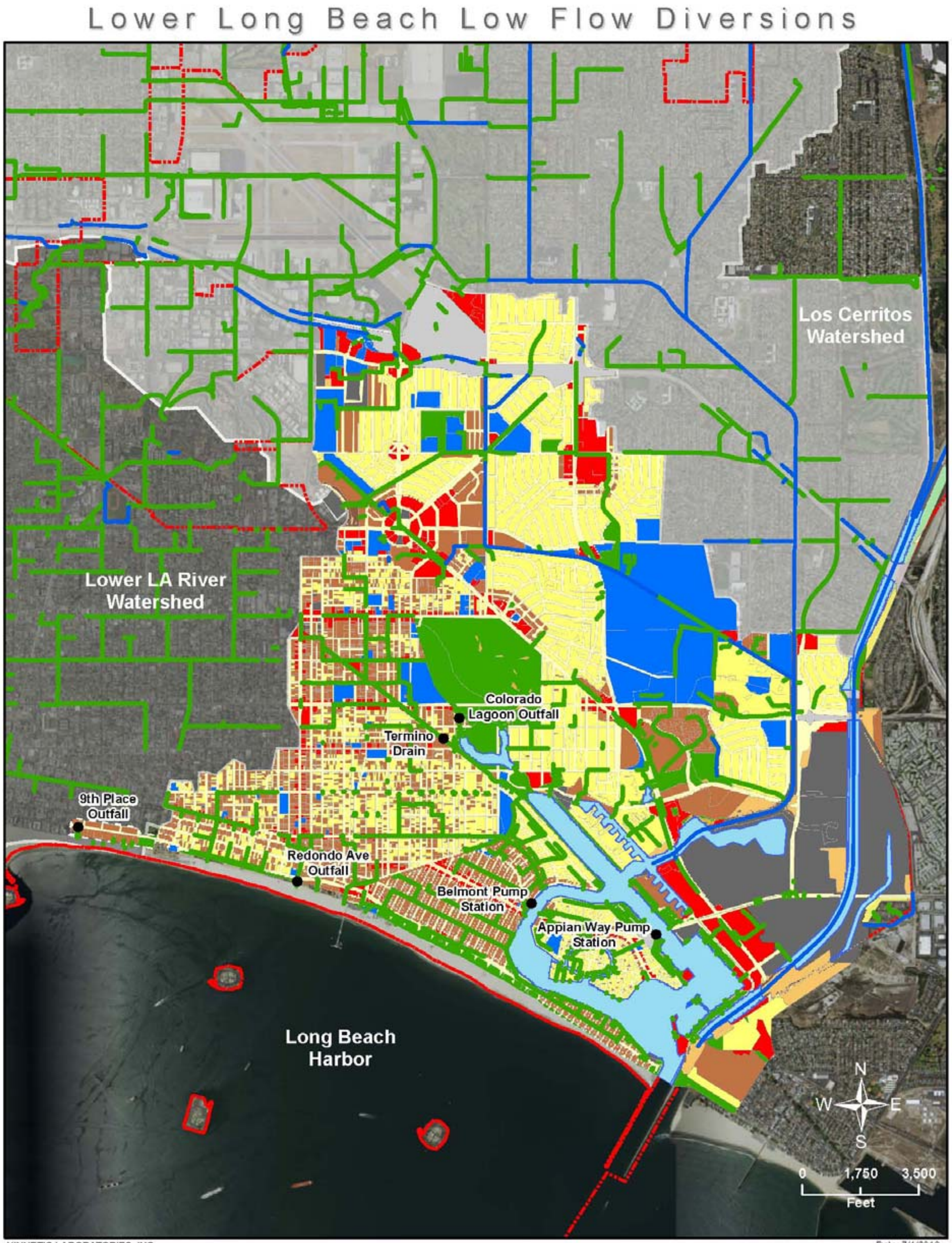

Figure 2-2. City of Long Beach Stormwater Dry Weather Diversions.

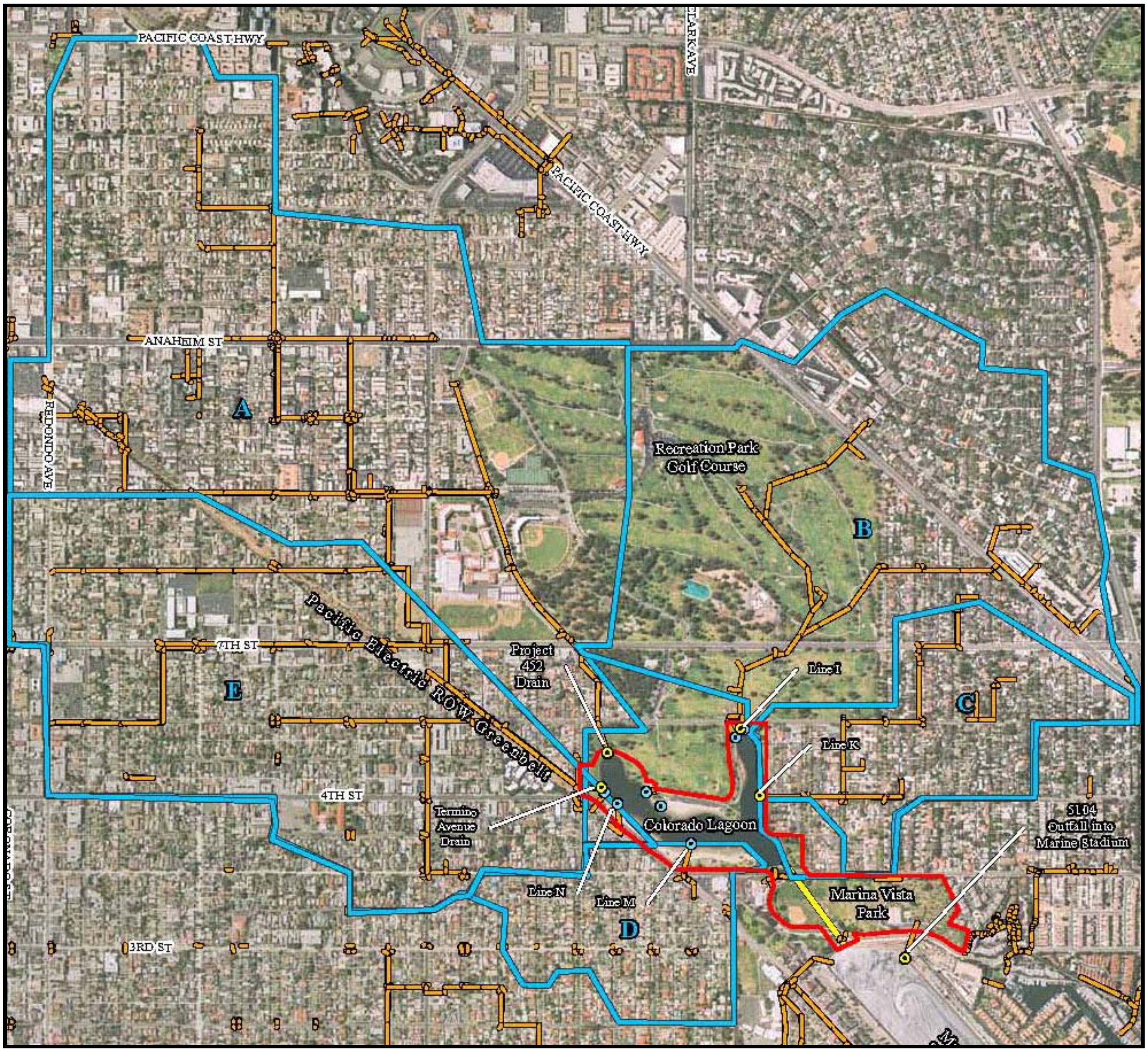

Figure 2-3. Major Subbasins and Location of Storm Drain Inputs to Colorado Lagoon that have been Eliminated or have Dry Weather Flow Diversions.

Non-Stormwater Outfall Monitoring Program

- Three initial surveys will be completed. The first will focus upon verification of outfalls as identified based upon available City and County GIS records, providing baseline photographic records, assessing flow, recording observations, and field water quality measurements. An inventory of outfalls above 12 inches in diameter will be created. The second and third screening surveys will include field water quality testing to assist in the identification and classification of the discharge.
- Information from the three initial surveys will be used to determine which outfalls have significant discharges and classify these outfalls for further investigation. Information from the three surveys such as flow rates of the discharge, flow rates in the channel, the nature of the channel-earthen or concrete, and land uses in the drainage area will be used collectively to determine significance.
- The Los Cerritos Estuary and Alamitos Bay have some outfalls that are subject to tidal action. As a result it is critical to assure that dry weather discharges from an outfall are not simply reflective of estuarine waters that discharge from some outfalls during a dropping tide. “Significant non-tidal flow” and “significant flow” are equivalent terms. Non-tidal was simply added to discriminate between true dry weather flows and residual effects of tidal action. Appendix K was added to provide an explanation of our approach to identification of sites with “high flows” and subsequently, how we will determine if a site has potential for significant flows. This significance analyses was developed from available baseline flow from watershed basins where continual flow data during dry weather was available.
- In summary, different criteria are used to identify high flows from catchments larger than 200 acres versus those that comprise less than 200 acres of drainage area. For drainages larger than 200 acres, high flows are considered to be any flows that exceed a rate of 150 gallons/acre/day. For catchments less than 200 acres, high flows are considered to flows that exceed a rate of 150 gallons/acre/day for a 200 acre watershed. This equates to a fixed flow rate of 21 gallons per minute (gpm). This flow rate is slightly greater than the maximum flow one would expect from a single ¾” hose. If high flows are identified a minimum of twice during the three surveys, flows will be considered potentially “significant discharges” and will warrant further investigation.
- Outfalls with significant non-tidal flow will be classified for further investigation. Flow measurements, observations, field water quality tests and limited laboratory tests may be used to classify the remaining outfalls as either **Suspect Discharges**, **Potential Discharges** or **Unlikely Discharges** of concern. Clean outfalls with no evidence of discharges or odors during the initial surveys will be classified as **Unlikely** sources of non-stormwater discharges and will not require further investigation.
- Outfalls considered having the highest risk for illicit discharges or illegal flows will be classified as **Suspect Discharges.** This will require multiple lines of evidence indicative of potential illicit discharges or persistent high flows that represent significant receiving waters contributions.
- Outfalls considered to be **Suspect Discharges** will be further classified and ranked for further investigations designed to identify the sources of these discharges and to determine whether

discharges are illicit, exempt, conditionally exempt, conditionally exempt but non-essential flows or unknown.

- Suspect outfalls determined to have exempt or conditionally exempt discharges will be identified in annual reports along with the measures taken to identify the sources.
- Suspect outfalls identified with conditionally exempt but non-essential flows or flows from unknown sources will first be subject to review to determine if suitable control measures can be implemented to eliminate the discharges.
- If discharges cannot be eliminated, they will be subjected to a periodic monitoring to document that sufficient measures are taken to control potential discharges of pollutants in the discharge.
- Source investigations for discharges from outfalls classified as suspect will be ongoing in order to meet the requirement that investigations are conducted for no less than 25% of the outfalls in the inventory by March 28, 2017 and 100% of the outfalls in the inventory by March 28, 2019.
- Outfalls classified as **Potential Discharges** will be reassessed during the permit.
- Outfalls with obvious illicit discharges will be immediately classified as such and investigated immediately.

3 Chemical/Physical Parameters

Water quality priorities within the Los Cerritos Channel Estuary, Alamitos Bay, and San Gabriel River Estuary were established in accordance with Section C.5.a.ii of the Permit. The three Permit categories are defined as follows:

- **Category 1 (Highest Priority):** Water body-pollutant combinations for which water quality-based effluent limitations and/or receiving water limitations are established in Part VI.

- **Category 2 (High Priority):** Pollutants for which data indicate water quality impairment in the receiving water according to the State's Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (State Listing Policy) and for which MS4 discharges may be causing or contributing to the impairment.

- **Category 3 (Medium Priority):** Pollutants for which there are insufficient data to indicate water quality impairment in the receiving water according to the State's Listing Policy, but which exceed applicable receiving water limitations contained in this Order and for which MS4 discharges may be causing or contributing to the exceedance.

These Permit categories were intended to be specific to water bodies within the watershed.

Table 3-1 summarizes pollutants within each category. Colorado Lagoon has its own TMDL and monitoring plan now underway. However, the constituents are still pertinent to the Los Cerritos Channel Estuary as the Termino Drain has been diverted to the Marine Stadium and is the drainage suspected of the contamination within the Lagoon that resulted in the TMDL. An outfall monitoring site will be placed on the Termino Drain as part of this IMP.

The primary constituents of concern in the watershed are chlordane (sediment), DDT (tissue), dieldrin (tissue), lead (sediment), PCBs (fish tissue), PAHs (sediment), toxicity (sediment), and zinc (sediment), which are part of the Colorado lagoon TMDL. Total chlordane (sediment) is incorporated due to a 303(d) listing in the Los Cerritos Channel Estuary. Indicator bacteria are incorporated due to a 303(d) listing in Alamitos Bay. Permittees in the nearshore watershed as defined in the Harbor Toxics TMDL are separately contributing to monitoring requirements in the Harbor waters and the Los Angeles River Estuary. PCBs and PAHs are currently incorporated into the sampling requirements for the Long Beach outfall monitoring sites. Additional listings exist for minor exceedances of copper, lead, zinc, and bacteria criteria and these parameters will be included for outfall monitoring sites.

The primary constituent of concern in the San Gabriel River Estuary watershed is copper during dry weather conditions (Table 3-2). Copper is included as part of the San Gabriel River Metals and Selenium TMDL. Dissolved oxygen, dioxins, and nickel are incorporated due to 303(d) listings in the San Gabriel River Estuary during storm events. Permittees in the nearshore watershed (as defined by the Harbor Toxics TMDL) are separately contributing to monitoring requirements in the Harbor waters and the Los Angeles River Estuary. Additional listings exist for exceedances of arsenic, selenium, lead and zinc during wet weather conditions.

Table 3-1. Waterbody-Pollutant Categories for the Los Cerritos Channel Estuary, Alamitos Bay, San Pedro Beaches and Colorado Lagoon.

Category	Los Cerritos Channel Estuary	Alamitos Bay	San Pedro/ Coastal Beaches	Colorado Lagoon
1			Total coliform, *E. coli*, *enterococcus* [8]	Chlordane (sediment), dieldrin (tissue), DDT (tissue), lead (sediment), PAHs (sediment), PCBs (fish tissue), toxicity (sediment), zinc (sediment)
2	Total chlordane (sediment)[5,6,7]	Indicator bacteria		Indicator bacteria [9]
3	<u>Dry Weather</u> Copper [1,5,6] (water and sediment), 4,4-DDD[4,6] (sediment), *enterococcus*[2,6], fecal coliform[2,6], lead[1,5] (sediment), total coliform[2, 6], zinc[1,5,7] (sediment)	<u>Dry Weather</u> Copper [1,5,6] (water and sediment), 4,4-DDT[7,5] (sediment), *enterococcus*[2,6], fecal coliform[2,6], lead [1,5] (sediment), total coliform[2, 6], Total chlordane (sediment)[2,5,6], zinc[1,5] (sediment)		
	<u>Wet Weather</u> Dieldrin[1,6], *enterococcus*[2,6], fecal coliform[2,6], , malathion[3,6], total coliform[2, 6]	<u>Wet Weather</u> E*nterococcus*[6], fecal coliform[6], malathion[3,6], total coliform[2,6], toxaphene[1,6]		

1. Exceeds California Toxics Rule Saltwater.
2. Exceeds the Los Angeles Basin Plan.
3. Exceeds National Non-Priority Pollutant Aquatic Life Criteria for Saltwater.
4. Exceeds ERMs, SCCWRP Bight 2003 data.
5. SCCWRP Bight 2008 data.
6. City of Long Beach Stormwater Monitoring Reports 2002-2014.
7. Regional Water Board 4 Dominguez Channel Watershed Monitoring 2003-2005.
8. Will be monitored according to the Long Beach City Beaches and Los Angeles River Estuary Bacteria TMDL.
9. Listed in the 2010 303(d) list category 5, a water segment where standards are not met and a TMDL is required, but not yet completed.

