SECTION K1 INTRODUCTION

This municipal separate storm sewer system (MS4) outfall monitoring work plan satisfies the requirements of the San Diego Regional Water Quality Control Board (Regional Board) Order R9-2013-0001 (MS4 Permit) Provision D.2. for the 2015-2016 fiscal/monitoring year for the Tijuana River Watershed Management Area (WMA). This work plan assumes the reader is familiar with the requirements of MS4 Permit and the Tijuana River Water Quality Improvement Plan (WQIP) within which this work plan is contained.

To assess potential impacts on receiving water and identify potential pollutant sources, the RAs are required to monitor the wet weather and non-storm water discharges from the MS4 outfalls in the Tijuana River WMA during implementation of the Tijuana River WQIP to assess the effectiveness of their jurisdictional runoff management programs (JRMPs) toward effectively prohibiting non-storm water discharges into the MS4 and reducing pollutants in storm water discharges from their MS4s to the maximum extent practicable (MEP) (Regional Board 2013).

Table K-1-1 presents the RAs, land area, and percent of area within the Tijuana River WMA. Table K-1-2 presents areas within the Tijuana River WMA that are currently listed on the United States Environmental Protection Agency (USEPA) 303(d) list. Figure K-1 provides an illustration of the Tijuana River WMA, jurisdictional boundaries, and proposed monitoring locations.

Table K-1-1
Responsible Agencies within the Tijuana River WMA

Responsible Agency	Land Area (acres)	Percent of WMA
City of Imperial Beach	2,146	0.7%
City of San Diego	14,026	4.7%
County of San Diego	282,669	94.6%

Table K-1-2
Applicable 303(d) Listed Analytes within the Tijuana River WMA

Receiving Water Segment	Pollutant																										
	Indicator Bacteria	Total Coliform	Fecal Coliform	Enterococcus	Turbidity	Solids	Sedimentation/Siltation	Trash	Total Nitrogen as N	Ammonia as Nitrogen	Phosphorus	Eutrophic	Low Dissolved Oxygen	Pesticides	Surfactants (MBAS)	Lead	Manganese	Nickel	Selenium	Thallium	Trace Elements	Synthetic Organics	Perchlorate	Color	pH	Toxicity
Pacific Ocean Shoreline, Tijuana HU, at 3/4 mile North of Tijuana River		•	•	•																						
Pacific Ocean Shoreline, Tijuana HU, at end of Seacoast Drive		•	•	•																						
Pacific Ocean Shoreline, Tijuana HU, at Monument Road		•	•																							
Pacific Ocean Shoreline, Tijuana HU, at the US Border		•	•	•																						
Pacific Ocean Shoreline, Tijuana HU, at Tijuana River mouth		•	•	•																						
Tijuana River (6 miles afffected)	•					•	•	•	•		•	•	•	•	•				•		•	•				•
Tijuana River Estuary (1320 acres affected)	•				•			•				•	•	•		•		•		•						
Tecate Creek (1 mile affected)																			•							
Barrett Lake (125 acres affected)									•								•						•	•	•	
Pine Valley Creek (Upper) (3 miles affected)					•																					
Morena Reservoir (104 acres affected)										•	•						•							•	•	
Cottonwood Creek (53 miles affected)																			•							

LEGEND

- MS4 Dry Weather
- MS4 Wet Weather
- Receiving Waters
- Tijuana River Watershed Management Area (WMA)
- Jurisdictional Boundary
- River/Stream
- Dam

Upper Watershed

- Barrett Lake
- Cameron
- Campo
- Cottonwood
- Monument
- Morena
- Potrero

Lower Watershed

- Tijuana Valley

Monument (911.4)

Cottonwood (911.6)

Cameron (911.7)

Morena (911.5)

Barrett Lake (911.3)

Potrero (911.2)

Campo (911.8)

Tijuana Valley (911.1)

CITY OF IMPERIAL BEACH

CITY OF SAN DIEGO

COUNTY OF SAN DIEGO

USA

MEXICO

Morena Reservoir

Barrett Lake

Pine Valley Creek

Cottonwood Creek

Tecate Creek

Dulzura River

Sweetwater River

Otay River

Tijuana River

Path: G:\gis\projects\27672671359\map_docs\mxd\Report_figures\Appendix_K\MS4_locations.mxd, Paul_Moreno, 1/22/2015, 3:57:40 PM

URS

1.75 0 1.75 3.5 Miles

SCALE: 1" = 3.5 Miles (1:221,760)

SCALE CORRECT WHEN PRINTED AT 11X17

CREATED BY: DS | DATE: 1/22/2015

PM: JB | PROJ. NO: 27673159.20000

SOURCES: Watershed Management Area, Hydrologic Areas (SanGIS, 2003). Jurisdictional Boundary (SanGIS, 2010). Rivers/Streams (SanGIS, 2004). Dams (URS, 2014)

FIGURE K-1 TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA) MS4 OUTFALL AND RECEIVING WATER MONITORING LOCATIONS

This page intentionally left blank

SECTION K2 MONITORING

This section details the monitoring required to comply with the MS4 Permit.

K2.1 NON-STORM WATER MS4 OUTFALL DISCHARGE MONITORING

Each RA is required to perform non-storm water MS4 outfall prioritization and monitoring to aid in the identification of non-storm water and illicit discharges within their respective jurisdictions as required by Provision D.2.b of the MS4 Permit.

K2.1.1 MS4 Outfall Inventory

The RAs have identified the known major MS4 outfalls[1] that discharge directly to receiving waters within their respective jurisdictions within the Tijuana River WMA. The identified major MS4 outfalls have been geo-located on respective Geographic Information System (GIS) jurisdictional maps[2] of the Tijuana River WMA as required by Provision D.2.a.(1) of the MS4 Permit. Each RA will maintain, confirm, and updated their respective maps during annual field screening (Section 2.1.2). The respective jurisdictional MS4 maps contain the following items that, at a minimum, will be confirmed and updated during annual field screening as applicable:

- Segments of the MS4 owned, operated, and maintained by the RA;
- Known locations of inlets that discharge and/or collect runoff into the RA's MS4;
- Known locations of connections with other MS4s not owned or operated by the RA;
- Known locations of MS4 outfalls and private outfalls that discharge runoff collected from areas within the RA's jurisdiction;
- Segments of receiving waters within the RA's jurisdiction that receive and convey runoff discharged from the RA's MS4 outfalls;
- Locations of the MS4 outfalls within each RA's respective jurisdiction; and
    - Latitude and longitude of MS4 outfall point of discharge;
    - Watershed Management Area;
    - Hydrologic subarea;
    - Outlet size;
    - Accessibility (i.e., safety and without disturbance of critical habitat);
    - Approximate drainage area; and
    - Classification of whether the MS4 outfall is known to have persistent non-storm water flows, transient non-storm water flows, no non-storm water flows, or unknown non-storm water flows.

[1] A major outfall is defined as 36 inches or larger in diameter

[2] Geo-located MS4 outfall maps are not included in the work plan due to size

- Locations of the selected non-storm water persistent flow MS4 outfall discharge monitoring stations within each RA's respective jurisdiction (Section 2.1.3).

Table K-2-1 presents the number of identified major outfalls in the Tijuana River WMA by RA.

Table K-2-1
Number of Identified Major Outfalls by RA in the Tijuana River WMA

RA	Identified Major Outfalls
City of Imperial Beach	3
City of San Diego	30
County of San Diego	4

K2.1.2 Field Screening

Each RA is required to conduct field screening to determine which non-storm water MS4 outfall discharges are transient flows and which are persistent flows, and prioritize the non-storm water MS4 discharges that will be investigated and eliminated in accordance with the Illicit Discharge Detection and Elimination (IDDE) program.

K2.1.2.1 Major Outfall Selection and Screening Frequency

Per the requirements of Provision D.2.a.(2).(a) of the MS4 Permit, the number of major outfalls required to be screened is dependent upon the number of known major outfalls present in a RA's inventory. The requirements are as follows:

- For RAs with fewer than 125 known major MS4 outfalls that discharge to receiving waters within a WMA, at least 80 percent of the outfalls are required be visually inspected two times per year during non-storm water conditions.
- For RAs with 125 major MS4 outfalls or more, but fewer than or equal to 500 that discharge to receiving waters within a WMA, all the outfalls is required be visually inspected at least annually during non-storm water conditions.
- For RAs with more than 500 major MS4 outfalls that discharge to receiving waters within a WMA, at least 500 outfalls are required to be visually inspected at least annually during non-storm water conditions. RAs with more than 500 major MS4 outfalls within a WMA are required to identify and prioritize at least 500 outfalls to be inspected considering the following:
    - Assessment of connectivity of the discharge to a flowing receiving water;
    - Reported exceedances of numeric non-storm water action levels (NALs) in water quality monitoring data;
    - Surrounding land uses;
    - Presence of constituents listed as a cause for impairment of receiving waters in the WMA listed on the Clean Water Act (CWA) section 303(d) List; and

- Flow rate.

