This appendix provides examples of the use of the Threat-to-Water Quality (TTWQ) methodology discussed in the 2011 Long-Term Effectiveness Assessment (LTEA) Section 4. All of the examples presented in this appendix, although may include some real data and information, are fictional in nature and are intended to be for example purposes only.

The tables presented in this appendix are provided in electronic form on the accompanying 2011 LTEA compact disc. The compact disc also contains template (blank) forms for use in conducting the TTWQ methods.

The imagery for the examples are taken from the watershed interactive mapping in the 2011 LTEA Water Quality Report included as Attachment 1 to the 2011 LTEA. The aerial imagery is from Google Earth and includes overlays from City of San Diego storm drain mapping and hydrologic areas – the data and information presented in these images are not necessarily accurate or correct, but are presented as examples only.

The plots and tables in the examples below, illustrate a process in which the TTWQ in a particular watershed is analyzed by using available data and information to prioritize sources. The primary approaches to the TTWQ process are presented for two monitoring locations in the Peñasquitos watershed. Four examples are provided:

1) Single Pollutant Approach on Large Area Scale (MLS/TWAS)
2) Multi-Pollutant Approach on Large Area Scale (MLS/TWAS)
3) Single Pollutant Approach on Small Area Scale (MLS/TWAS)
4) Investigative Method using TTWQ Approach (MS4 Outfall)

As discussed in Section 4 of the LTEA, the methodologies for the single and multi-pollutant approaches are listed below:

Steps for Single Pollutant Approach to TTWQ

1) Determine Scale to Develop Threat to Water Quality
    a. Regional
    b. Hydrologic Area
    c. Hydrologic Subarea
    d. Tributary Area
    e. Jurisdictional
2) Determine Wet or Dry Weather Conditions
3) Determine Water Quality Issues (Pollutant(s)) to Evaluate
    a. LTEA Water Quality Priorities (RW and MS4)
    b. TMDLs
    c. 303(d)
    d. Special Studies
4) Associate Sources[1] to Pollutant
    a. Source SLPs
    b. PGA Associations to Pollutants
    c. Special Studies
5) Incorporate Source Quantities
6) Incorporate Other Criteria as Desired

[1] May include land use as a source

7) Develop Priority Ranking of Sources

A multi-pollutant approach to TTWQ follows:

1) Perform Steps 1 and 2 above
2) Repeat steps 3-6 above for each pollutant, each time identifying the priority ranking of sources for each pollutant.

The first example is for an area that is tributary to a MLS in the Peñasquitos WMA and demonstrates a multi-pollutant approach to TTWQ. The mass loading station, LPC-MLS, is the monitoring location that captures a large tributary area spanning two Hydrologic Areas (HAs) in the watershed.

Multi-Pollutant Large Area Scale TTWQ Approach

1) Determine Scale to Develop Threat to Water Quality

When determining the TTWQ, the first step is to determine the scale and location where a particular monitoring location can characterize the flow from a tributary area. For the example, Figures B-1 and B-2 show the Peñasquitos watershed and the associated monitoring locations, including MLS, TWAS, and MS4 outfalls.

For this example, the ***mass loading station LPC-MLS*** has been chosen because of its large tributary area. Figure B-1 shows the Los Peñasquitos Creek WMA dry weather urban runoff and receiving water base map. To see the tributary area to the LPC-MLS station to be used in the example, Figure B-2 shows the drainage to the MLS throughout the watershed, which is turned on as one of the map layers. The station is encircled in red on the maps in order to callout its location.

2) Determine Wet or Dry Weather Conditions

The flow conditions should be selected at this point. For the example, a ***dry weather*** condition is selected.

3) Determine Water Quality Issues (Pollutant(s)) to Evaluate

Using Table 2-2 of the LTEA, the water quality issues are identified by reviewing the watershed priority constituents presented. This process identifies the pollutants that are deemed a priority based on the water quality monitoring data. This step is conducted by reviewing the priorities table (LTEA Table 2-2) and locating the appropriate row containing information pertaining to the monitoring location. Table B-1 below shows the watershed priority constituents identified for mass loading station LPC-MLS in the Peñasquitos WMA. The high priority constituents have been highlighted to show a corresponding 'high' score represented in the data. The outcome of this step is ***Nutrients and Bacteria/Pathogens*** as Dissolved Minerals (TDS) is not an analyte that is selected for Copermittee action in this example due to its nexus to groundwater and/or imported water issues.

4) Associate Sources to Pollutant

Using the high priority constituents determined in the step above, the next step is to review the final source loading potentials (SLPs) of sources within the LPC-MLS tributary area that are likely sources contributing to the selected pollutant(s). Using the information presented in Section 3 (LTEA Table 3-10), the activities with source loading potential with regards to mass loading station LPC-MLS have been highlighted based on the three high priority constituents (nutrients and bacteria/pathogens) –see Table B-2 below for sources.