Table 3-2. Waterbody-Pollutant Categories for the San Gabriel River Estuary.

Category	Constituents	
	Wet	Dry
1	Copper[1]	Copper[1]
2	Dissolved oxygen[2], dioxin (2,3,7,8-TCDD)[3], nickel[3], fecal coliform[4], *Enterococcus*[4], total coliform[4]	
3	Arsenic[5], Selenium[6], Lead[6], Zinc[6]	

1. Listed in the San Gabriel River Metals TMDL.
2. 303(d) Category 2B: Water Body-Pollutant Combination that is not a "pollutant" (i.e. Toxicity).
3. 303(d) Category 2C: Water Body-Pollutant Combination without exceedances in past 5 years.
4. San Gabriel River, Estuary, and Tributaries Indicator Bacteria TMDL became effective on June 14, 2016.
5. In 2006 California updated the 303(d) list and removed the listings for arsenic for the San Gabriel River Estuary and silver for Coyote Creek.
6. City of Long Beach WMP.

Table 3-3 summarizes the constituents that will be monitored at the outfall and receiving water sites in the Los Cerritos Channel Estuary and Alamitos Bay and Table 3-4 summarizes the constituents that will be monitored at the receiving water site in the San Gabriel River Estuary. These constituents will serve as the core of the monitoring program. In addition, sections VI.C.1.e and VI.D.1.d of the MRP require that a comprehensive list of constituents is screened once during the first major storm event of the year and once during a period of critical dry weather flow. Results of this analytical screening process will determine which constituents need to be analyzed at the upstream outfall monitoring sites for the remainder of the five-year cycle of the permit.

Table 3-3. Summary of Constituents to be Monitored on a Regular Basis at the Outfall Sites, Receiving Water Sites in the Los Cerritos Channel Estuary and Alamitos Bay and on Coastal Beaches.

CLASS OF MEASUREMENTS	OUTFALL SITES		RECEIVING WATER SITES	RECEIVING WATER SITES	RECEIVING WATER SEDIMENTS	SAN PEDRO BAY BEACHES
	Wet	Dry	Wet	Dry	Dry	Wet and Dry
Flow	3	2				
Field Measurements pH, dissolved oxygen, temperature, and specific conductivity	3	2	3	2		
MRP Table E-2 Constituents[1] (other than those specifically listed below)			1	1		
Aquatic Toxicity[3]			2	1		
General and Conventional Pollutants (Table 3-5)	3	2	3	2		
Microbiological Constituents (Table 3-6) Total & Fecal Coliform, *Enterococcus*	3	2	3	2		West Beach 3/week East Beach 1/week
Nutrients (Table 3-7) - none required						
Organochlorine Pesticides and PCBs (Table 3-9) - none required						
Metals (Table 3-8) Cu, Pb, Zn	3	2	3	2		
Organophosphate Pesticides (Table 3-10) Malathion	3	2	3	2		
Semivolatile Organic Compounds (Table 3-11) - none required						
Sediment Quality Objectives (SQO) **Sediment chemistry, Sediment toxicity, benthic infauna**					1[4]	

1. All Table E-2 constituents will be measured at the receiving water sites during the first major storm event of the season and the critical, low flow dry weather event (July) during the first year of the IMP
2. Chlordane components are based upon sum of chlordane-alpha, chlordane-gamma, nonachlor-alpha, nonachlor-gamma, and oxychlordane consistent with the Harbor Toxics TMDL.
3. One of the two wet weather events monitored for aquatic toxicity will be the first significant storm event of the storm year and the dry weather event monitored for aquatic toxicity will be during the month with the historically lowest flows. Aquatic toxicity at outfall sites may be triggered by toxicity at receiving water sites. Measured toxicity at the receiving water sites will trigger toxicity testing at upstream outfall monitoring sites in Alamitos Bay and the LCC Estuary.
4. Phase 1 Sediment Quality Objectives will be monitored once every 2 years and will be coordinated, if possible, with similar monitoring being conducted in Harbor waters.

Table 3-4. Summary of Constituents to be Monitored on a Regular Basis for the Receiving Water Site in the San Gabriel River Estuary.

CLASS OF MEASUREMENTS	RECEIVING WATER SITE		RECEIVING WATER SEDIMENTS
	Wet	Dry	Dry[1]
Flow	NA[2]	NA[2]	
Field Measurements pH, dissolved oxygen, temperature, and specific conductivity	4	2	
MRP Table E-2 Constituents (other than those specifically listed below)	1	1	
Aquatic Toxicity[3]	2	1	
General and Conventional Pollutants (Table 3-5) (All <u>except</u> alkalinity and TSS)	4	2	
Microbiological Constituents (Table 3-6) Total and Fecal Coliform, and *Enterococcus*	3	Quarterly	
Nutrients (Table 3-5) - none required			
Organochlorine Pesticides and PCBs (Table 3-9) Dioxin	3		
Metals (Table 3-8) Cu (dry and wet), Ni, As, Se, Pb, Zn (wet weather)	4	2	
Organophosphate Pesticides (Table 3-10) - none required			
Semivolatile Organic Compounds (Table 3-11) - none required			
Sediment Quality Objectives (SQO) Sediment chemistry, Sediment toxicity, benthic infauna			1[4]

1. Dry Weather monitoring in San Gabriel River Estuary to be done by San Gabriel River Regional Monitoring Program.
2. Tidal sites so no flow measurements to be made.
3. Toxicity will be monitored immediately after the first significant storm of the year for one of the two wet weather events. Toxicity for the dry weather event will be measured during the month of the historical lowest flows (July).
4. Sediment Quality Objective monitoring in San Gabriel River Estuary to be done by San Gabriel River Regional Monitoring Program. SQO monitoring will be once every 2 years.

If a parameter is not detected above the Method Detection Limit (MDL) for its respective test method *<u>or</u>* the result is below the lowest applicable water quality objective and is not otherwise identified as a basic monitoring requirement, a TMDL analyte or a 303(d) listing, it need not be further analyzed. If a parameter is detected exceeding the lowest applicable water quality objective during either the wet or dry weather screening then the parameter shall be analyzed for the remainder of the Order at the receiving water monitoring station where it was detected during the respective conditions (wet or dry).

Analytical tests will be reconsidered at least once during each permit cycle in order to assess the appropriateness of maintaining the analyte or suite of analyses in the testing requirements. Water quality criteria, analytical methods, analytical results consistently near detection limits, updated information with respect to sources or many other additional factors may contribute to factors may warrant reconsideration of the analyte. If an analyte listed in Table E-2 (Attachment E of the Permit) is not detected at the receiving water sites at levels of concern during two consecutive monitoring events representing the same seasonal conditions, the City will submit a request to the Regional Board to remove the analyte from future sampling. This does not include constituents that are part of basic monitoring requirements. In order to avoid bias due to seasonal build-up/wash off, this evaluation would be limited to the comparisons of the first major storm of the season rather than data associated with consecutive events from the same season.

Constituents requiring screening are listed in Table E-2 of the MRP. These constituents are further broken out by major analytical groups in Table 3-5 through Table 3-11 below. Analytical requirements for the program are broken out by analytical test requirements since many are associated with an analytical test suite. This is most evident with the semivolatile organic compounds analyzed by EPA Method 625. Although this section identifies recommended methods for each analyte, many of the target constituents can be addressed by alternative methods. Use of alternative analytical methods may be preferable in cases where a larger suite of target analytes can be tested and still enable meeting minimum levels (MLs) established for each analyte. Selection of analytical methods is intended to be performance-based to allow laboratories flexibility to utilize methods that meet or exceed MLs listed in the MRP. As an example, the following tables (Table 3-5 and Table 3-6) list separate EPA methods for organochlorine pesticides and Aroclors, organophosphate pesticides and semivolatile organic compounds. Some laboratories choose to use EPA Method 625 for all of these test requirements. This approach is acceptable as long as the method meets the MLs listed in Table E-2 of the MRP and meet data quality objectives consistent with the State's Surface Water Ambient Monitoring Program (SWAMP, 2008), but other laboratories will use separate test protocol for organophosphate pesticides. Regional data suggest that rainfall and flows in major watersheds are least in July. As such, critical low flow monitoring will be conducted in July.

A table listing available Water Quality Objectives is provided in Appendix I. This table includes criteria for both freshwaters and for saltwaters and will be the basis for evaluations of the levels present in these waters of contaminants of concern.

3.1 General and Conventional Pollutants

Most of the general and conventional pollutants listed in Table 3-5 will continue to be analyzed as part of the base monitoring requirements for both receiving water and outfall sampling. These constituents are common contaminants in stormwater from urban environments. Some, such as turbidity, are redundant and best used as surrogates under special studies. Turbidity is often used as a surrogate for suspended solids but requires calibration to the source material. Turbidity measurements are recognized to lack comparability due to differences in equipment as well as the differences between static and dynamic measurements (Anderson 2005 - USGS National Field Manual for Collection of Water Quality Data, Chapter 6.7). Total suspended solids (TSS) and suspended sediment concentrations (SSC) directly examine particles associated with water samples and do not suffer from the problems associated with measuring turbidity. An integral part of the pollutant reduction strategy involves the reduction of discharged solids from the MS4, therefore both TSS and SSC will be monitored. Since SSC sampling protocols are not met by the automatic stormwater samplers designed to measure pollutants, SSC analysis will be done on a subsample of the composite samples. Rigorous subsampling protocols will be utilized in order to assure representative samples that can be related directly to the chemical results. The SSC sample analyses will add information to the current TSS analyses being run.

Other pollutants in this group have been previously analyzed in stormwater and dry weather discharges into the Los Cerritos Channel from LCC1 and the LBE1 Bouton Creek site since 2000 and have not been detected. As an example, total phenols have never exceeded the ML of 0.1 mg/L in this watershed. MTBE and cyanide were analyzed during the first three years of the City of Long Beach Stormwater Monitoring Program. MTBE was only detected in 1 out of 11 samples and cyanide was never detected. Although perchlorate has not been analyzed in stormwater in the LCC watershed, industrial activities likely to result in perchlorate discharges do not exist in the watershed. Perchlorate will be screened at the outfall sites during the initial surveys but this contaminant is not expected to require continued analysis at any monitoring site.

In summary, sufficient evidence exists to require total phenols, cyanide, turbidity and MTBE to be monitored at a minimum only in the first year of monitoring during the first significant rain event of the year and during the critical dry weather event (per Attachment E Parts VI.C.1.e and VI.D.1.d). Perchlorate will be incorporated in the initial screening since it has not been tested but it is not expected that continued testing will be required. Most other constituents included in this list are common contaminants in stormwater runoff and will continue to be analyzed. Analysis of chloride and fluoride may be analyzed as needed to assist in differentiating potable water and groundwater sources during source tracking programs for the non-stormwater outfall monitoring program but will not be included in monitoring conducted for wet/dry weather receiving water monitoring or for monitoring of the outfall monitoring sites.

Table 3-5. Conventional Constituents, Analytical Methods, and Quantitation Limits.

CONSTITUENTS Conventional Pollutants	Method	Target Reporting Limits mg/L
Oil and Grease	EPA1664	5
Total Petroleum Hydrocarbon	EPA 418.1	5
Total Phenols	EPA 420.1	0.1
Cyanide	EPA 335.2	0.003
Turbidity	EPA 180.1	1
Total Suspended Solids	EPA 160.2	1
Suspended Sediment Concentration	ASTM D3977-97 (Method C)	0.5
Total Dissolved Solids	EPA 160.1	1
Volatile Suspended Solids	EPA 160.4	1
Total Organic Carbon	EPA 415.1	1
Biochemical Oxygen Demand	SM 5210B EPA 405.1	3
Chemical Oxygen Demand	EPA 410.1	4
Alkalinity	EPA 310.1	5
Specific Conductance	EPA 120.1	1 umho
Total Hardness	EPA 130.2	1
MBAS	EPA 425.1	0.02
Chloride	EPA300.0	2
Fluoride	EPA300.0	0.1
Perchlorate	EPA314.0	4 ug/L
Sulfate	EPA375.2	2
Volatile Organics	**Method**	**mg/L**
Methyl tertiary butyl ether (MTBE)	EPA 624	1
Field Measurements	**Method**	**mg/L**
pH-field instrumentation	EPA 150.1	0 – 14
Temperature-field	In-situ	N/A
Dissolved Oxygen- field [1]	In-situ	Sensitivity to 5 mg/L

[1]Dissolved Oxygen will only be measured during dry weather surveys.

3.2 Microbiological Constituents

All microbiological constituents used as fecal indicator bacteria (FIB) will continue to be monitored at the outfall and receiving water monitoring sites. Bacteria used as fecal indicators in marine waters will continue to be analyzed during wet and dry weather surveys because they discharge to estuarine waters. Table 3-6 provides both upper and lower quantification limits for each FIB which was established to assure that quantifiable results are obtained. Upper quantitation limits are provided to assure that FIBs are quantified.

The City's Recreational Beach Monitoring Program proposes to increase the frequency of bacterial indicator monitoring on City beaches located from the mouth of the Los Angeles River Estuary to the Belmont Pier from once a week to three times a week. Because of the very good compliance record on these beaches, the City would rather continue to spend resources on prevention measures and feel that this frequency of three times a week is sufficient to monitor the compliance on these beaches and will meet the requirements of the Permit.

Table 3-6. Microbiological Constituents, Analytical Methods, and Quantitation Limits.

BACTERIA[1]	Method	Lower Limits MPN/100ml	Upper Limits MPN/100ml
Total coliform	SM 9221B	<20	>2,400,000
Fecal coliform	SM 9221E	<20	>2,400,000
Enterococcus	SM 9230B/C	<20	>2,400,000

[1]Microbiological constituents will vary based upon sampling point. Total and fecal coliform and *enterococcus* will be measured only in marine waters or at locations where either the discharge point or receiving water body will impact marine waters.

3.3 Nutrients

Nutrients (Table 3-7) are also considered as part of the base requirements for the monitoring program. These will be analyzed as part of the Table E-2 screening requirements during the first major storm event of the year and a critical dry weather sampling event at the receiving water sites. Nutrients have not been identified as exceeding any applicable RWL to date and are therefore not scheduled to be sampled as part of the ongoing program unless required based upon the initial screening. The current monitoring plan calls for separate analysis of nitrate-N and nitrite-N. Concentrations of nitrite-N have typically been low at the previous outfall monitoring sites within the estuaries. If data indicates that concentrations of nitrite-N remain minimal, these analytes will be combined into one analytical procedure that quantifies both nitrate-N and nitrite-N at the same time.

Table 3-7. Nutrients, Analytical Methods, and Quantitation Limits.