- For an RA with portions of its jurisdiction in more than one WMA and more than 500 major MS4 outfalls within its jurisdiction, at least 500 major MS4 outfalls within its inventory are required to be visually inspected at least annually during non-storm water conditions. RAs with more than 500 major MS4 outfalls in more than one WMA are required to identify and prioritize at least 500 outfalls to be inspected considering the following:
  - Assessment of connectivity of the discharge to a flowing receiving water;
  - Reported exceedances of NALs in water quality monitoring data;
  - Surrounding land uses;
  - Presence of constituents listed as a cause for impairment of receiving waters in the WMA listed on the CWA section 303(d) List; and
  - Flow rate.
- Inspections of major MS4 outfalls conducted in response to public reports and staff or contractor reports and notifications may count toward the required visual inspections of MS4 outfall discharge monitoring stations.

Based on these criteria, Table K-2-2 details the number of major outfalls that each respective RA will inspect within their respective jurisdictions and frequency[3] within the Tijuana River WMA. The locations of the major MS4 outfalls that will be screened by each RA are included in Figure K-3.

Table K-2-2
MS4 Outfall Screening Number and Frequency by RA

RA	Number of Outfalls	Frequency
City of Imperial Beach	3	Twice per year
City of San Diego	30	Once per year
County of San Diego	4	Twice per year

K2.1.2.2 Field Screening Visual Observations

During a field screening visual observation inspection, each MS4 outfall selected for screening will be inspected following at least 72 hours of dry weather following any storm event producing greater than 0.10 inch of rainfall within a 24-hour period. Table K-2-3 details the visual observations that will be recorded during each field screening visual observation inspection. A copy of the field observation form that will be used to record field screening visual observations is included in Attachment A.

[3] The field screening monitoring frequencies and locations for the MS4 outfalls in RAs respective inventories may be modified to aid in the identification and elimination of sources of persistent flow non-storm water discharges in accordance with the highest priority water quality conditions identified in the WQIP, provided the requisite number of visual inspections are performed.

Table K-2-3
Field Screening Visual Observations for MS4 Outfall Discharge Monitoring Stations

Field Observations

• Station identification and location
• Presence of flow, or pooled or ponded water
• If flow is present:
  o Flow estimation (i.e. width of water surface, approximate depth of water, approximate flow velocity, flow rate)
  o Flow characteristics (i.e. presence of floatables, surface scum, sheens, odor, color)
  o Flow source(s) suspected or identified from non-storm water source investigation
  o Flow source(s) eliminated during non-storm water source identification
• If pooled or ponded water is present:
  o Characteristics of pooled or ponded water (i.e. presence of floatables, surface scum, sheens, odor, color)
  o Known or suspected source(s) of pooled or ponded water
• Station description (i.e. deposits or stains, vegetation condition, structural condition, observable biology)
• Presence and assessment of trash in and around station
• Evidence or signs of illicit connections or illegal dumping

K2.1.2.3 Illicit Discharge Detection and Elimination

Based on the field screenings the RAs will conduct follow up investigations under the IDDE program as applicable. The IDDE program is part of each respective RA's JRMP and thus, is not included in this monitoring plan.

K2.1.3 Non-Storm Water Persistent Flow MS4 Outfall Discharge Monitoring

Each RA is required to perform non-storm water persistent flow MS4 outfall discharge monitoring to determine if persistent non-storm water discharges may be impacting receiving water quality.

K2.1.3.1 Outfall Prioritization and Selection

Based upon the field screening, the highest priority water quality conditions identified in the WQIP, and any additional criteria developed by the RA (e.g., historical data), the RAs are required to prioritize their respective major outfalls. Each RA is required to select, at a minimum, five high priority major MS4 outfalls with non-storm water persistent flows. Each respective RA will monitor the five selected major MS4 outfalls within its jurisdiction. In the event that a RA has fewer than five major outfalls, then the RA is required to monitor each of the known major MS4 outfalls with persistent flows within its respective jurisdiction within the Tijuana River WMA. Table K-2-4 details the major outfalls selected for monitoring within each jurisdiction within the Tijuana River WMA. Figure K-2 illustrates the location of the selected major MS4 outfalls for non-storm water persistent flow MS4 outfall monitoring within the Tijuana River WMA by jurisdiction.

Table K-2-4
Selected Locations for Non-Storm Water Persistent Flow Monitoring

Jurisdiction	Station ID	Outfall Location Latitude	Outfall Location Longitude
City of Imperial Beach	IB_E1A	32.572874	-117.12315
	IB_ F-34	32.576647	-117.113087
City of San Diego	SD-DW0224	32.56681	-117.0996
	SD-DW0304	32.549406	-116.99104
	SD-DW1032	32.569429	-117.035969
	SD-DW1034	32.551811	-117.05301
	SD-DW1151	32.554197	-116.92789
County of San Diego	CT-MS4-TIJ-001	32.6087	-116.47461
	CT-MS4-TIJ-002	32.8198	-116.52623
	CT-MS4-TIJ-003	32.83939	-116.52688
	CT-MS4-TIJ-004	32.55254	-116.92762

This page intentionally left blank

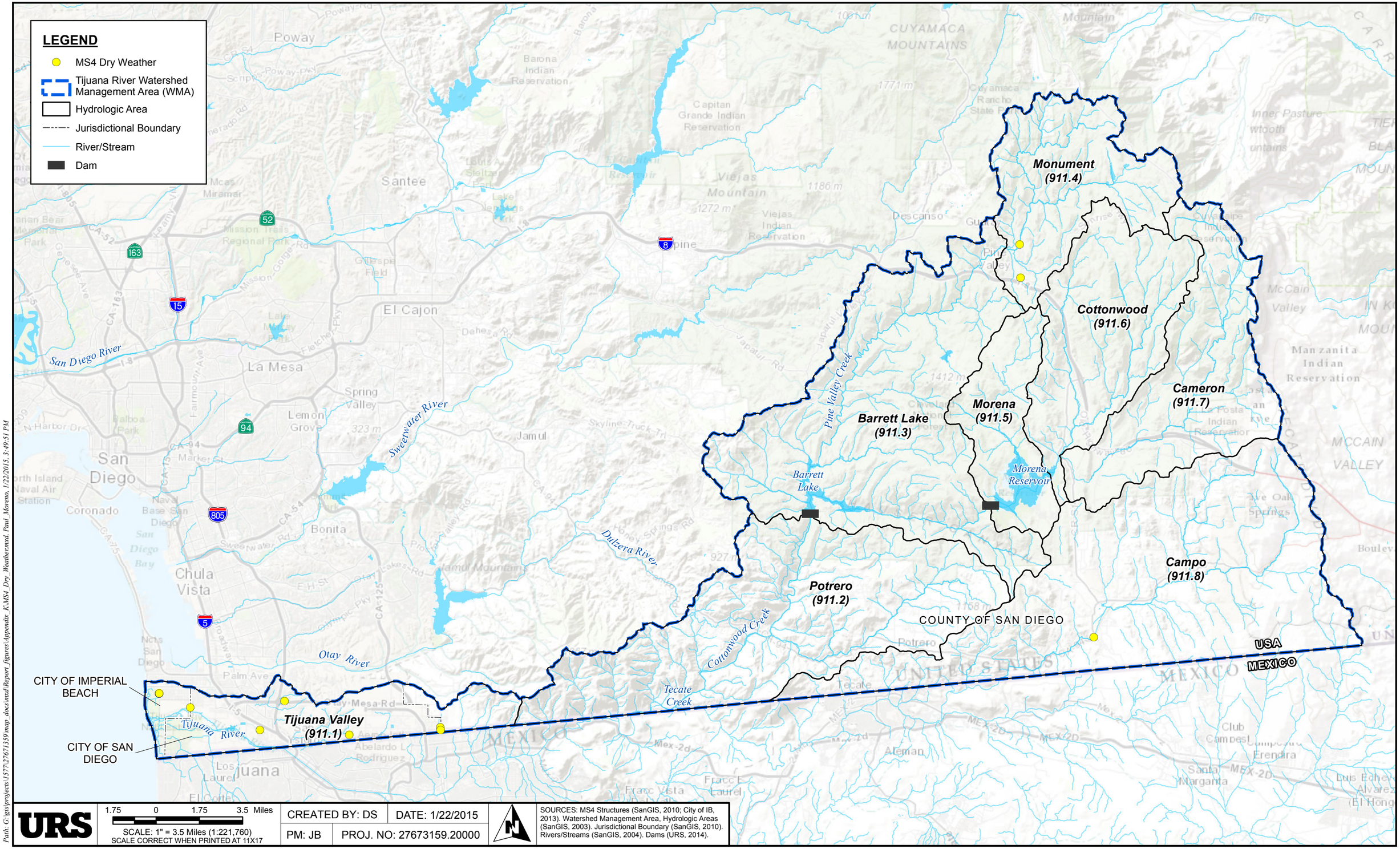

FIGURE K-2 TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA) MS4 OUTFALL DRY WEATHER MONITORING LOCATIONS

This page intentionally left blank

K2.1.3.2 Monitoring Frequency

Each of the selected major outfalls detailed in Table K-2-4 will be monitored twice during the 2015-2016 fiscal/monitoring year at the Imperial Beach, County of San Diego, and City of San Diego locations. An alternate major outfall may be substituted for a selected major outfall in the event that one of the following criteria becomes applicable:

- The non-storm water discharges have been effectively eliminated (i.e., no flowing, pooled, or ponded water) for three consecutive non-storm water monitoring events[4].
- The source(s) of the persistent flows has been identified as a category of non-storm water discharges that does not require an NPDES permit and does not have to be addressed as an illicit discharge because it was not identified as a source of pollutants.
- The constituents in the persistent flow non-storm water discharge do not exceed NALs.
- The source(s) of the persistent flows has been identified as a non-storm water discharge authorized by a separate NPDES permit.