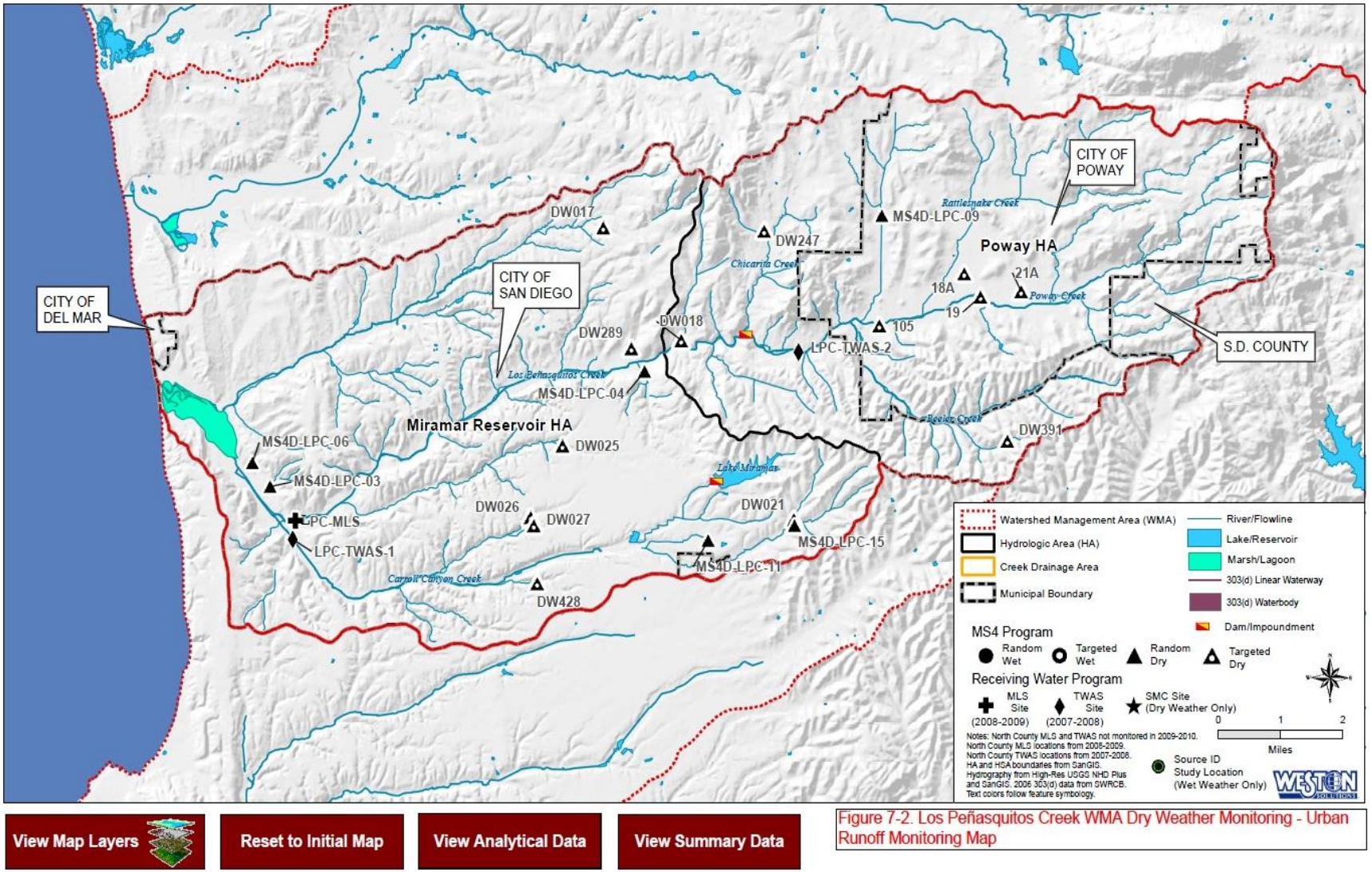

Figure B-1: Los Peñasquitos Creek Monitoring Map

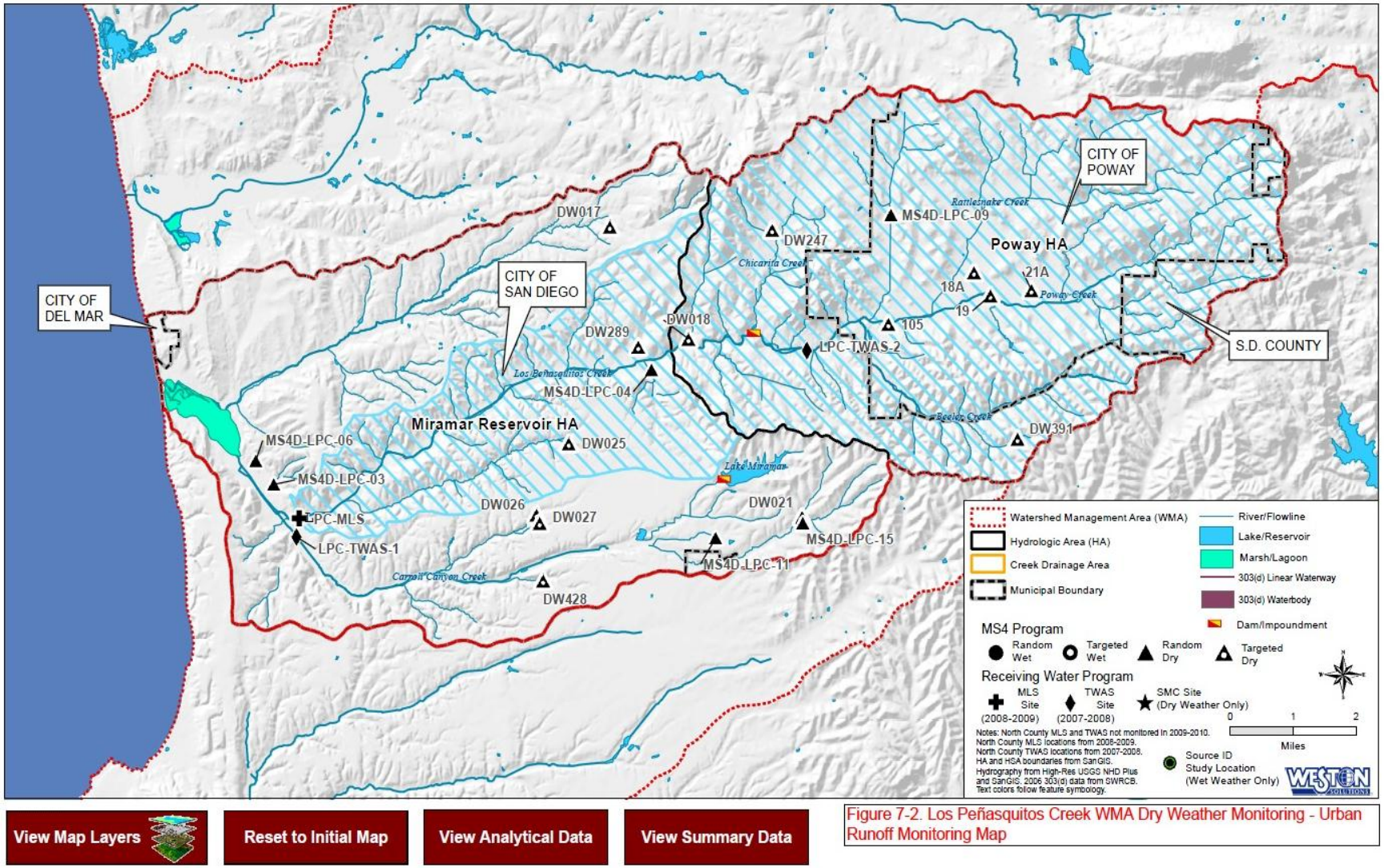

Figure 7-2. Los Peñasquitos Creek WMA Dry Weather Monitoring - Urban Runoff Monitoring Map

Figure: B-2 Los Peñasquitos Creek Monitoring Map showing tributary drainage to Mass Loading Station LPC-MLS

Table B-1: Watershed Priority Constituents Determined by Water Quality Assessment Monitoring Program at LPC-MLS

WMA	Station	Wet							Dry						
		Metals	Oil and Grease	Sediment	Pesticides	Nutrients	Bacteria/ Pathogens	Dissolved Minerals	Metals	Oil and Grease	Sediment	Pesticides	Nutrients	Bacteria/ Pathogens	Dissolved Minerals