CONSTITUENTS	Method	Reporting Limit (mg/L)
Total Kjeldahl Nitrogen (TKN)[1]	EPA 351.1	0.50
Nitrate as Nitrogen (NO_3-N)[1,2]	EPA 300.0	0.10
Nitrite as Nitrogen (NO_2-N)[1,2]	EPA 300.0	0.05
Total Nitrogen[1]	calculation	NA
Ammonia as Nitrogen (NH_3-N)	EPA 350.1	0.10
Total Phosphorus	SM 4500-P E or F	0.1
Dissolved Phosphorus	SM 4500-P E or F	0.1

1. Total Nitrogen is the sum of TKN, nitrate, and nitrite.
2. Nitrate –N and Nitrite-N may be analyzed together using EPA 300

3.4 Total and Dissolved Trace Metals

A total of 16 trace metals are listed in Table E-2 of the MRP. Analytical methods and reporting limits for these elements are summarized in Table 3-8. Most metals will be analyzed by EPA Method 1620 using ICP-MS to provide appropriate detection limits. Hexavalent chromium and mercury both require alternative methods. Neither hexavalent chromium or mercury are commonly analyzed as part of stormwater programs. Hexavalent chromium has been analyzed at LACFCD's mass emission monitoring sites in both the Los Angeles River (S10) and the San Gabriel River (S14) for the past eight to ten years and has not been detected. Mercury has been detected at some mass emission monitoring sites but detections are not common at any sites. Analytical methods and detection limits used for the monitoring have been consistent with those required in Table E-2 of the MRP.

Measurement of mercury is generally not considered to be appropriate in flow-weighted composite samples taken with autosamplers due to its volatility. This becomes more of an issue when sampling is conducted near the limits of a peristaltic pump. Automatic stormwater samplers are not suitable for sampling stormwater at low detection limits (0.5 to 5 nanograms/liter). Grab samples will be taken for analysis of mercury in order to augment composite samples, which will be analyzed by EPA method 245.1. These grab samples will be analyzed by Method 1631E since this method is less subject to interferences and will be collected at the same time that monitoring crews pull other grab samples required by the monitoring program. Additional QAQC will be employed to support the extremely low detection limits required by the program.

Table 3-8. Metals, Analytical Methods, and Quantitation Limits.

METALS	METHODS		REPORTING LIMIT *ug/L*
	FRESHWATER	SALTWATER	
Aluminum	EPA200.8	EPA1620	100
Antimony	EPA200.8	EPA1620	0.5
Arsenic	EPA200.8	EPA1620	0.5
Beryllium	EPA200.8	EPA1620	0.5
Cadmium	EPA200.8	EPA1620	0.25
Chromium (total)	EPA200.8	EPA1620	0.5
Chromium (Hexavalent)	EPA218.6	EPA218.6	5
Copper	EPA200.8	EPA1620	0.5
Iron	EPA200.8	EPA1620	25
Lead	EPA200.8	EPA1620	0.5
Mercury	EPA245.1	EPA 7470A	0.2
Mercury (Low level)	1631E	EPA1631E	0.0005
Nickel	EPA200.8	EPA1620	1
Selenium	EPA200.8	EPA1620	1
Silver	EPA200.8	EPA1620	0.25
Thallium	EPA200.8	EPA1620	0.5
Zinc	EPA200.8	EPA1620	1

3.5 Organochlorine Pesticides and PCBs

Although organochlorine pesticides (OC pesticides) and PCBs are not commonly present in stormwater sampled at previous outfall monitoring stations in the estuary, they have periodically been detected at low concentrations. The analytical methods and detection limits for these compounds are summarized in Table 3-9.

These compounds are specified in Table E-2 of the MRP. The MRP suggests that detection of any of these analytes in excess of the ML and/or applicable criteria will require continuation of the analysis through the period of the permit. Since this could be attributable to analytical issues, we have recommended more frequent reevaluation (refer to Section 3).

Since the OC pesticides are part of an analytical suite, detection of one compound would necessitate continuation of the entire suite. However, this would not require continuation of PCB analyses if they are not detected in the early storm event and critical dry weather monitoring event. Monitoring for PCBs will be reported as the summation of Aroclors and a minimum of 50 congeners, using EPA Method 8270 without the use of High Resolution Mass Spectrometry for routine monitoring.

Table 3-9. Chlorinated Pesticides and PCB, Analytical Methods, and Quantitation Limits.

CHLORINATED PESTICIDES	METHOD	REPORTING LIMIT µg/L
Aldrin	EPA 608, 8081A	0.005
alpha-BHC	EPA 608, 8081A	0.01
beta-BHC	EPA 608, 8081A	0.005
delta-BHC	EPA 608, 8081A	0.005
gamma-BHC (lindane)	EPA 608, 8081A	0.02
alpha-chlordane	EPA 608, 8081A	0.1
gamma-chlordane	EPA 608, 8081A	0.1
Nonachlor-alpha	EPA 608, 8081A	0.1
Nonachlor-gamma	EPA 608, 8081A	0.1
Oxychlordane	EPA 608, 8081A	0.1
4,4'-DDD	EPA 608, 8081A	0.05
4,4'-DDE	EPA 608, 8081A	0.05
4,4'-DDT	EPA 608, 8081A	0.01
Dieldrin	EPA 608, 8081A	0.01
alpha-Endosulfan	EPA 608, 8081A	0.02
beta-Endosulfan	EPA 608, 8081A	0.01
Endosulfan sulfate	EPA 608, 8081A	0.05
Endrin	EPA 608, 8081A	0.01
Endrin aldehyde	EPA 608, 8081A	0.01
Heptachlor	EPA 608, 8081A	0.01
Heptachlor Epoxide	EPA 608, 8081A	0.01
Toxaphene	EPA 608, 8081A	0.5
POLYCHLORINATED BIPHENYLS		
PCBs[1] (Reported as the summation)	EPA Method 8270	0.005
Aroclor-1248	EPA 608,EPA 8082	0.5
Aroclor-1254	EPA 608,EPA 8082	0.5
Aroclor-1260	EPA 608,EPA 8082	0.5

1. Monitoring for PCBs will be reported as the summation of aroclors and a minimum of 50 congeners for routine monitoring. 54 PCB congeners include: 8, 18, 28, 31, 33, 37, 44, 49, 52, 56, 60, 66, 70, 74, 77, 81, 87, 95, 97, 99, 101, 105, 110, 114, 118, 119, 123, 126, 128, 132, 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 177, 180, 183, 187, 189, 194, 195, 201, 203, 206, and 209. These include all 41 congeners analyzed in the SCCWRP Bight Program and dominant congeners used to identify the aroclors. List of aroclors and congeners were obtained from Table C8 in the State's Surface Water Ambient Monitoring Program's Quality Assurance Program Plan.

3.6 Organophosphate Pesticides and Herbicides

Organophosphate pesticides, triamine pesticides and herbicides list in Table E-2 of the MRP are summarized in Table 3-10. Due to the fact that diazinon and chlorpyrifos are no longer available for residential use, these constituents are now rarely detected. When detected, concentrations rarely exceed available water quality criteria for protection of aquatic life. Malathion, however, remains a common constituent in stormwater runoff but this pesticide is not as toxic as other organophosphate pesticides.

Two compounds in this list, atrazine and simazine, are not organophosphate pesticides but can be analyzed by EPA Method 8141a. Both are triazine herbicides which are used for control of broadleaf weeds. Based upon historical data, herbicides such as these and the three additional separately listed compounds are unlikely to require continued analysis after completion of initial screening of Table E-2 constituents. Alternative analytical methods may be considered and used as long as the established reporting limits can be met.

Table 3-10. Organophosphate Pesticides and Herbicides, Analytical Methods, and Quantitation Limits.

ORGANOPHOSPHATE PESTICIDES	METHOD	REPORTING LIMIT µg/L
Atrazine	EPA507, 8141A	1
Chlorpyrifos	EPA8141A	0.05
Cyanazine	EPA8141A	1
Diazinon	EPA8141A	0.01
Malathion	EPA8141A	1
Prometryn	EPA8141A	1
Simazine	EPA8141A	1
HERBICIDES		
Glyphosate	EPA547	5
2,4-D	EPA515.3	0.02
2,4,5-TP-SILVEX	EPA515.3	0.2

3.7 Semivolatile Organic Compounds (Acid, Base/Neutral)

Semivolatile organic compounds (SVOCs) from Table E-2 of the MRP are listed in Table 3-11 below. Acids consist mostly of phenolic compounds which are uncommon in stormwater samples. Base/neutral compounds include polynuclear aromatic hydrocarbons (PAHs) and phthalates. SVOCs were only measured during the first two years of the City of Long Beach Stormwater Monitoring Program. Very few analytes were detected and those that were detected were typically less than 10 times the reporting limit. Phthalates were among the most common SVOCs detected and are 303(d) listed based upon measurements taken over ten years ago. Phthalates have been historically a common laboratory contaminant due to the significant use of plastic in laboratories but they are also a common environmental contaminant for the same reason.

Table 3-11. Semivolatile Organic Compounds, Analytical Methods, and Quantitation Limits.

SEMIVOLATILE ORGANIC COMPOUNDS	METHOD	REPORTING LIMIT
ACIDS		**µg/L**
2-Chlorophenol	EPA625	2
4-Chloro-3-methylphenol	EPA625	1
2,4-Dichlorophenol	EPA625	1
2,4-Dimethylphenol	EPA625	2
2,4-Dinitrophenol	EPA625	5
2-Nitrophenol	EPA625	10
4-Nitrophenol	EPA625	5
Pentachlorophenol	EPA625	2
Phenol	EPA625	1
2,4,6-Trichlorophenol	EPA625	10
BASE/NEUTRAL		µg/L
Acenaphthene	EPA625	1
Acenaphthylene	EPA625	2
Anthracene	EPA625	2
Benzidine	EPA625	5
1,2 Benzanthracene	EPA625	5
Benzo(a)pyrene	EPA625	2
Benzo(g,h,i)perylene	EPA625	5
3,4 Benzofluoranthene	EPA625	10
Benzo(k)fluoranthene	EPA625	2
Bis(2-Chloroethoxy) methane	EPA625	5
Bis(2-Chloroisopropyl) ether	EPA625	2
Bis(2-Chloroethyl) ether	EPA625	1
Bis(2-Ethylhexl) phthalate	EPA625	5
4-Bromophenyl phenyl ether	EPA625	5
Butyl benzyl phthalate	EPA625	10
2-Chloroethyl vinyl ether	EPA625	1
2-Chloronaphthalene	EPA625	10
4-Chlorophenyl phenyl ether	EPA625	5
Chrysene	EPA625	5
Dibenzo(a,h)anthracene	EPA625	0.1
1,3-Dichlorobenzene	EPA625	1
1,4-Dichlorobenzene	EPA625	1
1,2-Dichlorobenzene	EPA625	1
3,3-Dichlorobenzidine	EPA625	5
Diethyl phthalate	EPA625	2
Dimethyl phthalate	EPA625	2
di-n-Butyl phthalate	EPA625	10
2,4-Dinitrotoluene	EPA625	5
2,6-Dinitrotoluene	EPA625	5
4,6 Dinitro-2-methylphenol	EPA625	5
1,2-Diphenylhydrazine	EPA625	1
di-n-Octyl phthalate	EPA625	10

SEMIVOLATILE ORGANIC COMPOUNDS	METHOD	REPORTING LIMIT
Fluoranthene	EPA625	0.05
Fluorene	EPA625	0.1
Hexachlorobenzene	EPA625	1
Hexachlorobutadiene	EPA625	1
Hexachloro-cyclopentadiene	EPA625	5
Hexachloroethane	EPA625	1
Indeno(1,2,3-cd)pyrene	EPA625	0.05
Isophorone	EPA625	1
Naphthalene	EPA625	0.2
Nitrobenzene	EPA625	1
N-Nitroso-dimethyl amine	EPA625	5
N-Nitroso-diphenyl amine	EPA625	1
N-Nitroso-di-n-propyl amine	EPA625	5
Phenanthrene	EPA625	0.05
Pyrene	EPA625	0.05
1,2,4-Trichlorobenzene	EPA625	1

3.8 Marine Sediment Analyte List, Methods, and Required Reporting Limits

Chemical Analyses of sediments from the estuaries will need to be analyzed as part of the Sediment Quality Objective test protocols described below in Section 4. Table 3-12 provides a list of analytes, analytical methods, and reporting limits for use in the analyses of these marine sediments for the SQO testing of estuarine sediments.

Table 3-12. Analytes, Analytical Methods, and Target Quantitation Limits for Marine Sediments.

ANALYTE	METHOD	UNITS	REPORTING LIMIT
CONVENTIONALS			
Total Solids	SM2540 B	%	0.1
Total Organic Carbon	EPA 9060A	%	0.01
Grain Size	ASTM D 422	%	1.0
METALS			
Arsenic	EPA 6020	mg/kg	0.1
Cadmium	EPA 6020	mg/kg	0.1
Chromium	EPA 6020	mg/kg	0.1
Copper	EPA 6020	mg/kg	0.1
Lead	EPA 6020	mg/kg	0.1
Mercury	EPA 7471A	mg/kg	0.03
Nickel	EPA 6020	mg/kg	0.1
Selenium	EPA 6020	mg/kg	0.1
Silver	EPA 6020	mg/kg	0.1
Zinc	EPA 6020	mg/kg	1.0
CHLORINATED PESTICIDES			
2,4' DDD	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
2,4' DDE	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
2,4' DDT	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
4,4' DDD	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
4,4' DDE	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
4,4' DDT	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Total DDT	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Aldrin	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
BHC-alpha	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
BHC-beta	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
BHC-delta	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
BHC-gamma (Lindane)	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Chlordane-alpha	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Chlordane-gamma	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Oxychlordane	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Dieldrin	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Endosulfan sulfate	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Endosulfan I	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Endosulfan II	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Endrin	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Endrin aldeyde	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Endrin ketone	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Heptachlor	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Heptachlor epoxide	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Methoxychlor	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
Toxaphene	EPA 8081A/ 8270C (SIM)	µg/kg	20
trans-Nonachlor	EPA 8081A/ 8270C (SIM)	µg/kg	1.0
PCB CONGENERS			

ANALYTE	METHOD	UNITS	REPORTING LIMIT
PCB congeners of: 003, 005, 008, 015, 018, 027, 028, 029, 031, 033, 037, 044, 049, 052, 056, 060, 066, 070, 074, 077, 081, 087, 095, 097, 099, 101, 105, 110, 114, 118, 119, 123, 126, 128, 137 138, 141, 149, 151, 153, 156, 157, 158, 167, 168, 169, 170, 174, 180, 183, 187, 189, 194, 195, 200, 201, 203, 206 and 209.	EPA 8270C (SIM)	µg/kg	0.5

4 Aquatic Toxicity Testing and Toxicity Identification Evaluations

Aquatic toxicity testing supports the identification of BMPs to address sources of toxicity in urban runoff. Monitoring begins in the receiving water and the information gained is used to identify constituents for monitoring at outfalls to support the identification of pollutants that need to be addressed in the WMP.

The receiving waters for the Los Cerritos Channel Estuary and Alamitos Bay Estuary are salt water, so suitable marine toxicity test species must be selected. If toxicity is measured in these marine receiving and if the follow up TIEs do not identify the contaminant(s) causing the toxicity, then toxicity must be measured at the stormwater outfalls being monitored. In this case, the stormwater samples must be salted up to all the bioassay tests to be conducted with the same marine test species.

The sub-sections below describe the detailed process for conducting aquatic toxicity monitoring, evaluating results, and the technical and logistical rationale. Control measures and management actions to address confirmed toxicity caused by urban runoff are addressed by the WMP, either via currently identified management actions or those that are identified via adaptive management of the WMP.

4.1 Sensitive Species Selection

The Permit MRP (page E-29) states that sensitivity screening to select the most sensitive test species should be conducted unless “a sensitive test species has already been determined, or if there is prior knowledge of potential toxicant(s) and a test species is sensitive to such toxicant(s), then monitoring shall be conducted using only that test species.” The receiving waters for the Los Cerritos Channel Estuary and Alamitos Bay Estuary are salt water so suitable toxicity test species must be selected.