K2.1.3.3 Field Observations

During the two annual monitoring events field observations consistent with Table K-2-3 will be recorded at each of the selected major outfall persistent flow monitoring sites. The dry weather field observation form is presented in Attachment B.

K2.1.3.4 Field Monitoring

During annual monitoring events, the parameters in Table K-2-5 will be recorded from *in-situ* measurements at each of the selected major outfall non-storm water persistent flow monitoring sites.

Table K-2-5
Non-Storm Water Field Monitoring Parameters

Parameters
pH
Temperature
Specific conductivity
Dissolved oxygen
Turbidity

[4] Meeting this criterion during a single monitoring year is unlikely, thus it is presented in this Work Plan for informational purposes only.

K2.1.3.5 Analytical Monitoring

During annual monitoring events (provided sufficient measurable flow is present), grab samples will be collected for analysis by an analytical laboratory according to the procedures described in Section K3.2.1, which follow Surface Water Ambient Monitoring Program (SWAMP) protocols[5].

The required analyses[6] are based upon the following four groupings of constituents:

1. Constituents contributing to the highest priority water quality conditions identified in the Tijuana River WMA WQIP;
2. Constituents listed as a cause for impairment of receiving waters in the Tijuana River WMA as listed on the 303(d) list;
3. Applicable NAL constituents listed in Provision C.1 of the MS4 Permit; and
4. Constituents listed in Table D-7 of the MS4 Permit.

Table K-2-6 details the analyses required for each of the selected MS4 outfall non-storm water persistent flow monitoring. Analytical methods and detection limits for each analyte are provided in Attachment C.

[5] Flow- or Time-weighted composite sampling may also be performed at the discretion of the RA.

[6] If, during a monitoring event, the RA identifies and eliminates the source of the persistent flow non-storm water discharge, the sample will not be analyzed.

Table K-2-6
Non-Storm Water Persistent Flow MS4 Outfall Discharge Analytical Monitoring by Site

Analyte	City of Imperial Beach			City of San Diego					County of San Diego			
	IB_E1A	IB_E1B	IB_F	SD-DW0224	SD-DW0304	SD-DW1032	SD-DW1034	SD-DW1151	CT-MS4-TIJ-001	CT-MS4-TIJ-002	CT-MS4-TIJ-003	CT-MS4-TIJ-004
Conventional Parameters												
Total Hardness[1,1A]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Dissolved Solids (TDS)[1]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Suspended Solids (TSS)[1,2,3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MBAS[3,4B]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Turbidity[2,3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Suspended Sediment Concentration (SSC)[2,3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Indicator Bacteria												
Total Coliform[1,3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fecal Coliform[1,3,4A,4B]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enterococcus[1,3,4A,4B]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Inorganic Analytes												
Aluminum (Dissolved)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Aluminum (Total)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Beryllium (Dissolved)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Beryllium (Total)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cadmium (Dissolved)[1,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cadmium (Total)[1,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromium (Dissolved)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromium (Total)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromium III (Dissolved)[4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromium III (Total)[4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromium VI (Dissolved)[4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Chromium VI (Total)[4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Copper (Dissolved)[1,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Copper (Total)[1,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Iron (Dissolved)[4B]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Iron (Total)[4B]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead (Dissolved)[1,3,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Lead (Total)[1,3,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manganese (Dissolved)[4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manganese (Total)[4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mercury (Dissolved)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Analyte	City of Imperial Beach			City of San Diego					County of San Diego			
	IB_E1A	IB_E1B	IB_F	SD-DW0224	SD-DW0304	SD-DW1032	SD-DW1034	SD-DW1151	CT-MS4-TIJ-001	CT-MS4-TIJ-002	CT-MS4-TIJ-003	CT-MS4-TIJ-004
Mercury (Total)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Molybdenum (Dissolved)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Molybdenum (Total)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nickel (Dissolved)[3,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nickel (Total) [3,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Selenium (Dissolved)[3,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Selenium (Total)[3,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silver (Dissolved)[4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silver (Total)[4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thallium (Dissolved)[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Thallium (Total)[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Titanium (Dissolved)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Titanium (Total)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc (Dissolved)[1,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zinc (Total)[1,4A,4B,7]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Trace Elements[3,5]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nutrients												
Total Phosphorus[1,3,4B,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dissolved Phosphorus[3,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Orthophosphate[1,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitrite[1,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitrate[1,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Kjeldahl Nitrogen (TKN)[1,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ammonia[1,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Nitrogen[3,4B,6]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pesticides/PCBs												
Organophosphate Pesticides[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen Pesticides	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pyrethroid Pesticides[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pesticides/PCBs	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Organics												
Polyaromatic hydrocarbons (PAHs)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Synthetic Organics[3]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes:

1. Parameter listed in Table D-7 of the MS4 Permit.

Analyte	City of Imperial Beach			City of San Diego					County of San Diego			
	IB_E1A	IB_E1B	IB_F	SD-DW0224	SD-DW0304	SD-DW1032	SD-DW1034	SD-DW1151	CT-MS4-TIJ-001	CT-MS4-TIJ-002	CT-MS4-TIJ-003	CT-MS4-TIJ-004

1A. Collection of receiving water hardness for each outfall location is required during non-storm water sampling (non-storm water persistent flow) to calculate NALs for hardness-dependent metals.

2. Parameter contributes to a highest priority water quality condition identified in the Tijuana River WMA Water Quality Improvement Plan.

3. Parameter listed as a cause for impairment of receiving waters in the Tijuana River WMA on the 303(d) list. Synthetic organics are understood to include: di(2-ethylhexyl)adipate, di(2-ethylhexyl)phthalate, hexachlorobenzene, hexachlorocyclopentadiene (HEX), and 2,3,7,8-tetetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).

4A. Parameter listed in NALs for discharges from MS4s to Bays, Harbors, and Lagoons/Estuaries (MS4 Permit Provision C.1.a(2))

4B. Parameter listed in NALs for discharges from MS4s to Inland Surface Waters (MS4 Permit Provision C.1.a(3))

5. Trace elements analysis includes those 303(d) constituents listed for the Tijuana River, which include Aluminum, Beryllium, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Molybdenum, Nickel, Selenium, Silver, Titanium, and Zinc.Trace element constituent list derived from Fact Sheet for listing Tijuana River (and Tijuana River Estuary) in 1998 and Order No. 90-42 (pers. com H. Yu [RWQCB staff member] on November 10, 2015).

6. Multiple nitrogen and phosphorus species analyzed to address 303(d) listings for eutrophic conditions (nitrogen, nitrate+nitrite, nitrate-nitrogen, ammonia, total Kjeldahl nitrogen [TKN], dissolved and total phosphorous, and orthophosphate).

7. Permit-mandated parameter also considered and analyzed as a trace element. See footnote 5.

*Nitrate and nitrite may be combined and reported as nitrate+nitrite

K2.2 WET WEATHER MS4 OUTFALL DISCHARGE MONITORING

Each RA is required to perform wet weather MS4 outfall prioritization and monitoring to aid in the identification of pollutants in storm water discharges from the MS4s and to guide pollutant source identification efforts.

K2.2.1 Outfall Prioritization and Selection

The RAs may adjust the wet weather MS4 outfall discharge monitoring locations in the Tijuana River WMA, as needed, to identify pollutants in storm water discharges from MS4s, to guide pollutant source identification efforts in accordance with the highest priority water quality conditions identified in the Tijuana River WMA WQIP.

The requirements for outfall monitoring location selection are as follows:

- At least five (5) wet weather MS4 outfall discharge monitoring stations that are representative of storm water discharges from areas consisting primarily of residential, commercial, industrial, and typical mixed-use land uses present within the Tijuana River WMA; and
- At least one (1) wet weather MS4 outfall discharge monitoring station for each RA within the Tijuana River WMA.

The selected outfalls are listed in Table K-2-7. The monitoring locations shown below may be adjusted if access or safety concerns exist. Minor adjustment in monitoring location within the same drainage tributary will allow the needed flexibility for samples to be collected at the closest feasible location to the outfall while providing for suitable site access, avoiding tidal inundation, or circumventing border patrol security grates that prevent the installation of monitoring equipment. Figure K-3 illustrates the location of the RAs' selected wet weather MS4 outfall discharge monitoring sites within the Tijuana River WMA.

Table K-2-7
Selected Major Outfalls for MS4 Outfall Storm Water Monitoring

Site ID	Jurisdiction	Outfall Size (in.)	Outfall Type	Outfall Location
IB_F-34	City of Imperial Beach	36	Pipe	32.576647 -117.113087
SD-DW0223	City of San Diego	240 x 60	Culvert	32.562647 -117.088167
SD-DW0224	City of San Diego	56	Outfall	32.56681 -117.0996
SD-DW1022	City of San Diego	60	Pipe	32.56571 -116.99681
SD-DW1032	City of San Diego	42	Outfall	32.569429 -117.035969

This page intentionally left blank

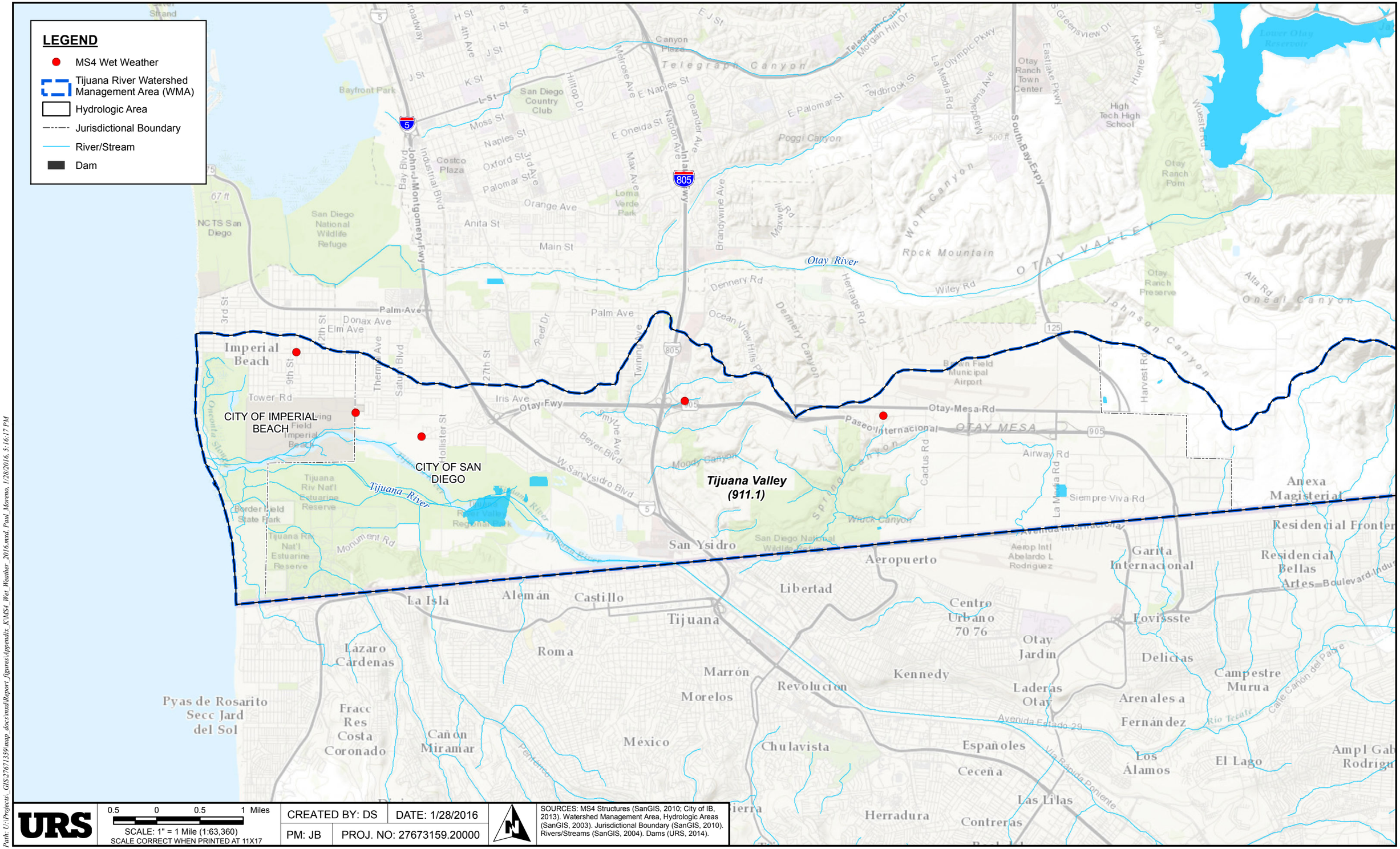

FIGURE K-3 TIJUANA RIVER WATERSHED MANAGEMENT AREA (WMA) MS4 OUTFALL WET WEATHER MONITORING LOCATIONS

This page intentionally left blank

K2.2.2 Monitoring Frequency

During the 2015-2016 fiscal/monitoring year[7], the Cities of San Diego and Imperial Beach will monitor their wet weather MS4 outfall discharge monitoring station(s) in the Tijuana River WMA once (Table K-2-7).

K2.2.3 Field Observations

During the wet weather monitoring event, the following narrative descriptions and observations will be recorded at each wet weather MS4 outfall discharge monitoring station:

- Narrative description of the monitoring event
- Location
- Date
- Duration of the storm event
- Storm event rainfall total
- Antecedent dry period
- Flow hydrograph and volume estimations as detailed in Section K3.2.2

K2.2.4 Field Monitoring

During the wet weather monitoring event, the RAs will monitor and record the parameters in Table K-2-5 at each wet weather MS4 outfall discharge monitoring station. Field observations and monitoring will be documented on the storm water field observation form presented in Attachment D.

K2.2.5 Analytical Monitoring

During the wet weather monitoring event, samples will be collected for analysis by an analytical laboratory.

- Grab samples will be collected for the analytes listed in Table K-2-8, according to the procedures detailed in Section K3.1.2.1.
- Analytes amenable to composite sampling will be composited over the course of the storm using time-weighted sampling[8] , according to the procedures in Section K3.1.2.2.

[7] The RAs may conduct additional monitoring in order to identify pollutants in storm water discharges from the MS4s causing or contributing to the highest priority water quality conditions or to guide pollutant source identification efforts. This effort would be above and beyond permit requirements.

[8] Flow-weighted composite sampling may also be utilized at the discretion of the RA.

Table K-2-8
Wet Weather MS4 Outfall Discharge Grab Samples

Parameters
pH[1]
Temperature[1]
Specific conductivity[1]
Dissolved oxygen[1]
Turbidity[1]
Hardness[2]
Indicator Bacteria
Analytical Methods not amenable to composite sampling (e.g. Suspended Sediment Concentration)

[1] This analyte will be monitored *in-situ.*

[2] Collection of receiving water hardness for each outfall location is also required during storm water sampling to calculate storm water action levels (SALs) for hardness-dependent metals.

Per MS4 Permit Provision D.2.c.(5).(a), analytes that are field measured are not required to be analyzed in a laboratory.

The required analyses[9] are based upon the following three groupings of constituents:

1. Constituents contributing to the highest priority water quality conditions identified in the Tijuana River WMA WQIP;
2. Constituents listed as a cause for impairment of receiving waters in the Tijuana River WMA as listed on the 303(d) list; and
3. Applicable storm water action level (SAL) constituents listed in Provision C.2 of the MS4 Permit.

Table K-2-9 details the analyses required for each of the selected wet weather MS4 outfall discharge monitoring locations. Sample collection will follow SWAMP protocols. Analytical methods and detection limits for each analyte are provided in Attachment E.

[9] The RAs may adjust the analytical monitoring required for the Tijuana River WMA if they are able to provide information demonstrating that analysis of the constituent is not necessary.

Table K-2-9
Wet Weather MS4 Outfall Discharge Analytical Monitoring by Site

Analyte	City of Imperial Beach	City of San Diego			
	IB_F-34	SD-DW0223	SD-DW0224	SD-DW1022	SD-DW1032
Conventional Parameters					
Total Hardness[1]	✓	✓	✓	✓	✓
Total Dissolved Solids (TDS)[3]	✓	✓	✓	✓	✓
Total Suspended Solids (TSS)[2,3]	✓	✓	✓	✓	✓
Suspended Sediment Concentration (SSC)[2,3]	✓	✓	✓	✓	✓
MBAS[3]	✓	✓	✓	✓	✓
Indicator Bacteria					
Total Coliform[3]	✓	✓	✓	✓	✓
Fecal Coliform[3]	✓	✓	✓	✓	✓
Enterococcus[3]	✓	✓	✓	✓	✓
Inorganic Analytes					
Aluminum (Dissolved)[5]	✓	✓	✓	✓	✓
Aluminum (Total)[5]	✓	✓	✓	✓	✓
Beryllium (Dissolved)[5]	✓	✓	✓	✓	✓
Beryllium (Total)[5]	✓	✓	✓	✓	✓
Cadmium (Dissolved)[4,7]	✓	✓	✓	✓	✓
Cadmium (Total)[4,7]	✓	✓	✓	✓	✓
Chromium (Dissolved) [5]	✓	✓	✓	✓	✓
Chromium (Total) [5]	✓	✓	✓	✓	✓
Copper (Dissolved)[4,7]	✓	✓	✓	✓	✓
Copper (Total)[4,7]	✓	✓	✓	✓	✓