Samples collected in receiving waters with salinity equal to or greater than 1 ppt or from outfalls discharging to receiving waters with salinity that is equal to or greater than 1 ppt, should be tested using the most sensitive test species in accordance with *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms (EPA/600/R-95/136, 1995)*. The marine and estuarine test species identified in the MRP are:

- A static renewal toxicity test with the topsmelt, *Atherinops affinis* (Larval Survival and Growth Test Method).
- A static non-renewal toxicity test with the purple sea urchin, *Strongylocentrotus purpuratus* (Fertilization Test Method).
- A static non-renewal toxicity test with the giant kelp, *Macrocystis pyrifera* (Germination and Growth Test Method).

In addition to the three species identified in the MRP, the red abalone, *Haliotis rufescens (H. rufescens*) larval development test was also considered given the extensive use of this test in this region.

Although all the species mentioned have been demonstrated as sensitive to a wide variety of toxicants and have been subject to numerous inter- and intra-laboratory testing using standardized toxicants, two species: *Macrocystis pyrifera* (*M. pyrifera*) and *Atherinops affinis* (*A. affinis*); have limitations when used to assess the toxicity of stormwater compared to the sea urchin fertilization test and the red abalone larval development test.

The method for *M. pyrifera* is a 48-hour chronic toxicity test that measures the percent zoospore germination and the length of the gametophyte germ tube. Although the test may be sensitive to herbicides, fungicides, and treatment plant effluent, the use of *M. pyrifera* as a test species for stormwater monitoring may not be ideal. Obtaining sporophylls for stormwater testing could also be a limiting factor for selecting this test. Collection of *M. pyrifera* sporophylls from the field is necessary prior to initiating the test and the target holding time for any receiving water or stormwater sample is 36 hours; however, 72 hours is the maximum time a sample may be held prior to test initiation. During the dry season, meeting the 36-72 hour holding time will be achievable; however, field collection during wet weather may be delayed beyond the maximum holding time due to heavy seas and inaccessible collection sites. In addition, collection of *M. pyrifera* sporophylls during the storm season may include increased safety risks that can be avoided by selection of a different species.

The *A. affinis* test measures the survival and growth test of a larval fish over seven days. At the end of seven days of exposure to a suspected toxicant, the number of surviving fish are recorded, along with their weights, and compared to those exposed to non-contaminated seawater. Positive characteristics of the *A. affinis* chronic test include the ability to purchase test organisms from commercial suppliers as well as being one of the few indigenous test species that may be used to test undiluted stormwater by the addition of artificial sea salts to within the range of marine receiving waters. Unfortunately, the tolerance of *A. affinis* to chemicals in artificial sea salts may also explain their lack of sensitivity to changes in water quality compared to other test organisms such as the sea urchin or red abalone. Further, there are concerns with the comparability of conducting a seven-day exposure test when most rain events do not occur over a seven-day period.

The *Strongylocentrotus purpuratus* (*S. purpuratus*) fertilization test measures the ability of *S. purpuratus* sperm to fertilize an egg when exposed to a suspected toxicant. The *S. purpuratus* fertilization has been selected as a chronic toxicity test organism in previous MS4 permits and has been used to assess ambient receiving water toxicity, sediment porewater toxicity, as well as stormwater toxicity. The *S. purpuratus* fertilization test is also among the most sensitive test species to metals. The adult test organisms may be purchased and held in the lab prior to fertilization, and the sample volume necessary to conduct the test is small with respect to the other suggested tests. The minimal exposure period (20 minutes) allows for a large number of tests to be conducted over a short period of time and permits the testing of toxicants that may lose their potency over long periods of time.

The *Haliotis rufescens* (*H. rufescens*) larval development test measures the percent of abnormal shell development in larvae exposed to toxic samples for 48 hours. The *H. rufescens* is commonly used to test treatment plant effluent, but has had limited use in stormwater compared to the *S. purpuratus* fertilization test. The advantages of the red abalone test include a sensitive endpoint, the ability to purchase abalone from commercial suppliers, hold test organisms prior to spawning, and the low variability in results compared to other species (e.g., *S. purpuratus* fertilization test). Thus, though not listed as a potential test species for use in stormwater monitoring in the MS4 permit, it was considered as a potentially sensitive species for the purposes of selecting the most sensitive species.

Due to the limitations of the giant kelp germination and growth test and the topsmelt survival and growth test, in addition to not being particularly sensitive to the constituents identified as problematic in stormwater, these tests are not considered particularly helpful in supporting the identification of pollutants of concern.

Based on the sensitivity, smaller test volume requirements, their ability to be housed in the laboratory prior to testing, and shorter exposure times, the *S. purpuratus* fertilization test and the red abalone development test will be considered during sensitive species selection to measure toxicity in marine and estuarine environments. Based on historical data of the sensitivity of the *S. purpuratus* and *H. rufescens* tests, and the limiting factors associated with the *A. affinis* and *M. pyrifera tests*, the sensitive species test for marine and estuarine species will be conducted with the sea urchin and red abalone tests. Species screening was determined to be appropriate for these two species (as opposed to selecting just one) as testing conducted within the region with both species have shown varying sensitivity. Thus, it is appropriate to test both to determine sensitivity at a given site. After the screening testing is completed, monitoring will be conducted with the most-sensitive species.

If testing of freshwater from outfall samples should become necessary, salting up required for freshwater testing will limit the highest concentration that can be tested with the sea urchin to about 60% to 63.8% as brine must be used. For the red abalone development test, solid standard salts may be added so this test does not have this limitation.

4.2 Testing Period

The following describes the testing periods to assess toxicity in samples collected in the Long Beach bay and estuaries watershed and in the San Gabriel River Estuary Watershed during dry and wet weather conditions. Testing of marine receiving waters will be carried out using the two species, the Sea Urchin (*S. purpuratus*) fertilization test and Red Abalone (*H. rufescens*) larval development tests. These same test organisms will be used if required for upstream outfall discharge testing if necessary by using standard salting up procedures. Thus toxicity testing of marine receiving waters and of stormwater outfall discharges will be carried out in accordance with *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms (EPA/600/R-95/136, 1995)*.

4.3 Toxicity Endpoint Assessment and Toxicity Identification Evaluation Triggers

Per the MRP, toxicity test endpoints will be analyzed, using the Test of Significant Toxicity (TST) t-test approach specified by the USEPA (USEPA, 2010a). The Permit specifies that the chronic in-stream waste concentration (IWC) is set at 100% receiving water for receiving water samples and 100% effluent for outfall samples. Using the TST approach, a t-value is calculated for a test result and compared with a critical t-value from USEPA's TST Implementation Document (USEPA, 2010a). Follow-up triggers are generally based on the Permit specified statistical assessment as described below.

With chronic toxicity testing on fresh water samples using the sea urchin (*Strongylocentrotus*), the highest concentration of a fresh water stormwater sample that can be tested after the addition of brine is approximately 66% freshwater. Thus an approximate 2 TU_c reduction in survival or reproduction needs to be observed between the sample and laboratory control that is statistically significant, for a toxicity identification evaluation (TIE) to be performed.

TIE procedures will be initiated as soon as possible after the toxicity trigger threshold is observed to reduce the potential for loss of toxicity due to extended sample storage. If the cause of toxicity is readily apparent or is caused by pathogen related mortality or epibiont interference with the test, the result will be rejected, if necessary, a modified testing procedure will be developed for future testing.

In cases where significant endpoint toxicity effects greater than 50% are observed in the original sample, but the follow-up TIE positive control "signal" is found to not be statistically significant, the cause of toxicity will be considered non-persistent. No immediate follow-up testing is required on the sample. However, future test results will be evaluated to determine if implementation of concurrent TIE treatments are needed to provide an opportunity to identify the cause of toxicity.

4.4 Toxicity Identification Evaluation Approach

The results of toxicity testing will be used to trigger further investigations to determine the cause of observed laboratory toxicity. The primary purpose of conducting TIEs is to support the identification of management actions that will result in the removal of pollutants causing toxicity in receiving waters. Successful TIEs will direct monitoring at outfall sampling sites to inform management actions. As such, the goal of conducting TIEs is to identify pollutant(s) that should be sampled during outfall monitoring so that management actions can be identified to address the pollutant(s).

The TIE approach as described in USEPA's 1991 Methods for Aquatic Toxicity Identification is divided into three phases although some elements of the first two phases are often combined. Each of the three phases is briefly summarized below:

- Phase I utilizes methods to characterize the physical/chemical nature of the constituents, which cause toxicity. Such characteristics as solubility, volatility and filterability are determined without specifically identifying the toxicants. Phase I results are intended as a first step in specifically identifying the toxicants but the data generated can also be used to develop treatment methods to remove toxicity without specific identification of the toxicants.
- Phase II utilizes methods to specifically identify toxicants.
- Phase III utilizes methods to confirm the suspected toxicants.

A Phase I TIE will be conducted on samples that exceed a TIE trigger described in Section 4.3. Water quality data will be reviewed to future support evaluation of potential toxicants. A range of sample manipulations may be conducted as part of the TIE process. The most common manipulations are described in Table 4-1. Information from previous chemical testing and/or TIE efforts will be used to determine which of these (or other) sample manipulations are most likely to provide useful information for identification of primary toxicants. TIE methods will generally adhere to USEPA procedures documented in conducting TIEs (USEPA, 1991, 1992, 1993a-b).

Table 4-1. Phase I and II Toxicity Identification Evaluation Sample Manipulations.

TIE Sample Manipulation	Expected Response
pH Adjustment (pH 7 and 8.5)	Alters toxicity in pH sensitive compounds (i.e., ammonia and some trace metals)
Filtration or centrifugation*	Removes particulates and associated toxicants
Ethylenediamine-Tetraacetic Acid (EDTA) or Cation Exchange Column*	Chelates trace metals, particularly divalent cationic metals
Sodium thiosulfate (STS) addition	Reduces toxicants attributable to oxidants (i.e., chlorine) and some trace metals
Piperonyl Butoxide (PBO)*	Reduces toxicity from organophosphate pesticides such as diazinon, chlorpyrifos and malathion, and enhances pyrethroid toxicity
Carboxylesterase addition(1)	Hydrolyzes pyrethroids
Temperature adjustments(2)	Pyrethroids become more toxic when test temperatures are decreased
Solid Phase Extraction (SPE) with C18 column*	Removes non-polar organics (including pesticides) and some relatively non-polar metal chelates
Sequential Solvent Extraction of C18 column	Further resolution of SPE-extracted compounds for chemical analyses
No Manipulation*	Baseline test for comparing the relative effectiveness of other manipulations

* Denotes treatments that will be conducted during the initiation of toxicity monitoring, but may be revised as the program is implemented. These treatments were recommended for initial stormwater testing in Appendix E (Toxicity Testing Tool for Stormwater Discharges) of the State Water Resources Control Board's June 2012 Public Review Draft "Policy for Toxicity Assessment and Control".

1 Carboxylesterase addition has been used in recent studies to help identify pyrethroid-associated toxicity (Wheelock et al., 2004; Weston and Amweg, 2007). However, this treatment is experimental in nature and should be used along with other pyrethroid-targeted TIE treatments (e.g., PBO addition).

2 Temperature adjustments are another recent manipulation used to evaluate pyrethroid-associated toxicity. Lower temperatures increase the lethality of pyrethroid pesticides. (Harwood, You and Lydy, 2009)

The City of Long Beach will identify the cause(s) of toxicity using a selection of treatments in Table 4-1 and, if possible, using the results of water column chemistry analyses. After any initial assessments of the cause of toxicity, the information may be used during future events to modify the targeted treatments to more closely target the expected toxicant or class of toxicants. Moreover, if the toxicant or toxicant class is not initially identified, toxicity monitoring during subsequent events will confirm if the toxicant is persistent or a short-term episodic occurrence.

As the primary goals of conducting TIEs is to identify pollutants for incorporation into outfall monitoring, narrowing the list of toxicants following Phase I TIEs via Phase II/III TIEs is not necessary if the toxicant class determined during the Phase I TIE is sufficient for 1) identifying additional pollutants for outfall monitoring and/or 2) identifying control measures. Thus, if the specific pollutant(s) or classes of pollutants (e.g., metals that are analyzed via EPA Method 200.8) are identified then sufficient information is available to incorporate the additional pollutants into outfall monitoring and to start implementation of control measures to target the additional pollutants.

Phase II TIEs may be utilized to identify specific constituents causing toxicity in a given sample if the results of Phase I TIE testing and a review of available chemistry data fails to provide information necessary to identify constituents that warrant additional monitoring activities or management actions to identify likely sources of the toxicants and lead to elimination of the sources of these contaminants. Phase III TIEs will be conducted following any Phase II TIEs.

For the purposes of determining whether a TIE is inconclusive, TIEs will be considered inconclusive if:

- The toxicity is persistent (i.e., observed in the baseline), and
- The cause of toxicity cannot be attributed to a class of constituents (e.g., insecticides, metals, etc.) that can be targeted for monitoring.

If (1) a combination of causes that act in a synergistic or additive manner are identified; (2) the toxicity can be removed with a treatment or via a combination of the TIE treatments; or (3) the analysis of water quality data collected during the same event identify the pollutant or analytical class of pollutants, the result of a TIE is considered conclusive.

Note that the MRP (page E-30) allows a TIE Prioritization Metric (as described in Appendix E of the Stormwater Monitoring Coalition's Model Monitoring Program) for use in ranking sites for TIEs. However, as the extent to which TIEs will be conducted is unknown, prioritization cannot be conducted at this time. However, prioritization may be utilized in the future based on the results of toxicity monitoring and an approach to prioritization will be developed through the CIMP adaptive management process and will be described in future versions of the CIMP.

4.5 Follow Up on Toxicity Testing Results

The suggested approach is that If the results of TIEs are inconclusive, a toxicity test conducted during the same conditions (i.e., wet or dry weather), using the same test species, will be conducted at applicable upstream outfalls as soon as feasible (i.e., the next monitoring event that is at least 45 days following the toxicity laboratory's report transmitting the results of an inconclusive TIE). The same TIE evaluation triggers and TIE approach presented in Section 4.3 and 4.4, respectively will be followed based on the results of the outfall sample.

The MRP (page E-30) indicates the following actions should be taken when a toxicant or class of toxicants is identified through a TIE:

1. The toxicant(s) should be analyzed during the next scheduled sampling event in the discharge from the outfall(s) upstream of the receiving water location.
2. If the toxicant is present in the discharge from the outfall at levels above the applicable receiving water limitation, a toxicity reduction evaluation (TRE) will be performed for that toxicant.

The list of constituents monitored at outfalls identified in the IMP will be modified based on the results of the TIEs. Similarly, upon completion of a successful dry weather TIE, additional constituents identified in the TIE will be added to monitoring requirements at outfalls with significant non-stormwater flows. Monitoring for those constituents will occur as soon as feasible following the completion of a successful

TIE (i.e., the next monitoring event that is at least 45 days following the toxicity laboratory's report transmitting the results of a successful TIE).

The requirements of the TREs will be met as part of the adaptive management process in the WMPs rather than the IMP. The identification and implementation of control measures to address the causes of toxicity are tied to management of the stormwater program, not the IMP. It is expected that the requirements of TREs will only be conducted for toxicants that are not already addressed by an existing Permit requirement (i.e., TMDLs) or existing or planned management actions.