Table K-2-9
Wet Weather MS4 Outfall Discharge Analytical Monitoring by Site

Analyte	City of Imperial Beach	City of San Diego			
	IB_F-34	SD-DW0223	SD-DW0224	SD-DW1022	SD-DW1032
Lead (Dissolved)[3,4,7]	✓	✓	✓	✓	✓
Lead (Total)[3,4,7]	✓	✓	✓	✓	✓
Manganese (Dissolved) [5]	✓	✓	✓	✓	✓
Manganese (Total) [5]	✓	✓	✓	✓	✓
Mercury (Dissolved) [5]	✓	✓	✓	✓	✓
Mercury (Total) [5]	✓	✓	✓	✓	✓
Molybdenum (Dissolved) [5]	✓	✓	✓	✓	✓
Molybdenum (Total) [5]	✓	✓	✓	✓	✓
Nickel (Dissolved)[3,7]	✓	✓	✓	✓	✓
Nickel (Total) [3,7]	✓	✓	✓	✓	✓
Selenium (Dissolved)[3,7]	✓	✓	✓	✓	✓
Selenium (Total)[3,7]	✓	✓	✓	✓	✓
Silver (Dissolved)[5]	✓	✓	✓	✓	✓
Silver (Total)[5]	✓	✓	✓	✓	✓
Thallium (Total)[3,5]	✓	✓	✓	✓	✓
Thallium (Dissolved)[3,5]	✓	✓	✓	✓	✓
Titanium (Dissolved)[5]	✓	✓	✓	✓	✓
Titanium (Total)[5]	✓	✓	✓	✓	✓
Zinc (Dissolved)[7]	✓	✓	✓	✓	✓
Zinc (Total)[4,7]	✓	✓	✓	✓	✓
Trace Elements[3,5]	✓	✓	✓	✓	✓
Nutrients					
Ammonia[6]	✓	✓	✓	✓	✓
Nitrate as	✓	✓	✓	✓	✓

Table K-2-9
Wet Weather MS4 Outfall Discharge Analytical Monitoring by Site

Analyte	City of Imperial Beach	City of San Diego			
	IB_F-34	SD-DW0223	SD-DW0224	SD-DW1022	SD-DW1032
Nitrogen[4,6]					
Nitrite as Nitrogen[4,6]	✓	✓	✓	✓	✓
Total Kjeldahl Nitrogen (TKN)[6]	✓	✓	✓	✓	✓
Total Nitrogen[3,6]	✓	✓	✓	✓	✓
Total Phosphorus[3,6]	✓	✓	✓	✓	✓
Dissolved Phosphorus[3,6]	✓	✓	✓	✓	✓
Orthophosphate[3,6]	✓	✓	✓	✓	✓
Pesticides/PCBs					
Organophosphorus Pesticides[3]	✓	✓	✓	✓	✓
Pyrethroid Pesticides[3]	✓	✓	✓	✓	✓
Nitrogen Pesticides	✓	✓	✓	✓	✓
Pesticides/PCBs[3]	✓	✓	✓	✓	✓
Organics					
Polyaromatic hydrocarbons (PAHs)	✓	✓	✓	✓	✓
Synthetic Organics[3]	✓	✓	✓	✓	✓

Notes:
1. Collection of receiving water hardness for each outfall location is being performed per Table K-2-8.
2. Parameter contributes to a highest priority water quality condition identified in the Tijuana River WMA Water Quality Improvement Plan.
3. Parameter listed as a cause for impairment of receiving waters in the Tijuana River WMA on the 303(d) list. Pesticides/PCBs as determined by EPA methods 507, 608, 8081, 8081A, and 8141. Synthetic organics are understood to include: di(2-ethylhexyl)adipate, di(2-ethylhexyl)phthalate, hexachlorobenzene, hexachlorocyclopentadiene (HEX), and 2,3,7,8-tetetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD).
4. Parameter listed in SALs for discharges of storm water from the MS4 (MS4 Permit Provision C.2.a)
5. Parameter is listed as Trace Elements in the Tijuana River WMA on the 303(d) list,. Trace element constituent list derived from Fact Sheet for listing Tijuana River (and Tijuana River Estuary) in 1998 and Order No. 90-42 (pers. com H. Yu [RWQCB staff member] on November 10, 2015).
6. Multiple nitrogen and phosphorus species analyzed to address 303(d) listings for eutrophic conditions (nitrogen, nitrate+nitrite, nitrate-nitrogen, ammonia, total Kjeldahl nitrogen [TKN], dissolved and total phosphorous, and orthophosphate).7. Permit-mandated parameter also considered and analyzed as a trace element. See footnote 5.

SECTION K3 METHODOLOGIES AND EQUIPMENT

This section describes the methodologies and equipment that are proposed to be used to complete the MS4 outfall monitoring program for the Tijuana River WMA, as well as the installation and maintenance procedures.

Flow estimation and water quality sampling are dynamic processes which may require modification based on current site and channel conditions. Thus, the methodologies presented are subject to modification or substitution in order to meet the requirements of this monitoring program described in Section 2.

K3.1 FLOW ESTIMATION METHODOLOGIES

K3.1.1 Non-Storm Water Flow Estimation

During non-storm water screening and MS4 outfall monitoring, flow will be estimated visually and/or manually using one of the methodologies detailed in Section 3.2.2 of the USEPA document *NPDES Storm Water Sampling Guidance Document* (USEPA 1992) which is included in Attachment F. These methodologies include, but are not limited to the "float method" and the "bucket and stopwatch method".

K3.1.2 Storm Water Flow Estimation

Flow hydrograph and storm volume will be estimated in accordance with the Section 3.2.1 of the USEPA document *NPDES Storm Water Sampling Guidance Document* (USEPA, 1992). Flow- or time-weighted composite sampling may be performed at the discretion of the RA.

Due to flood control concerns typically associated with MS4 outfalls during storm events, a primary measurement device such as a weir or flume is unlikely to be selected. Thus, a lower profile secondary flow measurement device, such as an area-velocity sensor or bubbler pressure transducer, may be used for MS4 outfall flow estimation.

If a secondary measurement device is selected, an American Sigma 950 flow meter (or equivalent) will be used, which will be connected to an automated sampler to control or pace the sampler and store sampling data. The flow meter will measure and log estimated flow, rainfall, and sample history.

If flow-weighted sampling is employed, the flow meter may be outfitted with one of the following sensor types depending on the site conditions:

- Submerged area-velocity (AV) sensor;
- Submerged AV sensor with a bubbler;
- Pressure transducer level sensor;
- Pressure bubbler level sensor;
- Low profile velocity sensor; or
- Ultrasonic sensor (Hach, 2009).

Data containing storm and hydrological information is electronically stored in the flow meter, with each monitoring event stored separately. The recorded information includes:

- Flow rates
- Time of peak flow rate
- Cumulative rainfall
- Rainfall intensity
- Discharge volume totals
- Time of each sample
- Success or failure of each sample

Data downloads will occur after a monitoring event is complete. If data gaps occur due to data loss associated with debris fouling, flows from the respective drainage area may be estimated from the drainage area and impervious cover calculations.

K3.2 WATER QUALITY SAMPLING

K3.2.1 Grab Sample Collection

Grab samples for wet weather or non-storm water persistent flow MS4 outfall monitoring will be performed according to the requirements of the Permit and Section K2 of this monitoring plan. Grab samples will be collected directly in clean laboratory-supplied sampling containers or other suitably decontaminated container. An automated sampler may be used to collect grab samples only if manual sample collection is determined to be infeasible. The decision regarding the method of sample collection will be made on a case-by-case basis by the field sampling team and documented. Analytes that are field measured are not required to also be analyzed by a laboratory. A receiving water grab sample for hardness analysis will also be collected from the nearest downstream receiving water body associated with each outfall.

K3.2.2 Composite Sample Collection

For wet weather events, a flow- or time-weighted [10] composite sample will be collected over the length of the storm event or a 24-hour period, whichever is shorter. At least one sample aliquot every 30 minutes will be collected during a storm event.

The representativeness of any composite sample depends on many factors. Best professional judgment will be used to determine whether samples with questionable representativeness will be analyzed. Ideally, the following criteria will be achieved, but these are not considered requirements.

- A minimum of 20 sample aliquots during the monitoring event

[10] Flow weighted composite sampling may be utilized at the discretion of the RA.

- Collection of sample aliquots from the onset of rainfall until flow returns to within 10% of base flow or sampling has been undertaken for 24 hours
- Sample aliquots that represent at least 75% of the monitoring event total flows or a 24-hour time period
- If flow weighted composite sampling is utilized, sufficient sample pacing so that the stream flow does not lead to the automated sampler becoming outpaced (i.e., unable to keep up with required sample collection)

If automated compositing is not feasible, a composite sample will be collected using a minimum of 4 grab samples, collected during the first 24 hours of the storm water discharge, or for the entire storm water discharge if the storm event is less than 24 hours.

The automated sampler proposed for this project is an American Sigma 900 MAX or equivalent, which incorporates an intake strainer, Teflon-lined intake tubing, flexible silicon pump tubing, a peristaltic pump, and sample bottles. The autosampler will be deployed by the field team upon arrival at each site. Depending on the site conditions and safety characteristics, the samplers will be programmed to collect time-weighted composite samples throughout a monitoring event. The automated samplers and flow meters will be powered by 12-VDC batteries.

The intake strainers will be securely fastened at the desired sampling point in the runoff flow stream to collect samples from the center of the flow regime. Intake tubing will be attached to the flexible silicon pump tubing at the sampler's peristaltic pump. Samples will be collected into a clean glass bottle that is appropriately labeled with the sample identifier (ID), date, and time, and will be preserved on ice for transport to the laboratory. After compositing, samples will be subsampled by the analytical laboratory staff into the appropriate bottles for individual analysis. Non-powered nitrile or latex gloves will be worn during sample handling.

Bacteria samples and field measurements will be taken via grab samples along with field measurements after the second hour of storm water runoff and before the sixth hour of storm water runoff. Relative to radar imagery or NOAA quantitative precipitation statements, if the storm water runoff duration is estimated to be less than 2 hours, the grab sample will be collected as close to the peak of flow as possible. Bacteria samples will be collected using sterile techniques. Non-powdered nitrile or latex-type gloves will be worn during sample handling. During the sampling event, an intermediate sampling bottle (certified clean by the analytical laboratory) will be used to collect runoff discharge and transferred to a 100-milliliter (mL) sterile bacteria bottle. Care will be employed to not allow contact with area structures or the bottom sediments. The bacteria sample container will be closed immediately following sample transfer. If it is suspected that the container was compromised at any time, the sample container will be discarded, and a new sample will be collected with the same methodology. The sample bottle must be filled only to the 100-mL mark on the bottle (not over topped or under filled). A receiving water grab sample for hardness will also be collected from the nearest downstream receiving water body associated with each outfall.

Field measurements will include pH, conductivity, temperature, dissolved oxygen (DO), and turbidity using a YSI Inc. 6600 series water quality probe or similar device.

A field observation data sheet will be completed (Attachment D) for each sample collected to document representative site conditions during each sample collection. COC documentation will be completed, and samples will be delivered to the appropriate laboratory within allowable holding times for each respective analytical method.

K3.2.2.1 Installation of Monitoring Equipment

Field teams will determine the most appropriate installation of monitoring equipment based on safety, security, and sampling quality (i.e., best professional judgment). Once the annual monitoring requirement is completed, monitoring equipment will be demobilized.

K3.2.2.2 Calibration of Monitoring Equipment

Calibration of monitoring equipment will be performed in accordance with manufacturer specifications during installation and checked prior to monitoring events per the calibration frequencies discussed in Table K-3-1. A calibration log will be maintained for calibrations performed in the field. Prior to monitoring events, field teams will verify that the batteries are sufficiently charged, that the automated samplers and flow monitoring equipment are calibrated and active, and that the system pumps are functioning as designed. The flow sensors will be checked for debris. Additional preparation for monitoring events includes performing general equipment inspections to confirm that the sites are operational.

Table K-3-1
Calibration of Field Sampling Equipment and Monitoring Instruments

Proposed Equipment	Calibration Description	Responsible Person	Frequency	SOP Reference
Sigma 950 flow meter (level only)	Water level check against known levels	Sampling Team	Semi-annually	Sigma 950 O&M Manual 3314
Sigma 900MAX automated sampler	Aliquot calibration	Sampling Team	Semi-annually	Sigma 900MAX Sampler O&M Manual DOC026.53.00742

Notes:
O&M = operations and maintenance.
SOP = standard operating procedure.

SECTION K4 STORM WATER EVENT MONITORING LOGISTICS

Storm events will be considered viable for mobilization if they are predicted to produce at least 0.10 inch of rainfall in the drainage area with at least a 70% chance of rainfall. The storm monitoring team will determine if mobilization is suitable based on predicted rainfall patterns and cumulative rainfall that can produce via runoff for sampling. Each storm of at least 0.10 inch of rainfall must be separated by a minimum of 72 hours, and the forecasted storm volume within + 50% of the average storm volume and duration for the region. These mobilization criteria must be met at least 24 hours prior to the anticipated onset of rainfall. For the purposes of these criteria, storm forecasts will be obtained from the National Weather Service-sponsored websites (e.g., http://www.wrh.noaa.gov/sgx/).

For each monitoring event, a narrative description of the station, which includes the location, date, and duration of the storm event(s) sampled; rainfall estimates of the storm event; and the duration between the storm event sampled and the end of the previous measurable (greater than 0.10 inch rainfall) storm event, will be recorded.

This page intentionally left blank

SECTION K5 PERSONNEL

Water quality monitoring tasks require a variety of skills and positions. The recommended personnel include:

- Project Manager.
- Sampling Manager.
- Field Technicians.

Project Manager – During monitoring events, the Project Manager will monitor the status of the monitoring stations via communication with field crews. The Project Manager will interpret the most recent weather forecasts to guide field technicians on proper sample collection times. If an assistant fills this position, the consultant's Project Manager will be available for supporting mobilization and monitoring decisions, if needed.

Sampling Manager – The Sampling Manager will be an experienced field supervisor for guiding and directing the field team. This position requires a thorough understanding of project requirements, sampling procedures, and equipment operations. The Sampling Manager will communicate frequently with the Project Manager to determine monitoring priorities. The Sampling Manager will also monitor the safety and effectiveness of the field team, and will notify the Project Manager if relief teams are needed. The Sampling Manager must be able to troubleshoot the common problems that could be experienced by any of the field teams, and will be make sure that data are recorded properly. The Sampling Manager will also provide on-site weather observations for the Project Manager.

Field Technicians – Depending on the level of effort needed, the Sampling Manager will have one to three field technicians for monitoring assistance. Field technicians are field personnel trained in water quality sample collection and Health and Safety issues.

K5.1 MONITORING EVENT PREPARATION

Monitoring for flow and water quality of runoff requires considerable planning prior to an actual monitoring event occurring. The uncertainty of weather forecasts coupled with abrupt changes in the weather can alter mobilization decisions or create false starts. A Staffing Plan, which designates personnel and equipment required for monitoring, will be completed for each potential monitoring event.

The Staffing Plan should include the following:

- Personnel assigned for monitoring.
- Shift (e.g., start-up and relief).
- Equipment mobilization.
- Communication channels.

Field teams will not be mobilized during or near certain holidays if either the mobilization or the laboratory analysis is projected to continue through that holiday. This includes the following holidays and dates:

- Thanksgiving: November 26 and 27, 2015.
- Christmas: December 24 and 25, 2015.
- New Year's: December 31, 2015, and January 1, 2016.

K5.1.1 Weather Tracking

Weather will be tracked for monitoring purposes from October 1 to April 30 (wet weather season) using National Weather Service-sponsored and other suitable weather-prediction websites to determine whether and when to mobilize monitoring crews. Mobilization decisions will be in accordance with Section K4. The field sampling manager and/or project manager may modify the criteria on a storm by storm basis, in consultation with the RAs.

K5.1.2 Station Preparation

Prior to a monitoring event, stations will be made ready for monitoring. These preparations include verifying that the automated samplers and flow monitoring equipment are calibrated and active, and that the system pumps are functioning as designed. Additional preparation for monitoring events includes performing general equipment inspections to confirm that the sites are operational.

Pre-storm assessment will include checking the performance of the equipment, checking power supplies, inspecting and clearing intake structures, checking the status of instrumentation desiccant, and performing any necessary equipment repairs to keep the monitoring equipment operational.

Field teams will verify that the automated sampler has been programmed properly.

K5.1.3 Additional Sampling Gear

Equipment proposed for water quality monitoring and sampling includes that listed in Table K-5-1.

Table K-5-1
Storm Kit Equipment and Mobilization List

Storm Kit Equipment List	Mobilization List
Flashlights (2) Maps High-quality alkaline D-cell batteries Spare sample labels Pencils and indelible markers Desiccant (packages and jar) Diagonal clipper Electrical tape Cable ties (assorted sizes) Utility knife Ziploc bags (assorted sizes) Nitrile gloves Keys Sampling pole for grab samples Manhole lifter	Field notebook (including Job Hazard Analysis (JHA) and Tailgate Safety Meeting Forms) Paper towels Spare chains of custody Sample control paperwork Extra-fine indelible markers Sample bottles Reagent-grade, analyte-free deionized water (3-gallon jug) from the laboratory Cellular phone Personal rain gear Digital or disposable camera Necessary safety gear (see Attachment G - *Health and Safety Plan*)

K5.1.4 Communication Channels

Communication channels will be established for personnel to contact each other before and during the event. The project field notebook will include phone contacts with home, work, and cellular numbers of the field team, management staff, the analytical laboratory, and RA personnel for comprehensive communication.

K5.1.5 Data Retrieval

After each successful water quality monitoring event, flow and rainfall data will be downloaded from the flow meter.

SECTION K6 SAMPLE IDENTIFICATION, TRANSPORT, AND CUSTODY

K6.1 SAMPLE PRESERVATION

K6.1.1 Grab Sample

Once a grab sample is collected it will be sealed, labeled, and placed directly into a cooler with wet ice sufficient to maintain a sample temperature of 4 degrees Celsius or less and under chain of custody (COC).