The Water Boards' TMDL Roundtable is currently evaluating options to streamline and consistently respond to urban-use pesticide impairment listings throughout the State including a statewide urban-use pesticide TMDL modeled after the San Francisco Bay Area Urban Creeks Pesticides TMDL. In addition to toxicity testing, statewide efforts will be monitored to study these pesticides being discussed by the California Stormwater Quality Association (CASQA) Pesticides sub-committee and other Regional Water Boards. The toxicity approach is subject to modifications based on discussions with the Regional Board.

4.6 Summary of Aquatic Toxicity Monitoring

The approach to conducting aquatic toxicity monitoring as described in the previous sections is summarized in detail in Figure 4.1. The intent of the approach is to identify the cause of toxicity observed in receiving water to the extent possible with the toxicity testing tools available, thereby directing outfall monitoring for the pollutants causing toxicity with the ultimate goal of supporting the development and implementation of management actions.

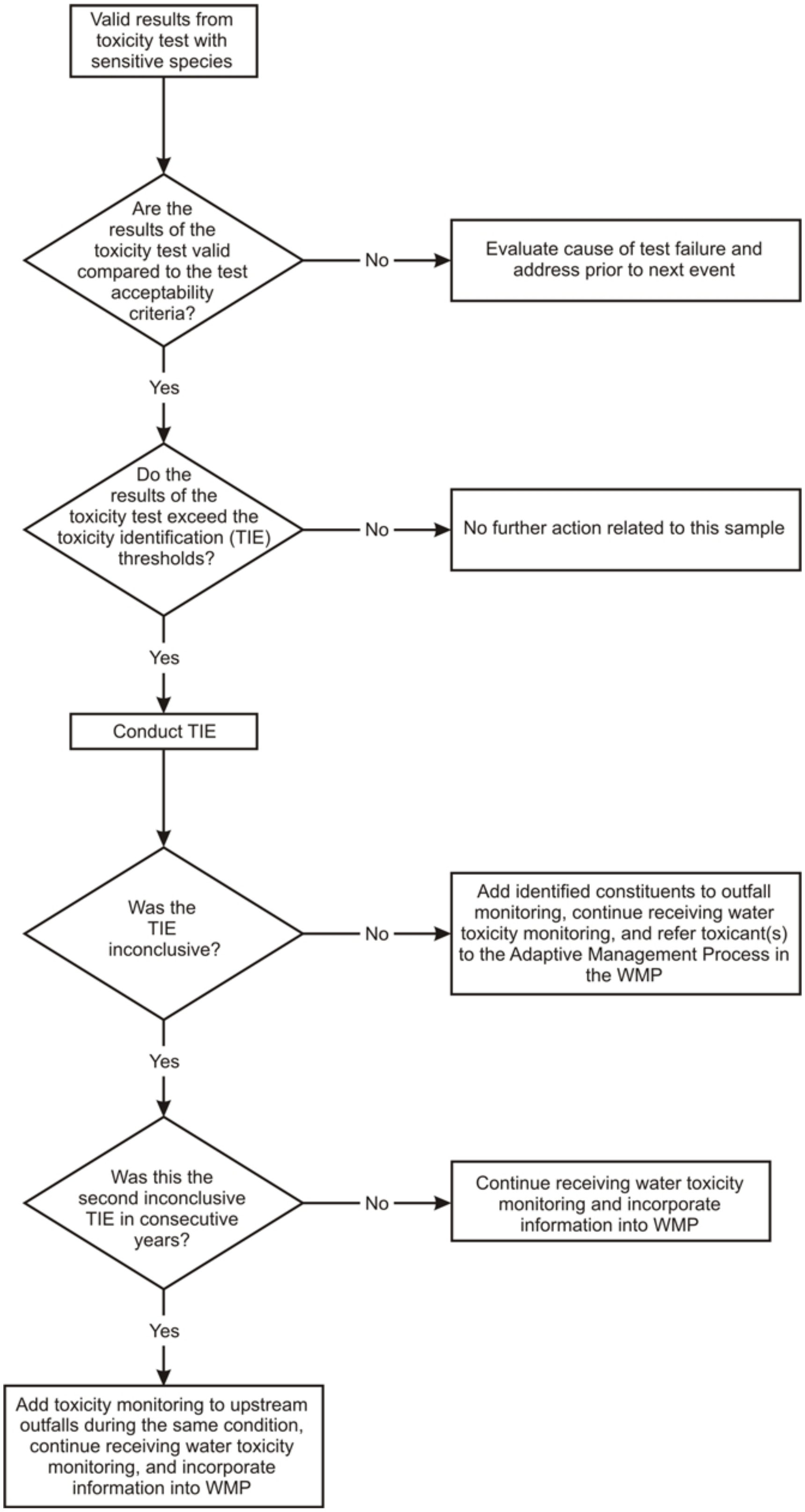

Figure 4.1. Detailed Aquatic Toxicity Assessment Process.

4.7 Receiving Water Sediment Monitoring, Sediment Quality Objectives

4.7.1 Overview of SQO Procedure

From Section 1.2.1 above that briefly summarizes previous data in the Los Cerritos Estuary and Alamitos Bay, chlordane is 303d listed, although a TMDL is not in place. Data from several sources show that chlordane in sediments exceeds the ERM marine water guidance level within this estuary and DDTs generally only exceeds ERL levels. At only one station near the power plant, DDTs and PCBs exceed ERMs. Generally, current data indicates that marine waters within this estuary are not toxic, though a few instances in the Bight 2008 dataset, some toxicity was measured at one sampling point.

Because chlordane concentrations above ERM values are widespread in sediments in this Estuary along with other contaminants at lower levels, this sediment contamination will not go away soon due to increased stormwater WMP practices. It is therefore important to determine whether the estuarine sediments are not significantly impacted to warrant a TMDL and further actions.

Therefore, SQO testing will be conducted at the receiving water Site LBR1 located at the Los Cerritos Channel Estuary at the East Pacific Coast Highway Bridge. This method is designed to evaluate whether these estuarine sediments show any significant impairments. Guidance for this SQO approach is contained in the SWRCB's Water Quality Control Plan for Enclosed Bays and Estuaries – Part I Sediment Quality (2009). SQOs have been developed for contaminants of concern in bays and estuaries in California based on an approach that incorporates multiple lines of evidence (MLOE; Bay et al. 2014). These MLOEs include sediment chemistry, sediment toxicity, and benthic community composition. It is proposed that this SQO method for the evaluation of sediment quality be used at the LBR1 receiving water site in the Los Cerritos Estuary. Where practical, the timing of SQO monitoring will be coordinated with SQO monitoring now being carried out in San Pedro Bay as part of the Harbor Toxics TMDL. Similar work is also now being done at the San Gabriel River Estuary receiving water Site R8 located at the Marina Bridge near the mouth of the San Gabriel River. This latter work is also part of a continuing program at multiple sites in the receiving waters up the San Gabriel River Estuary as part of the ongoing San Gabriel River Regional Monitoring program.

Evaluation of sediments follows the following path:

- **Sediment Chemistry Line of Evidence**. The chemistry LOE requires chemical analysis of a suite of constituents. Two indices are used to interpret the results: the California Logistic Regression Model (CA LRM) and the Coordinated Compliance Monitoring and Reporting Plan Chemical Score Index (CSI). Results produced by these indices are subsequently used to produce a single score representing the chemistry LOE.
- **Sediment Toxicity LOE.** The toxicity LOE requires two toxicity tests: acute amphipod survival and a sub-lethal test (i.e., bivalve embryo development). The results of each test are compared to classification ranges (nontoxic, low toxicity, moderate toxicity, or high toxicity) and assigned a corresponding score. The two test scores are integrated to produce a single score for the toxicity LOE.
- **Benthic Community LOE**. The benthic community LOE is comprised of enumerating and identifying organisms to species level (when possible) and evaluating results based on four

indices: the Index of Biotic Integrity (IBI), the Relative Benthic Index (RBI), the Benthic Response Index (BRI), and the River Invertebrate Prediction and Classification System (RIVPACS). The four indices are weighted together to provide an overall score for the benthic community LOE.

- **Integration of MLOEs**. First, integration of MLOEs aids in determining two broad effects categories. The chemistry and toxicity LOEs are evaluated together to determine the potential for chemically-mediated effects; likewise, the toxicity and benthic community LOEs are combined to determine the severity of biological effects. Finally, integration of the two effects categories results in an overall station assessment in which the station is placed into one of six impact categories (Unimpacted, Likely Unimpacted, Possibly Impacted, Likely Impacted, Clearly Impacted, or Inconclusive).

4.7.2 Sampling and Analyses Methods

Chemistry. Sediment chemistry is one of three essential lines of evidence (LOE) required for the SQO Part 1 , which helps determines the type of chemical exposure and its potential for producing adverse biological effects. Determination of the chemistry LOE is comprised of two main components: 1) measurement of a suite of constituents and 2) interpretation of the results using two indices of chemical exposure: CA CLR and CSI (Bay et al. 2014). Sediment samples will be analyzed for total organic carbon (TOC), grain size, total solids, metals, organochlorine pesticides, and PCBs.

Toxicity. Toxicity tests will be conducted in accordance with Sediment Quality Assessment Technical Support Manual (Bay et al. 2014). Two sediment toxicity tests, including an acute amphipod survival and a chronic, sub-lethal test are required for the assessment (Bay et al. 2014). For consistency and comparability with the Bight program and over time, the *Eohaustorius estuarius* amphipod toxicity test should be used for compliance monitoring. *E. estuarius* has been historically used during Bight Monitoring in 1998, 2003, and 2008 (Bay et al. 2014) and Ports Biological Baseline Monitoring in 2008 (SAIC, 2010). The continued use of this species as part of future monitoring events will allow for the greatest data comparability over time. However, due to the intolerance of *E. estuarius* for sediment with a high percent of clay, alternative species accepted by the SQO guidance (e.g., *Leptocheirus plumulosus*) should be considered in areas expected to have a high percent of fines.

The chronic, sublethal toxicity test that should be conducted as part of an SQO assessment in the Los Angeles/Long Beach Harbor Complex is the mussel (*Mytilus galloprovincialis*) sediment-water interface test. Recent Bight monitoring in 2008 employed the SWI test and, continued use of this test will provide the best data comparability between previous and future sampling events. In accordance with the original intent of the SWI test design (Anderson et al. 1996), *M. galloprovincialis* larvae should be exposed to intact cores. In contrast, homogenized sediment was used in the Bight 2008 testing program. The use of intact cores instead of homogenized sediment will reduce the potential for confounding effects of ammonia and sulfides found in deeper sediment, while still testing for the toxic effects of chemicals fluxing from sediment to overlying water.

A description of these toxicity test methods specified under the SQO policy is provided in Chapter 4 of the Sediment Quality Assessment Draft Technical Support Manual (Bay et al. 2014). Specifically, Chapter

4 provides guidance on sample preparation, organism acclimation, test methods, QA/QC procedures, and data analysis and interpretation (Bay et al. 2014).

Benthic Community. The third essential LOE for sediment quality assessment is the composition of the benthic community. The benthic LOE is a direct measure of the effect that sediment contaminant exposure has on the benthic biota of California's bays and estuaries. Determination of the benthic LOE is based on four measures of benthic community condition: 1) IBI, 2) RBI, 3) BRI, and 4) RIVPACS (Bay et al. 2014). Benthic community analyses will be conducted in accordance with Sediment Quality Assessment Technical Support Manual (Bay et al. 2014). Chapter 5 of the Sediment Quality Assessment Technical Support Manual (Bay et al. 2014) details recommended laboratory procedures for the processing of benthic infauna samples and subsequent data analysis necessary for the SQO Part 1 assessment. Methods are included in the SOP: Benthic Infauna Field Sampling and Biological Laboratory Protocols (Appendix H).

Sediment Quality Objective Assessment. The SQO assessment incorporates the MLOE described above (chemistry, toxicity, and benthic community) to develop final station assessments. SQO assessment should be conducted in accordance with the Water Quality Control Plan (SWRCB, 2009) and the Technical Support Manual (Bay et al. 2014). The calculation of the toxicity LOE is straightforward, as described in the Technical Support Manual. Consequently, only supplemental guidance is provided here for the chemistry and benthic LOEs.

Chemistry LOE. Calculation of the chemistry LOE should follow methods described in the Water Quality Control Plan (SWRCB 2009) and the Technical Support Manual (Bay et al. 2014). Specific attention should be given to guidance on the summing of total high molecular weight PAHs, low molecular weight PAHs, total PCBs, and total DDTs; guidance on using the specific chemical constituents in each class to sum, managing non-detects, and applying a multiplication factor as part of the total PCB concentration estimate should be strictly followed.

For individual analytes with a non-detect result, an estimated concentration represented by half the detection limit should be consistently used. Using this method will ensure consistency across all monitoring events. This stipulation does not apply to non-detect results used in a sum (as previously described). While there are other ways that non-detects can be estimated (i.e., non-detect equals detection limit), the recommended method is in agreement with the Technical Support Manual (Bay et al. 2014).

Calculations may be performed using various tools, including a calculator, Microsoft Excel®, or programming languages (i.e., Interactive Data Language [IDL]). SCCWRP has also developed a data integration tool in Microsoft Excel® (Data Integration Tool v5.4) for calculating each LOE and the final MLOE. The current version is available on the Sediment Quality Assessment Tools page of the SCCWRP website (SCCWRP 2014). It should be noted that this tool is currently under revision.

Benthic LOE. Calculation of the benthic LOE should follow methods described in the Water Quality Control Plan (SWRCB 2009) and the Technical Support Manual (Bay et al. 2014). As part of this calculation, data should be prepared and benthic indices calculated in accordance with this manual. The preparation of data for benthic indices calculations is a critical step that has significant impacts on the results and SQO outcome. The Technical Support Manual (Bay et al. 2014) describes most key steps required to prepare data prior to benthic indices calculations. In addition, the Technical Support Manual states that data should be prepared by identifying each taxon to the appropriate level "in keeping with the benthic macrofauna species list for the relevant habitat." While a seemingly uncomplicated task, to address this data requirement in full, the following steps should be taken to ensure consistency with SCCWRP data assessment tools, as it will allow for the most comprehensive quality control.

Species collected from within the Los Angeles/Long Beach Harbor Complex should be compared to the "Benthic Lookup" worksheet found within the Data Integration Tool v5.4 Excel file (Bay et al. 2014). Species should be matched to corresponding names within this species list, and if no corresponding species exists, species should be matched to the next lowest taxonomic level (genus, family, order, class, or phylum). Species may be identified to the nearest taxonomic level using the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT) Taxonomic Toolbox available at http://www.scamit.org/taxontools/.

Species not matching a corresponding species or the next lowest taxonomic level should be checked to ascertain that the species name is the most recently accepted name for that organism. For example, *Caesia perpinguis* (Hinds 1844) should be recorded as *Nassarius perpinguis*. The most recently accepted species names will be checked.

If benthic species or taxon do not match any taxon provided in the Benthic Lookup worksheet, they should be excluded from benthic indices calculations entirely (i.e., their names should be removed from the species listed at that station), until revision of the Data Integration Tool v5.4 is complete, which will allow for the ability to include some species that may not be on the list, but are in fact marine benthic invertebrates.

Upon conversion of species names to the lowest taxonomic level, duplicate, triplicate, or more taxon results should be compiled into one taxon result with one corresponding abundance. For example, if the abundance data show two organisms identified as *Lineus bilineatus* (which can be converted to the family Lineidae, as it is the lowest matching taxonomic level) and four organisms identified as Lineidae, then there should be one line item for Lineidae with a total of six organisms.

Within the Benthic Lookup worksheet found within the Data Integration Tool v5.4 Excel file, there is a species level column that indicates whether or not a species should be dropped. SCCWRP states that "when present, 'Drop' in this column indicates that abundances of this taxon are included in index calculations, but it is not included for counting numbers of taxa because lower taxonomic level entries in this taxon are also present." It is critical that programming language or user-designed spreadsheets used to calculate benthic indices incorporate this 'Drop' instruction.

The supplemental data preparation steps previously described must be followed such that QC checks can be conducted on the numerical results of the indices using the SCCWRP Data Integration Tool v5.4, assuming initial indices calculations were performed using a programming language such as IDL, SAS® software, or separate Excel file. In addition, if species are not matched to the Benthic Lookup worksheet when they should be, the match between observed and expected species could be reduced, which would affect the RIVPACS score and could also have an impact on the result of other benthic indices due the inclusion of total number of taxa or subclasses of taxa (i.e., molluscs) in the calculation of these indices. If species are included in the data analyses when they do not match the species list, the scores of the benthic indices could be impacted, which could potentially affect the benthic LOE outcome.

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5 Receiving and Outfall Water Quality Monitoring (Wet and Dry Weather)

For the Los Cerritos, Alamitos Bay, and San Gabriel River estuaries, receiving water sampling will be in the open estuarine waters. These samples are to be taken as soon as possible, but probably within 24 hours after a storm event. These samples will be taken at Site LBR2 in Alamitos Bay and at R8 in the San Gabriel River Estuary.

Receiving water quality will be assessed by grab samples collected at a depth of approximately 3 feet below the surface. Outfall sampling will be conducting using automated flow-composited water sampling equipment installed at Sites LBE1 at Bouton Creek and LBE2 at the Termino Drain.

5.1 Sampling Frequency and Mobilization Requirements

Outfall and receiving water quality monitoring will be performed three times a year during the wet season and two times a year during dry weather conditions. A fourth wet event will be required for Site R8 in the San Gabriel River Estuary but will involve only copper, conventional analytes, and field measurements to satisfy the copper TMDL. Outfalls will be monitored during wet weather conditions resulting from the first significant storm of the year and at least two additional wet weather events within the same wet weather season.

For the Los Cerritos Channel and Alamitos Bay, screening for Table E-2 constituents listed in the MRP will be conducted at the receiving water sites during the first significant storm of the year and during a critically dry weather period. Large sampling volumes are required to incorporate all analytical tests and associated QA/QC needed for Table E-2 constituents, bioassay tests and to provide sufficient volumes should TIEs be required. Due to these requirements, mobilization criteria for the wet weather events must be well planned.

Mobilization of field crews will typically start when there is both a 70% probability of rainfall within 24 hours of the arrival of a predicted storm event and Quantitative Precipitation Forecasts (QPFs) indicate that a minimum of 0.25 inches will occur within a 24-hour time period. Due to the importance of the first storm event of the year, crews will be mobilized to prepare the site (or sites) for monitoring 24 hours in advance of any events with at least a 50% probability of rainfall and QPFs of at least 0.20 inches within a 24-hour time period. If weather forecast for the first storm of the season indicate development of a condition known as a "cut-off low"[1], partial field teams may initially be deployed to prepare stations since such conditions create highly unpredictable situations that have the potential to suddenly move onshore with higher than expected rainfall. Full mobilization will require an upgrade in the local forecast to a predicted rainfall of at least 0.25 inches with a minimum probability of 70% within 12 hours of the event. For the purposes of this IMP, weather forecasts and QPFs provided by the Los

[1] A closed upper-level low which has become completely displaced (cut off) from basic westerly current, and moves independently of that current. Cutoff lows may remain nearly stationary for days, or on occasion may move westward opposite to the prevailing flow aloft (i.e., retrogression).

Angeles/Oxnard National Weather Service and the California Nevada River Forecast Center will be used to assess whether mobilization criteria are met.

Once the screening phase has been completed for Table E-2 constituents at the receiving water sites, storm events will be considered suitable for monitoring given a minimum of 72 hours (3 days) with cumulative rainfall of less than 0.1 inches within the watershed. Evaluation of antecedent rainfall conditions will initially be based upon Los Angeles County ALERT (Automatic Local Evaluation in Real Time) stations and rain gauges within or near the Los Cerritos Channel Watershed and rainfall measured at LCC1. The rain gauge located at Signal Hill City Hall (#335) will serve as the primary site for evaluation of antecedent conditions. The rain gauge installed at the outfall monitoring sites will also be used to evaluate antecedent conditions. Assessment of antecedent conditions will be based upon average rainfall measured at sites located within the watershed boundaries and that are known to be fully operable. Once crews are mobilized for a storm event, rainfall must exceed a minimum of 0.25 inches and provide sufficient rainfall to meet project objectives. The four storm events to be sampled at the R8 receiving water site are only intended to address the requirements of the copper TMDL in the San Gabriel River Estuary along with Dioxin. At this site, a minimum rainfall event of 0.25 inches would be expected to fulfill sampling requirements for the TMDL constituents and provide a representative flow-composite sample due to the fact that the watershed is highly impervious.

Two monitoring events are required during dry weather conditions. Based upon existing information, dry weather monitoring at the outfall sites will be conducted once in late spring/early summer (May to June) and again towards the end of the dry season in September/October. This will be consistent with historical dry weather sampling conducted under the City of Long Beach NPDES Permit. During the dry season, the only restriction on sampling will be that total rainfall over the 72-hour time period preceding the sampling event does not exceed 0.1 inches. In practice, rainfall is very rare during the summer months. With the exception of unusual periods when hurricanes developing off of Baja California cause some precipitation to spin north, rainfall events are very infrequent.

5.2 Sampling Constituents

For the Los Cerritos Channel and Alamitos Bay, with minor exceptions, chemical analyses are scheduled to be conducted for all analytes listed in Table 3-5 through Table 3-11 during the first significant rainfall of the season and again during a period of critical low flow. Chemical constituents not detected in excess of their respective MDLs or that do not exceed available water quality standards will be considered for removal during subsequent surveys. Adjustments to the list of analytical tests will be assessed separately for wet and dry weather sampling requirements. Since the initial screening event may be followed too quickly for the data to be received and fully evaluated, implementation of additional monitoring will be initiated during the subsequent monitoring year.

Most of the general and conventional pollutants listed in Table 3-5 will continue to be analyzed as part of the base monitoring requirements for continued monitoring for receiving and outfall waters. The only pollutants considered for elimination will be cyanide, total phenols, perchlorate, and MTBE. Analysis of chloride and fluoride will continue to be used to assist in the interpretation of potential potable water sources during in association with the non-stormwater screening program. In addition, microbiological constituents (Table 3-6), nutrients (Table 3-7), metals (Table 3-8), and chlordane compounds (Table 3-9) and will continue to be part of the ongoing monitoring.

From Section 4 above, two sensitive toxicity testing species have been selected for initial testing of the marine receiving water. These are the sea urchin (*S. purpuratus*) and the red abalone (*H. rufescens*) fertilization and development tests. These test species will also be used as necessary for outfall samples by salting up these outfall samples to accommodate these marine species.

As noted in the previous section, it has been determined that Table 5-1 provides sample volumes necessary for toxicity tests (both wet and dry weather) as well as minimum volumes necessary to fulfill Phase I TIE testing if necessary. As detailed in the previous section, the sublethal endpoints will be assessed using EPA's TST procedure to determine if there is a statistically significant 50% difference between sample controls and the test waters and ultimately determine if further testing is necessary.

Table 5-1. Toxicity Test Volume Requirements for Aquatic Toxicity Testing as part of the Long Beach Estuaries Stormwater Monitoring Program.

Test Organism	Toxicity Test Type	Test Concentration	Volume Required for Initial Screen (L)	Minimum Volume Required for TIE (L)[1]
Tests for Marine Water or Salted-Up Stormwater				
Sea Urchin (*S. purpuratus*)	Fertilization and larvae development	100% only	1.5	10
Red Abalone (*H. rufescens*)	Larval development	100% only	2.0	10
SampleQualityTests Water	--	--	1.0	--
Total volume required per Test event			2.5	a

[1] Minimum volume for the TIE is for Phase 1 characterization testing only. The additional volume collected for potential TIE testing can be held in refrigeration (4°C in the dark, no head space) and shipped to the laboratory at a later date if needed.

Note: The NPDES permit targets a 36-hr holding time for initiation of testing but allows a maximum holding time of 72-hr if necessary.

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6 Non-Stormwater (NSW) Outfall Monitoring for Los Cerritos Channel, Alamitos Bay, and San Gabriel River Estuaries

Detailed objectives of the screening and monitoring process (Section IX.A, page E-20 of the MRP) include the following:

1. Develop criteria or other means to ensure that all outfalls with significant non-stormwater discharges are identified and assessed during the term of this Order.

2. For outfalls determined to have significant non-stormwater flow, determine whether flows are the result of illicit connections/illicit discharges (IC/IDs), authorized or conditionally exempt non-stormwater flows, natural flows, or from unknown sources.

3. Refer information related to identified IC/IDs to the IC/ID Elimination Program (Part V8I.D of the Order) for appropriate action.

4. Based on existing screening or monitoring data or other institutional knowledge, assess the impact of non-stormwater discharges (other than identified IC/IDs) on the receiving water.

5. Prioritize monitoring of outfalls considering the potential threat to the receiving water and applicable TMDL compliance schedules.

6. Conduct monitoring or assess existing monitoring data to determine the impact of non-stormwater discharges on the receiving water.

7. Conduct monitoring or other investigations to identify the source of pollutants in non-stormwater discharges.

8. Use results of the screening process to evaluate the conditionally exempt non-storm water discharges identified in Parts IV.B.2 of this Order and take appropriate actions pursuant to Part IV.B.3 of this Order for those discharges that have been found to be a source of pollutants. Any future reclassification shall occur per the conditions in Parts IV.B.3 of this Order.

9. Maximize the use of Permittee resources by integrating the screening and monitoring process into existing or planned CIMP efforts.

Ultimately, the NSW program is intended to establish a process for identifying outfalls that serve as potential sources of contaminants. Sites where initial screening indicates the potential for discharges of a magnitude considered to have the potential to cause or contribute to exceedances of receiving water limitations will require further efforts to classify the discharges and determine appropriate actions.

In cases where flow or other factors show evidence of potential discharges of concern, the program will take further action to determine if the flows are illicit, exempt, conditionally exempt, conditionally exempt but non-essential, or if the source(s) of the discharge cannot be identified (unknown). Illicit discharges require immediate action and, if they cannot be eliminated, monitoring will be implemented until such time that the illicit discharge can be eliminated. Discharges classified as conditionally exempt but non-essential or unknown also require ongoing monitoring.

The following sections summarize the elements of the program and processes to ultimately eliminate major sources of non-stormwater discharges.

6.1 Non-Stormwater Outfall Screening and Monitoring Program

An outline of the NSW Outfall Screening Monitoring Program and a general timeline is shown in Table 6-1. The NSW Outfall Screening and Monitoring Program will consist of a screening phase designed to initially classify outfalls into one of three categories. Three screening surveys will be conducted starting in the Spring of 2015, Summer of 2015, and Fall (Winter-Dry Weather) 2015 to identify outfalls or other discharges that are considered to be significant and persistent sources of non-stormwater flow to either open channels or receiving waters.

In summary, different criteria are used to identify high flows from catchments larger than 200 acres versus those that comprise less than 200 acres of drainage area. For drainages larger than 200 acres, high flows are considered to be any flows that exceed a rate of 150 gallons/acre/day. For catchments less than 200 acres, high flows are considered to flows that exceed a rate of 150 gallons/acre/day for a 200 acre watershed. This equates to a fixed flow rate of 21 gallons per minute (gpm). This flow rate is slightly greater than the maximum flow one would expect from a single ¾" hose. If high flows are identified a minimum of twice during the three surveys, flows will be considered potentially "significant discharges" and will warrant further investigation.

The initial survey will focus on completing an inventory of all outfalls (refer to Appendix E) to receiving waters. Outfalls greater than 12-inches in diameter (or equivalent) will be photographed and documented. All minor outfalls[2] (outfalls less than 36-inches in diameter or equivalent) without evidence of the presence of industrial activities will be maintained in the database but will be considered as not requiring any further action.

If while in the process of conducting any of the site inspections, the inspection team encounters a transitory discharge, such as a liquid or oil spill, the problem will be immediately referred to the appropriate local jurisdiction for clean-up or response. If it is not readily apparent which jurisdictional authority has responsibility, the discharge will be reported to the City technical committee chair.

For the present case of outfalls discharging into an estuary or directly to San Pedro Bay, inspection methods will need to be modified somewhat as many of these discharges are intertidal in nature.

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[2] Minor municipal separate storm sewer outfall (or ''minor outfall'') means a municipal separate storm sewer outfall that discharges from a single pipe with an inside diameter of less than 36 inches or its equivalent (discharge from a single conveyance other than circular pipe which is associated with a drainage area of less than 50 acres); or for MS4s that receive stormwater from lands zoned for industrial activity (based on comprehensive zoning plans or the equivalent), an outfall that discharges from a single pipe with an inside diameter of less than 12 inches or from its equivalent (discharge from other than a circular pipe associated with a drainage area of 2 acres or less)

Indeed, the City of Long Beach's existing Bouton Creek stormwater monitoring station has been specially designed to operate in this intertidal creek. Thus for estuarine outfalls, inspections, flow estimates, and any water quality measurements may have to be taken at an upstream manhole or other suitable upstream site in the drainage as sampling a mixture of salt and freshwater of unknown proportions will not yield the desired information. Some of these upstream sampling sites may require partial street closures. For other facilities or for the Port of Long Beach, coordination with operations may be required.

Table 6-1. Outline of the NSW Outfall Screening and Monitoring Program.

Element	Description	Timing of Completion
1. Outfall Screening	Because data required to implement the NSW Outfall Program are not available, the Permittees will implement a screening process to determine which outfalls exhibit significant NSW discharges and those that do not require further investigation. Data will be recorded on Outfall Reconnaissance Investigation (ORI) forms and in the associated database.	The Outfall Screening process will be implemented in the spring, summer, and fall (Winter-Dry Weather) of 2015. Identification of obvious illicit discharges will be immediately addressed. Otherwise, the Outfall Screening process will be completed prior to starting source investigations.
2. Identification of outfalls with significant NSW discharge (Part IX.C of the MRP)	Data from the Outfall Screening process will be used to categorize MS4 outfalls on the basis of discharge flow rates, field water quality and physical observations.	Concurrent with Outfall Screening December, 28, 2016. Significant flow is determined as described in Appendix K and explained in second paragraph added to Section 6.1 text.
3. Inventory of Outfalls with NSW discharges (Part IX.D of the MRP)	Develop an inventory of all major MS4 outfalls, identify outfalls with known NSW discharges and identify outfalls with no flow requiring no further assessment.	Concurrent with Outfall Screening December 28, 2016.
4. Prioritized source investigation (Part IX.E of the MRP)	Use the data collected during the Outfall Screening process to further prioritize outfalls for source investigations.	Prioritization for Source Investigation will be occur after completion of Outfall Screening
5. Identify sources of significant NSW discharges (Part IX.F of the MRP)	For outfalls exhibiting significant NSW discharges, Permittees will perform source investigations per the established prioritization.	Complete source investigations for 25% of the outfalls with significant NSW discharges by March, 28, 2017 and 100% by March 28, 2019
6. Monitoring NSW discharges exceeding criteria (Part IX.G of the MRP)	Monitor outfalls determined to convey significant NSW discharges comprised of either unknown or conditionally exempt non-essential discharges, or illicit discharges that cannot be abated.	Monitoring will commence within 90 days of completing the source investigations

Information from all three screening surveys will be consolidated to assist in the identification and ranking of outfalls considered to have significant NSW discharges. Multiple lines of evidence will be considered when assessing the significance of a discharge. Data from the field screening program such as flow measurements, general observations and *in-situ* water quality information will be given primary consideration but land uses within the drainage area will also be considered.