K6.1.2 Composite Sample

Composite samples will be collected into a 19-L borosilicate glass bottle. These bottles will be kept in protective buckets with wet ice sufficient to maintain a sample temperature of 4 degrees Celsius or less and under COC. Following completion of a sampling event, they will be sealed and labeled. Composite sample bottles will remain under COC during each sampling event.

K6.2 SAMPLE LABELING

Water quality sample bottles will be pre-labeled, to the extent possible, before each monitoring event. Pre-labeling bottles simplifies field activities and leaves only date, time, sample ID, and sampling personnel names to be filled out in the field. Each sample collected will be labeled with the following information:

- Project name
- Monitoring program
- Event number
- Date and time (24 hour time)
- Site ID number
- Bottle __ of __ (for multi-bottle samples)
- Collected by
- Analysis type
- Preservation (if applicable)

K6.3 CHAIN-OF-CUSTODY FORMS

COC forms will be pre-printed along with the bottle labels. These forms will contain at a minimum the same data as the sample labels do. The COC forms will be completed in the field with dates, times, and sample team names, and will be cross-checked with the bottle labels. For composite samples, the start of

the holding time will be considered to be the time that the last sample aliquot was collected. An example COC is presented in Attachment H.

COC procedures will be followed for each sample throughout the collection, handling, and analysis process. The principal document used to track possession and transfer of samples is the COC form. For each sample, data will be recorded on a COC form the day it is collected. Data entries will be made manually, in indelible ink. Corrections will be made by drawing a single line through the error (leaving the original information legible), writing in the correct information, then dating and initialing the change. Blank lines and spaces on the COC form will be lined out, dated, and initialed by the individual maintaining custody. If used, electronic COC (eCOC) forms generated from a custom field application will be emailed directly to the laboratory and QA officer.

A sample will be considered to be in one's custody if they are:

- In the custodian's possession or view,
- In a secured location (under lock) with restricted access, or
- In a container that is secured with an official seal so that the sample is unlikely to be accessed without breaking the seal.

Each person in custody of samples will sign the COC form validating that the samples were not left unattended without being properly secured. Copies of all COC forms will be retained in the project files.

K6.4 SAMPLE TRANSPORT

Transport of the samples will be coordinated with the laboratories by the project manager. Samples will be transported to the selected analytical laboratory by the field team, a lab courier, or a shipping company.

Specific sample-handling procedures are as follows:

- Ice will be sealed in plastic bags and placed in the shipping containers for subsamples.
- Individual sample containers (post-compositing and subsampling) will be packed to prevent breakage, and transported in an ice chest or other suitable container.
- Glass jars will be separated in the shipping container by shock-absorbent material (e.g., bubble wrap) to prevent breakage.
- Upon transfer of sample possession to the analytical laboratory, each person responsible for custody of the sample container will sign the COC form. Upon receipt of samples at the laboratory, the receiver will record the condition of the samples on a sample receipt form. COC forms will be used internally in the laboratory to track sample handling and final disposition.

SECTION K7 QUALITY ASSURANCE AND QUALITY CONTROL

K7.1 FIELD QUALITY ASSURANCE/QUALITY CONTROL

This section presents quality assurance/quality control (QA/QC) activities associated with field sampling. Field QA/QC samples will be used to evaluate potential contamination and sampling errors applicable to automated composite samples and grab samples that may be introduced prior to submittal of the samples to the analytical laboratory.

K7.1.1 Training

Field personnel will be trained in the use of the monitoring equipment and clean sampling techniques along with appropriate health and safety protocols (Attachment G). The Health and Safety plan will be reviewed and updated as required.

Each field team member will review the Health and Safety Plan and consult with the Sampling Manager if they have any questions before mobilization. The Sampling Manager will train field personnel in sampling protocols and procedures in accordance with this Monitoring Plan's goals and objectives.

K7.1.2 *In-situ* Field Measurements

The quality of *in-situ* field data will be assessed by accuracy and completeness. Applicable quantitative goals for field data are presented in Table K-7-1.

Table K-7-1
***In-Situ* Field Measurement Data Quality Objectives**

Parameter	Range	Accuracy	Resolution	Completeness
Electrical Conductivity	0 to 100 mS/cm	± 0.5% of reading + 0.001 mS/cm	0.001 to 0.1 mS/cm (range-dependant)	90%
pH	0 to 14 units	±0.2 units	0.01 unit	90%
Temperature	-5 to +50 ˚C	±0.15 ˚C	0.01 ˚C	90%
Dissolved Oxygen	0 to 50 mg/L	0 to 20 mg/L ±0.01 mg/L or 1% of reading, whichever is greater; 20 to 50 mg/L ±15% of reading.	0.01 mg/L	90%
Turbidity	0 to 1,000 NTU	±2% of reading or 0.3 NTU, whichever is greater	0.1 NTU	90%

Notes:
˚C - degrees Celsius
mg/L - milligrams per liter
mS/cm - milliSiemens per centimeter
NTU - nephelometric turbidity units

K7.1.3 Field Quality Control Samples

The field QA/QC samples that will be utilized are field blanks, field duplicates, and equipment blanks (if equipment is decontaminated and re-used in the field). Sample types, measurement objectives, and frequencies based on SWAMP guidelines are summarized in Table K-7-2.

Table K-7-2
Field Quality Control Samples

Sample Type	Measurement Objective			Frequency of Analysis
	Field Duplicate	Field Blank	Equipment Blank[b]	
Conventionals	RPD<25%[a]	<RL for target analyte	<RL for target analyte	5% of total project sample count
Indicator Bacteria	RPD<25%[c]	Negative Response	Negative Response	5% of total project sample count
Metals	RPD<25%[a]	<RL for target analyte	<RL for target analyte	5% of total project sample count
Nutrients	RPD<25%[a]	<RL for target analyte	<RL for target analyte	5% of total project sample count
Solid Parameters	RPD<25%[a]	<RL for target analyte	<RL for target analyte	5% of total project sample count
Organics	Per method	<RL for target analyte	<RL for target analyte	5% of total project sample count

Notes:

RL = reporting limit.

RPD = relative percent difference.

a. NA if native concentration of either sample<RL.

b. For equipment blanks, the frequency is 5% per batch or lot. A batch is defined as the group of bottles that have been cleaned at the same time, in the same manner, or, if decontaminated bottles are sent directly from the manufacturer, the batch would be the lot designated by the manufacturer in their testing of the bottles.

c. Field duplicates are not a current SWAMP requirement for indicator bacteria. However, the collection and analysis of a field duplicate is recommended.

K7.1.3.1 Equipment Blanks

The selected analytical laboratory will decontaminate the 19-L sample bottles, Teflon-lined tubing, silicone pump tubing, silicone bottle stoppers, and stainless steel sample intake strainers. The following blank samples will be created for analysis:

- One blank sample representative of the cleaned silicone and Teflon-lined tubing. Blank water will be passed through at least 10% of cleaned tubing and be representative of both silicone and Teflon-lined tubing.
- One blank representing the bottles and stoppers. Blank water will be passed into/over at least 10% of cleaned bottles and stoppers.

The analytical laboratory will analyze the equipment blanks for total organic carbon and total metals at a minimum. The analytical laboratories will analyze blank water from the cleaned sampling equipment at the same detection level proposed for sample analysis; this will verify that the sampling equipment in contact with sample water is clean and is not a likely source of contamination.

If a blank sample produces an analyte detection above the RL, the equipment will be cleaned and blanked again. Cleaned and blanked sampling equipment will not be deployed for sampling until an acceptable blank analysis has occurred unless directed by the RAs.

K7.1.3.2 Field Duplicates

A field duplicate sample will be collected during each monitoring event. A field duplicate of *in-situ* parameters will not be performed.

K7.1.3.3 Field Blanks

A field blank sample will be prepared during each monitoring event. The field blanks will be created by pouring laboratory-grade distilled, deionized water into laboratory supplied bottles at one of the monitoring sites.

K7.1.4 Inspection/Acceptance of Supplies and Consumables

Sample bottles (provided by the laboratory) and collection equipment will be inspected prior to their use. Procured supplies will be examined for damage prior to use per Table K-7-3.

Field supplies will be stored at the sampling team's offices; laboratory supplies will be stored at the laboratory. Inspection and testing requirements for laboratory supplies are covered in the laboratory's QA/QC procedures.

Table K-7-3
Inspection/Acceptance Testing Requirements for Consumables and Supplies

Project-Related Supplies/ Consumables	Inspection/Testing Specifications/Source	Acceptance Criteria	Frequency	Responsible Party
Pre-cleaned sample bottles	Closed bottle	Lids screwed on bottles	100%	Sampling Team
Composite sample bottles	Laboratory cleaned	Pass blanking analysis	Clean bottles each monitoring event	Laboratory/Sampling Team
Silicone tubing	Laboratory cleaned	Pass blanking analysis	New tubing each season	Laboratory/Sampling Team
Teflon tubing	Laboratory cleaned	Pass blanking analysis	New tubing each season	Laboratory/Sampling Team
Gloves	New box	New box	As needed	Sampling Team

K7.1.5 Field Audits

The project manager may conduct spot verifications that field activities are being conducted in accordance with this monitoring plan, and has the authority to issue a stop work order on sample collection. Identified non-conformances will be discussed in the WQIP annual report.