A combination of field observations, flow measurements and field water quality measurements collected during the screening surveys will be used to classify outfalls into one of the following three categories that will determine further actions (Figure 6-1).

1. **Suspect Discharge** – Outfalls with persistent significant high flows during at least two out of three visits and with high severity on one or more physical indicators (odors, oil deposits, etc.). Outfalls in this category require prioritization and further investigation.

2. **Potential Discharge** - Flowing or non-flowing outfalls with presence of two or more physical indicators. Outfalls in this category are considered to be low priority but will be continue to be monitored periodically to determine if the sites are subject to less frequent, discharges or determine if actions can be taken to reduce or eliminate the factors that lead to the site being considered a potential source of contaminants.

3**. Unlikely Discharge** - Non-flowing outfalls with no physical indicators of an illicit discharge. Outfalls within this classification would not be subject to any further screening.

Initial screening activities will emphasize use of field water quality instrumentation and/or simple field test kits to assist in classifying discharges. Based upon initial data, collection of water samples for limited laboratory testing may be incorporated into the program as requirements for more complex, accurate and scientifically supportable data become necessary to characterize non-stormwater discharges and provide scientifically supportable data to track the source of these discharges.

As an example, the Center for Watershed Protection and Pitt (2004) provide an evaluation of twelve analytes for assistance in determining the source of NSW discharges (Table 6-2). Three of the analytes can be measured with *in-situ* instrumentation. Others can be analyzed relatively inexpensively by use of field test kits or can be analyzed in an ELAP-certified laboratory. In addition, three to five of the listed tests are often considered sufficient to screen for illicit discharges. Ammonia, MBAS, fluoride (assuming tap water is fluorinated), and potassium are considered to confidently differentiate between sewage, wash water, tap water, and industrial wastes. Incorporation of *in-situ* measurement of temperature, pH, TDS/salinity, turbidity and dissolved oxygen can further assist in characterizing and tracking the source(s) of an NSW discharge.

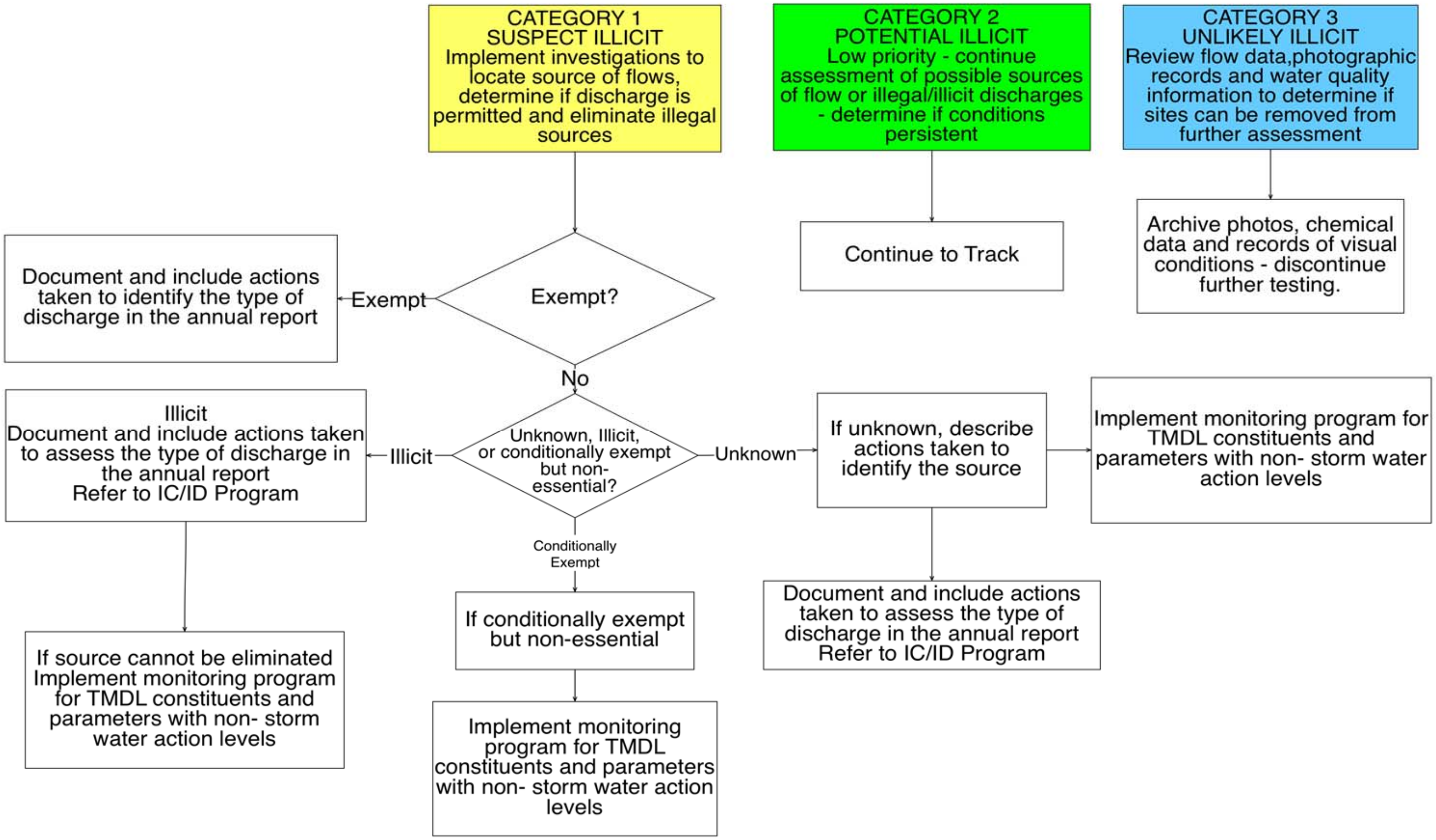

Figure 6-1. **Flow Diagram of NSW Outfall Program after Classifying Outfalls during Initial Screening.**

Table 6-2. Potential Indicator Parameters for Identification of Sources of NSW Discharges.

Indicator Parameters	
Ammonia	E. coli
Boron	Fluoride
Chlorine	Hardness
Color	pH - Field
Conductivity-Field	Potassium
Detergents – Surfactants (MBAS or fluorescence)	Turbidity

Based upon CWP and Pitt 2004. Illicit Discharge Detection and Elimination A Guidance Manual for Program Development and Technical Assessments

6.1.1 Identification of Outfalls with Significant Non-Stormwater Discharges

Existing monitoring data or institutional knowledge (Objective 4) are not available to allow identification of outfalls with significant NSW discharges. The screening program is necessary to collect information necessary to identify outfalls with potentially significant NSW discharges. The outfall screening includes collection of information necessary to provide an accurate inventory of the major outfalls, assess flow from each outfall and in the receiving waters, determine the general characteristics of the receiving waters (e.g. is flow present, does the flow from the outfall represent a large proportion of the flow, is it an earthen or lined channel), and record general observations indicative of possible illicit discharges. The initial screening survey(s) will also be used to refine the inventory information required in Section 6.1.2.

The outfall screening process will be initiated in the Spring of 2015 dry weather time period and be ongoing in order to meet the schedule for completion of 25% of the source identification work by March, 28, 2017. Once the screening process is completed, the Permittee are required to identify MS4 outfalls with "significant" NSW discharges. The MRP (Section IX.C.1) indicates that significant NSW discharges may be determined based upon one or more of the following characteristics:

a. Discharges from major outfalls subject to dry weather TMDLs.

b. Discharges for which existing monitoring data exceeds Non-Stormwater Action Levels (NALs) identified in Attachment G of the Order.

c. Non-stormwater discharges that have caused or have the potential to cause overtopping of downstream diversions.

d. Discharges exceeding a proposed threshold discharge rate as determined by the Permittee.

e. Discharges with the largest pollutant loading into the receiving waters.

f. Other characteristics as determined by the Discharger and incorporated within their screening program plan.

Most of these characteristics are either unlikely to differentiate significant NSW discharges or the information will not be available when the screening process is completed. Multiple lines of evidence derived from flow measurements, observations and *in-situ* water quality information recorded on the ORI forms used during the screening process will be used to determine "significant" NSW discharges and appropriately rank sites for source investigations. The relative magnitude of the discharges, persistence of the flow, visual and physical characteristics recorded at each site, and land uses associated with the drainage may also be considered. Characteristics of the receiving waters (flow, channel characteristics – hard or soft-bottom, etc.) at the discharge location will also be considered when determining the relative significance of NSW discharges. The most important consideration is whether the discharge has the potential to cause or contribute to exceedance of receiving water quality limitations. Factors that provide the best insight with respect to these impacts will receive the greatest weight when establishing the list of "significant" NSW discharges.

6.1.2 Inventory of MS4 Outfalls with Non-Stormwater Discharges

Part VII.A of the MRP requires that the IMP plan(s) include a map(s) and/or database of the MS4 that includes the elements listed in Table 6-3. A database of the MS4 outfalls within the LCC, Alamitos Bay, and San Gabriel watersheds of the City of Long Beach has been assembled for submission with this IMP. However, field verifications and outfall inspections are to be started during the period of Spring to Fall 2015 and be ongoing with the results reported by December 28, 2016. The planned schedule of performance is given in Table 6-3 for each of the required elements of this program.

Elements requiring further development include completing the descriptive MS4 database and performing the three outfall inspections events in the coming dry-weather periods of 2015. Other items include the Effective Impervious Area determination, information on the length of open channels and underground pipes equal to or greater than 18 inches, and the drainage areas associated with each outfall. Sub-basins used for the WMMS model are currently associated with each outfall within that sub-basin. If an outfall is identified as a significant source of NSW discharges, drainage areas for each targeted outfall will be refined and updated in the database. Additional information such as documenting presence of significant NSW discharges, links to a database documenting water quality measurements at sites with significant NSW discharges will be updated annually and submitted with the IMP annual report.

Table 6-3. Basic Database and Mapping Information for the Watershed.

Database Element	Status	
	Complete	Schedule
1. Surface water bodies within the Permittee(s) jurisdiction (Figure 6-2)	X	
2. Sub-watershed (HUC 12) boundaries	X	
3. Land use overlay	X	
4. Effective Impervious Area (EIA) overlay (if available)		Will provide if available
5. Jurisdictional boundaries	X	
6. The location and length of all open channel and underground pipes 18 inches in diameter or greater (with the exception of catch basin connector pipes)		Mar. 28, 2017
7. The location of all dry weather diversions (Figure 2-1)	X	
8. The location of all major MS4 outfalls within the Permittee's jurisdictional boundary. Each major outfall shall be assigned an alphanumeric identifier, which must be noted on the map	X[2]	
9. Notation of outfalls with significant non-stormwater discharges (to be updated annually)		Dec. 28, 2017
10. Storm drain outfall catchment areas for each major outfall within the Permittee(s) jurisdiction		Mar. 28, 2017
11. Each mapped MS4 outfall shall be linked to a database containing descriptive and monitoring data associated with the outfall. The data shall include:[4]		Mar. 28, 2017
a. Ownership		X
b. Coordinates		X
c. Physical description		X
d. Photographs of the outfall, where possible to provide baseline information to track operation and maintenance needs over time		X
e. Determination of whether the outfall conveys significant non-stormwater discharges		X
f. Stormwater and non-stormwater monitoring data		X

1. Locations are identified but the length of all open channel and underground pipes are not fully documented.
2. Attributes in Table in Appendix E (and are available as an Excel file) contain a Unique ID for all outfalls greater than 12" in diameter.
3. Catchments for each outfall are included as the area of the subbasins associated with each outfall. Several outfalls may drain these subbasins. Data will be developed as needed to resolve the drainage areas specific to each outfall.
4. Efforts are ongoing to define ownership and maintenance responsibility. As data become available, information regarding the conveyance of NSW and associated water quality data will be added to the database. Information will be updated based upon the three screening surveys.

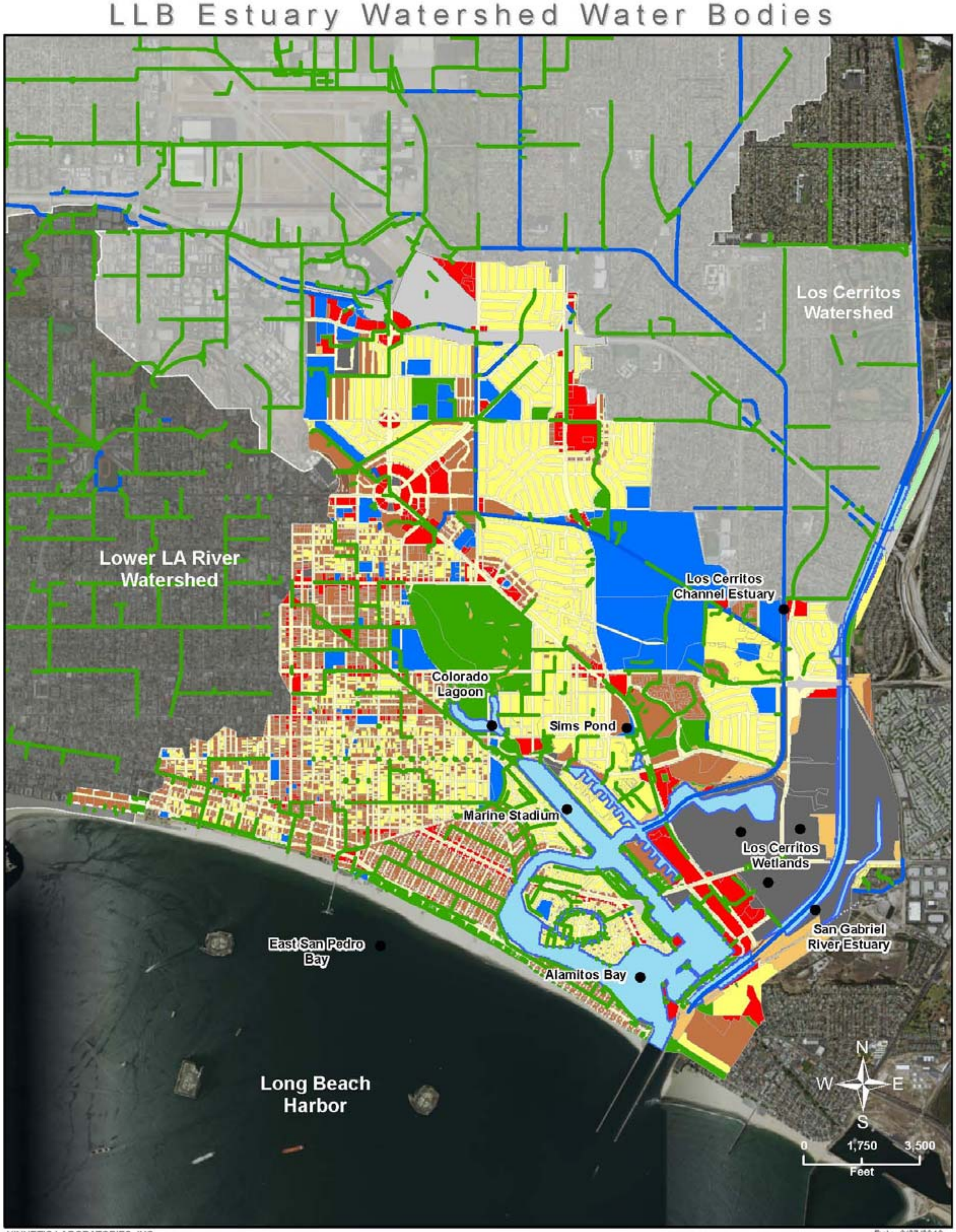

Figure 6-2. Surface Water Bodies in the City of Long Beach.