K7.1.6 Field Corrective Action

The field sampling manager will be responsible for correcting equipment malfunctions during field sampling. In the case of field instruments, problems will be addressed through cleaning the instrument, repairing it, or replacing the entire instrument, as warranted.

K7.2 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

This section addresses QA/QC activities associated with laboratory analyses. Laboratory QA/QC samples provide information to assess potential laboratory contamination, analytical precision, and accuracy. Analytical quality assurance for this program includes the following:

- Analytical laboratories certified through the California Environmental Laboratory Accredited Program (ELAP) to ensure the quality of analytical data used for regulatory purposes to meet the requirements of the State. ELAP-accredited laboratories have demonstrated capability to analyze environmental samples using approved methods.
- Adherence to documented procedures, United States Environmental Protection Agency (USEPA) approved methods, and written Standard Operating Procedures (SOPs).
- Calibration of analytical instruments.
- Use of quality control samples, internal standards, surrogates, and Standard Reference Materials (SRMs).
- Complete documentation of sample tracking and analysis.

Internal laboratory quality control checks will include the use of laboratory replicates, method blanks, matrix spikes/matrix spike duplicates (MS/MSDs), and laboratory control samples (LCSs). The quality control checks performed by constituent class is presented in Table K-7-4. The frequency of the laboratory QA/QC samples is presented in Attachment I.

Table K-7-4
Laboratory Quality Control Samples by Constituent Class

Laboratory Quality Control	Constituent Class							
	Conventionals	Indicator Bacteria	Inorganic Analytes	Nutrients	Solid Parameters	Acute Toxicity	Chronic Toxicity	Synthetic Organic Compounds
Calibration Standard	✓	–	✓	✓	–	–	–	–
Calibration Verification	✓	–	✓	✓	–	–	–	✓
Laboratory Blank	✓	✓	✓	✓	✓	–	–	✓
Reference Material	✓	–	✓	✓	–	–	–	✓
Matrix Spike	✓	–	✓	✓	–	–	–	✓
Matrix Spike Duplicate	✓	–	✓	✓	–	–	–	✓
Laboratory Duplicate	✓	✓	✓	✓	✓	–	–	–
Internal Standard	✓	–	✓	–	–	–	–	✓
Tuning	–	–	–	–	–	–	–	✓
Surrogate	–	–	–	–	–	–	–	✓
Calibration	–	–	–	–	–	–	–	✓

K7.2.1 Data Quality Objectives

Data quality objectives (DQOs) are quantitative and qualitative statements that define project objectives and specify the acceptable ranges of field sampling and laboratory performance. Numeric DQOs for *in-situ* measurements and water samples are listed in Attachment J. DQOs for this project will include the following:

- Accuracy
- Precision
- Completeness

Accuracy describes how close the measurement is to its true value. Accuracy is the measurement of a sample of known concentration and comparing the known value against the measured value. The accuracy of chemical measurements will be checked by performing tests on a standard prior to and/or during sample analysis. A standard is a known concentration of a certain solution. Standards can be purchased from chemical or scientific supply companies. Standards might also be prepared by a professional partner (e.g., a commercial or research laboratory). The concentrations of the standards should be within the mid-range of the equipment. Recovery measurements are determined by spiking a replicate sample in the laboratory with a known concentration of the analyte. Accuracy of the project data

will be determined by comparing results from MS/MSDs, LCSs, field blanks, and equipment blanks to the accuracy objectives specified in Attachment J.

Precision describes how well repeated measurements agree. The evaluation of precision described here applies to repeated measurements and samples collected in the field (field duplicates) or the laboratory (laboratory replicates and MS/MSDs). Precision measurements will be determined by comparing results from field duplicates, laboratory replicates and MSD to the precision objectives specified in Attachment J. Relative Percent Differences (RPDs) will be calculated to determine the precision between duplicate samples. This calculation is presented in Equation 1.

$$RPD = \frac{abs[x_1 - x_2]}{0.5 * (x_1 + x_2)} \qquad \text{Equation 1}$$

where:

abs is the absolute value.
x_1 is measurement 1.
x_2 is measurement 2.

Completeness is the fraction of planned data that must be collected to fulfill the statistical criteria of the project. There are no statistical criteria that require a certain percentage of data. However, the anticipated target is 90%. This accounts for adverse weather conditions, safety concerns, and equipment problems. The project team determined completeness by comparing the number of measurements planned to be collected with the number of measurements actually collected that are deemed valid. An invalid measurement would be one that does not meet the sampling method requirements. Completeness will be measured as a percentage of the number of samples collected that meet the respective DQOs compared to the anticipated number of samples. This calculation is presented in Equation 2.

$$Completens\,s = \frac{Actual\ \ number\ \ of\ \ samples\ \ collected}{\Pr oject\ \ required\ \ total\ \ samples\ \ to\ \ be\ \ collected} * 100 \qquad \text{Equation 2}$$

K7.2.2 Instrument/Equipment Calibration and Frequency

Laboratory equipment will be calibrated based on manufacturer recommendations and in accordance with the method and laboratory SOP, which will be available upon request.

K7.2.3 Corrective Action

Corrective action will be taken when an analysis is deemed suspect. Reasons a sample may be considered suspect consist of exceedances of the RPD ranges, spike recoveries, and blanks. The corrective action may vary from analysis to analysis, but typically will involve the following:

- Check of procedures.
- Review of documents and calculations to identify possible errors.
- Error correction.

- Re-analysis of the sample extract, if available, to see if results can be improved.
- Reprocessing and re-analysis of additional sample material, if it is available.

Malfunctions that occur during data collection and laboratory analyses will be the responsibility of the field crew or laboratory conducting the work, respectively. In the case of field instruments, problems will be addressed through instrument cleaning, repair, or replacement of parts or the instrument, as warranted. Field crews should carry basic spare parts and consumables with them, and have access to spare parts. The laboratories have procedures in place to follow when failures occur, and have identified individuals responsible for corrective action and developed appropriate documentation as needed.

This page intentionally left blank

SECTION K8 ASSESSMENT AND REPORTING

The RAs within the Tijuana River WMA are required to submit a WQIP Annual Report for the 2015-2016 reporting year by January 31, 2017. The results of the wet weather and non-storm water persistent flow MS4 outfall discharge monitoring data collected under this monitoring plan will be presented in that report. The following will be reported at a minimum:

- Applicable tabular and graphic data
- A summary of the removal or re-prioritization of the highest priority persistent flow MS4 outfall monitoring stations[11]

Detailed information regarding the Assessment Program for the Tijuana River WMA is contained in Section 4.2 of the Tijuana River WMA WQIP.

[11] Persistent flow MS4 outfall monitoring stations that have been removed will be replaced with the next highest prioritized MS4 outfall in the respective RA's jurisdiction in the Tijuana River WMA, unless there are no remaining qualifying major MS4 outfalls within the RA's jurisdiction in the WMA.

This page intentionally left blank

SECTION K9 REFERENCES

Hach. 2009. Catalog Number 3314: Sigma 950 Flow Meter User Manual. August, 2009. Available online at: http://www.hachflow.com/pdf/3314_950.pdf.

San Diego Regional Water Quality Control Board (Regional Board). 2010. *Revised TMDL for Indicator Bacteria, Project I–Twenty Beaches and Creeks in the San Diego Region (including Tecolote Creek)*. Resolution No. R9-2010-0001. Approved February 10. http://www.waterboards.ca.gov/sandiego/water_issues/programs/tmdls/docs/bacteria/updates_022410/2010-0210_BactiI_Resolution&BPA_FINAL.pdf.

United States Environmental Protection Agency (USEPA). 1992. NPDES Storm Water Sampling Guidance Document (EPA-833-B-92-001). July, 1992. Available online at: http://www.epa.gov/npdes/pubs/owm0093.pdf.

United States Environmental Protection Agency (USEPA). 1998. Environmental Monitoring and Assessment Program Surface Waters: Field Operations and Methods for Measuring the Ecological Condition of Wadeable Streams.

This page intentionally left blank

Attachment A
Field Screening Visual Observation Form

To be provided at a later date

This page intentionally left blank

Attachment B
Dry Weather Field Observation Form

To be provided at a later date

This page intentionally left blank

Attachment C
Analytical Methods and Detection Limits for MS4 Outfall Persistent Flow Monitoring Constituents

To be provided at a later date

This page intentionally left blank

Attachment D
Storm Water MS4 Outfall Field Observation Form

To be provided at a later date

This page intentionally left blank

Attachment E
Analytical Methods and Detection Limits for Wet Weather
MS4 Monitoring Constituents

To be provided at a later date

This page intentionally left blank

Attachment F
NPDES Storm Water Guidance Document

To be provided at a later date

This page intentionally left blank

Attachment G
Health and Safety Plan

To be provided at a later date

This page intentionally left blank

Attachment H
Example Chain of Custody

To be provided at a later date

This page intentionally left blank

Attachment I
Laboratory Quality Assurance/Quality Control

To be provided at a later date

This page intentionally left blank

Attachment J
Data Quality Assurance/Quality Control

To be provided at a later date

This page intentionally left blank