As a component of the inventory and screening process, Permittees are required to document the physical attributes of MS4 outfalls determined to have significant non-stormwater discharges. Table 6-4 summarizes the minimum physical attributes required to be recorded and linked to the outfall database. These data will be maintained using the ORI field form and associated database (Appendix D) developed by CWP and Pitt (2004). Data entry can be accomplished by completing the ORI form while conducting the screening survey. Current forms are shown in the Appendix D but may be modified as the parameters and database are modified to provide different information more relevant to the NSW program.

Table 6-4. Minimum Physical Attributes Recorded during the Outfall Screening Process.

Database Element
a. Date and time of last visual observation or inspection
b. Outfall alpha-numeric identifier
c. Description of outfall structure including size (e.g., diameter and shape)
d. Description of receiving water at the point of discharge (e.g., natural, soft-bottom with armored sides, trapezoidal, concrete channel)
e. Latitude/longitude coordinates
f. Nearest street address
g. Parking, access, and safety considerations
h. Photographs of outfall condition
i. Photographs of significant non-stormwater discharge (or indicators of discharge) unless safety considerations preclude obtaining photographs
j. Estimation of discharge rate
k. All diversions either upstream or downstream of the outfall
l. Observations regarding discharge characteristics such as turbidity, odor, color, presence of debris, floatables, or characteristics that could aid in pollutant source identification
m. Observations regarding the receiving water such as flow, channel type, hard/soft bottom. (added minimum attribute)

6.1.3 Prioritized Source Identification

After completion of the initial reconnaissance survey and the two additional screening surveys, sites will be ranked based upon both initial flow observations from the reconnaissance inventory and the classifications assigned during each of the screening surveys. Source investigations will be scheduled to be conducted at sites categorized as potential illicit discharges.

The MRP (IX.E.1) states that prioritization of source investigations should be based upon the following items in order of importance.

a. Outfalls discharging directly to receiving waters with WQBELs or receiving water limitations in the TMDL provisions for which final compliance deadlines have passed.

b. All major outfalls and other outfalls that discharge to a receiving water subject to a TMDL shall be prioritized according to TMDL compliance schedules.

c. Outfalls for which monitoring data exist and indicate recurring exceedances of one or more of the Action Levels identified in Attachment G of this Order.

d. All other major outfalls identified to have significant non-stormwater discharges.

Additional information from the screening process will be used to refine priorities. Sites with evidence of higher, more frequent flow, presence of odors or stains will be assigned higher priorities for source investigations.

6.1.4 Identify Source(s) of Significant Non-Stormwater Discharges

The screening and source identification component of the program is intended to identify the source or sources of contaminants contributing to an NSW discharge. The prioritized list of major outfalls with significant NSW discharges will be used to direct investigations starting with outfalls deemed to present the greatest risk to the receiving water body.

The Order requires the City to develop a source identification schedule based on the prioritized list of outfalls exhibiting significant NSW discharges. Source investigations will be conducted for no less than 25% of the outfalls in the inventory by March 28, 2017 and 100% of the outfalls in the inventory by March 28, 2019.

Part IX.A.2 of the MRP requires Permittees to classify the source investigation results into one of four endpoints: illicit connections/illicit discharges (IC/IDs), authorized or conditionally exempt non-stormwater flows, natural flows, or from unknown sources. If source investigations indicate the source is illicit or unknown, the Permittee will document actions to eliminate the discharge and implement monitoring if the discharge cannot be eliminated.

If the source of a discharge is found to be attributable to natural flows or authorized conditionally exempt NSW discharge, the Permittee must identify the basis for the determination (natural flows) and identify the NPDES permitted discharger. If the source is found to be a conditionally exempt but non-essential discharge, monitoring is required to determine whether the discharge should remain conditionally exempt or be prohibited.

Source investigations will be conducted using a variety of different approaches depending upon the initial screening results, land use within the area drained by the discharge point, and the availability of drainage maps. Any additional water quality sampling will emphasize analysis of simple indicators, most of which can be either taken to a laboratory or analyzed in the field using field test kits. Such testing would only be conducted as needed to differentiate major sources of flows or to assist in assessing mixed sources rather than detailed characterization of the discharge. Investigations may include:

- Tracking of dry weather flows from the location where they are first observed in an upstream direction along the conveyance system.

- Collection of additional water samples for analysis of NSW indicators for assistance in differentiating major categories of discharges such as tap water, groundwater, wash waters and industrial wastewaters.
- Compiling and reviewing available resources including past monitoring and investigation data, land use/MS4 maps, aerial photography, existing NPDES discharge permits and property ownership information.

If source tracking efforts indicate that the discharge originates from a jurisdiction upstream of the boundaries of the estuary watershed, the appropriate jurisdiction and the Regional Board will be notified in writing of the discharge within 30 days of the determination. All existing information regarding documentation and characterization of the data, contribution determination efforts, and efforts taken to identify its source will be included.

Investigations will be concluded if authorized, natural, or essential conditionally exempt flows are found to be the source of the discharge. If the discharge is determined to be due to non-essential conditionally exempt, illicit, or unknown discharges, further investigations will be considered to assess whether the discharge can be eliminated. Alternatively, if the discharges are either non-essential conditionally exempt or of an unknown source, additional investigations may be conducted to demonstrate that it is not causing or contributing to receiving water impairments.

6.1.5 Monitor Non-Stormwater Discharges Exceeding Criteria

As required in the MRP (Part II.D.4), outfalls with significant NSW discharges that remain unaddressed after source identification will be monitored. The objectives of the non-stormwater outfall based monitoring program include the following:

a. Determine whether a Permittee's discharge is in compliance with applicable NSW WQBELs derived from TMDL WLAs,

b. Determine whether a Permittee's discharge exceeds NSW action levels, as described in Attachment G of the Order,

c. Determine whether a Permittee's discharge contributes to or causes an exceedance of receiving water limitations,

d. Assist a Permittee in identifying illicit discharges as described in Part VI.D.10 of the Order.

e. Characterize the discharge's quantity, and quality and annual pollutant load if applicable.

After completion of source investigations, outfalls found to convey NSW discharges that could not be abated and were identified as illicit, conditionally exempt but non-essential or unknown will be monitored. Monitoring will be initiated within 90 days of completing the source investigations or as soon as the first scheduled dry weather survey. Conducting NSW monitoring at the same time as receiving water dry weather monitoring will be more cost effective and allow evaluation of whether the NSW discharges are causing or contributing to any observed exceedances of water quality objectives in the receiving water.

Monitoring of NSW discharges is expected to undergo substantial changes from year to year as the result of ongoing actions taken to control or eliminate these discharges. As NSW discharges are addressed, monitoring of the discharges will no longer be required. In addition, if monitoring demonstrates that discharges do not exceed any WQBELs, non-stormwater action levels, or water quality standards for pollutants identified on the 303(d) list after the first year, monitoring of the pollutants meeting all receiving water limitations will be no longer be necessary. The City will submit a written request to the Executive Officer to reduce or eliminate monitoring of specified pollutants based on an evaluation of the monitoring data. Due to potential frequent adjustments in the number and location of outfalls requiring monitoring and pollutants requiring monitoring, the annual IMP report is expected to communicate adjustments in the number and locations of monitored discharges, pollutants being monitored and justifications for any adjustments.

6.1.5.1 Monitoring Parameters and Frequency

The MRP (Section IX.G.1) specifies the minimum parameters for monitoring of NSW discharges. Determination of monitoring parameters at each site requires consideration of a number of factors applicable to each site. Monitoring parameters will include:

a. Flow,

b. Pollutants assigned a WQBEL or receiving water limitation to implement TMDL Provisions for the respective receiving water, as identified in Attachments L - R of the Order,

c. Other pollutants identified on the CWA section 303(d) List for the receiving water or downstream receiving waters,

d. Pollutants identified in a TIE conducted in response to observed aquatic toxicity during dry weather at the nearest downstream receiving water monitoring station (LBR2 and R8) during the last sample event or where the TIE conducted on the receiving water sample was inconclusive, aquatic toxicity testing will be conducted at the upstream outfall site(s). If the discharge exhibits aquatic toxicity, then a TIE shall be conducted,

e. Other parameters in Table E-2 identified as exceeding the lowest applicable water quality objective at LBR2 and R8 (the nearest downstream receiving water station) per Part VI.A.

The MRP (Part IX.G.2-5) specifies the following monitoring frequency for NSW outfall monitoring:

- For outfalls subject to a dry weather TMDL, the monitoring frequency shall be per the approved TMDL monitoring plan or as otherwise specified in the TMDL or as specified in an approved CIMP.
- For outfalls not subject to dry weather TMDLs, approximately quarterly for first year.
- Monitoring can be eliminated or reduced to twice per year, beginning in the second year of monitoring if pollutant concentrations measured during the first year do not exceed WQBELs, NALs or water quality standards for pollutants identified on the 303(d) List.

- Following one year of monitoring, the Discharger may submit a written request to the Executive Officer of the Los Angeles Regional Water Board to reduce or eliminate monitoring of specified pollutants, based on an evaluation of the monitoring data.

While a monitoring frequency of four times per year is specified in the Permit, it is inconsistent with the dry weather receiving water monitoring requirements. The receiving water monitoring requires two dry weather monitoring events per year. Additionally, during the term of the current Permit, outfalls are required to be screened at least once and those with significant NSW discharges will be subject to a source investigation. As a result, the City proposes that NSW outfall monitoring events be conducted twice per year. The NSW outfall monitoring events will be coordinated with the dry weather receiving water monitoring events to provide better opportunities to determine if the NSW discharges are causing or contributing to any observed exceedances of water quality objectives in the receiving water.

Any monitoring required will be performed using grab samples (refer to Appendix F for field sampling procedures) rather than automated samplers. Bacteria, which are expected to be the limiting factor at many sites during dry weather, require collection by grab methods and delivery to the laboratory within 6 hours. Based upon the much reduced variability experienced in measurements of dry weather flows associated with ongoing monitoring programs, measured concentrations of other analytes are not expected to vary significantly over a 24-hour period.

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7 New Development Redevelopment Effectiveness Tracking

The City of Long Beach will maintain an electronic database to track qualifying new development and re-development projects that are subject to the Planning and Land Development Programs of Part VII.J of Order N0. R4 2014-0024. The electronic databases contain the information listed in Table 7-1 that includes details about the project and the design of onsite and offsite best management practices, as well as descriptions of the required information.

To promote consistency across watersheds and facilitate future planning and research within the watershed, all watersheds are subscribing to MS4Front, a web-based software system designed to streamline record keeping for MS4 permits and assists with annual reporting. Cities have concluded that although it is a sophisticated management tool, it is flexible and relatively easy to use. The tracking programs will be converted to MS4Front.

Table 7-1. Information Required in the New Development/Re-Development Tracking Database.

	Required Information	Description
General Site Information	Project Name and Developer Name	Brief name of project and developer information (e.g. name, address, and phone number).
	Project Location and Map	Coordinates and map of the project location. The map should be linked to the GIS storm-drain map required in part VII.A of the Permit.
	Documentation of issuance of requirements to the developer	Date that the project developer was issued the Permit requirements for the project (e.g. conditions of approval).
	Date of Certificate of Occupancy	Date that the Certificate of Occupancy was issued.
On-site BMP Sizing Information	85^{th} percentile storm event (inches per 24 hours)	85^{th} percentile storm depth for the project location calculated using the Analysis of 85^{th} Percentile 24-hour Rainfall Depths Within the County of Los Angeles.
	95^{th} percentile storm event (inches per 24 hours)	95^{th} percentile storm depth for the project location calculated using the *Analysis of 85^{th} Percentile 24-hour Rainfall Depths Within the County of Los Angeles*. Only applies if the project drains directly to a natural drainage system[3] and is subject to hydromodification control measures.
	Project design storm (inches per 24 hours)	The design storm for each BMP as calculated using the Analysis of 85^{th} Percentile 24-hour Rainfall Depths Within the County of Los Angeles.
	Projects design volume (gallons or MGD)	The design storm volume (design storm multiplied by tributary area and runoff coefficient) for each BMP.
	Percent of design storm volume to be retained on site	The percentage of the design volume which on-site BMPs will retain.
	Other design criteria required to meet hydromodification requirements for projects that directly drain to natural water bodies	Information relevant to determine if the project meets hydromodification requirements as described in the Permit e.g., peak flow and velocity in natural water body, peak flow from project area in mitigated and unmitigated condition, etc.). Only applies if the project drains directly to a natural drainage system.
	One -year, one-hour storm intensity as depicted on the most recently issued isohyetal map published by the Los Angeles County Hydrologist for flow-through BMPs	If flow-through BMPs (e.g., sand filters, media filters) for water quality are used at the project, provide the one-year, one-hour storm intensity at the project site from the most recent isohyetal map issued by LA County.
Off-site BMP Information	Location and maps of off-site mitigation, groundwater replenishment, or retrofit sites	If any off-site mitigation is used, provide locations and maps linked to the GIS storm-drain map required in part VII.A of the Permit.
	Design volume for water quality mitigation treatment BMPs	The calculated design volume, If water quality mitigation is required.
	Percent of design storm volume to be infiltrated at an off-site mitigation or groundwater replenishment project site	The percentage of the design volume which off-site mitigation or groundwater replenishment will retain.
	Percent of design storm volume to be retained or treated with biofiltration at an off-site retrofit project	The percentage of the design volume which off-site biofiltration will retain or treat.

[3] A natural drainage system is defined as a drainage system that has not been improved (e.g., channelized or armored). The clearing or dredging of a natural drainage system does not cause the system to be classified as an improved drainage system.

8 Reporting

Reporting will normally consist of Annual IMP Reports and semi-annual data reports. Discharge Assessment Plans will only be submitted if TIEs are found to produce inconsistent results during two consecutive tests. These include the following reports:

Annual IMP Reports

Annual IMP monitoring reports are required to be submitted to the Regional Water Board Executive Officer by December 15th of each year in the form of three compact disks (CDs). The reporting period will cover July 1 through June 30. The annual reporting process is intended to meet the following objectives.

Summary information allowing the Regional Board to assess:

a. Each Permittee's participation in one or more Watershed Management Programs.
b. The impact of each Permittee(s) stormwater and non-stormwater discharges on the receiving water.
c. Each Permittee's compliance with receiving water limitations, numeric water quality-based effluent limitations, non-stormwater action levels, and Municipal Action Levels (MALs).
d. The effectiveness of each Permittee(s) control measures in reducing discharges of pollutants from the MS4 to receiving waters.
e. Whether the quality of MS4 discharges and the health of receiving waters is improving, staying the same, or declining as a result watershed management program efforts, and/or TMDL implementation measures, or other Minimum Control Measures.
f. Whether changes in water quality can be attributed to pollutant controls imposed on new development, re-development, or retrofit projects.

Data Submittals

Analytical data reports are required to be submitted to the Regional Board on a semi-annual basis in accordance with the Southern California Municipal Storm Water Monitoring Coalition's Standardized Data Transfer Formats. These reports are required to be subject to verification and validation prior to submittal. They are to cover monitoring periods of July 1 through December 31 for the mid-year report and January 1- June 30 for the end of year report. These data reports should summarize:

- Exceedances of applicable WQBELs, receiving water limitations, or any available interim action levels or other aquatic toxicity thresholds.
- Basic information regarding sampling dates, locations, or other pertinent documentation.

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