Santa Margarita River	SMR-MLS	-	-	M	-	-	M	-	-	-	-	-	H	-	H
	SMR-MLS-2	-	-	H	H	-	H	-	-	-	-	-	H	-	H
San Luis Rey	SLR-MLS	-	-	M	M	-	H	H	-	-	M	-	H	M	H
	SLR-TWAS-1	-	-	H	H	-	H	H	-	-	-	-	M	H	H
Carlsbad	LA-TWAS-1	-	-	H	M	-	H	-	-	-	-	-	H	M	-
	BVC-TWAS-1	-	-	H	H	-	H	-	-	-	-	-	H	M	H
	AHC-MLS	-	-	H	H	-	H	H	-	-	-	-	H	H	H
	AHC-TWAS-1	-	-	H	H	-	H	M	-	-	-	-	H	M	H
	ESC-MLS	-	-	H	H	-	H	H	-	-	-	-	H	H	H
	ESC-TWAS-1	-	-	H	H	-	H	M	-	-	-	-	H	M	H
San Dieguito Creek	SDC-MLS	-	-	M	M	-	H	H	-	-	H	-	H	M	H
	SDC-TWAS-1	-	-	H	H	-	M	M	-	-	-	-	H	M	H
	SDC-TWAS-2	-	-	H	-	H	H	M	-	-	H	-	H	H	H
Los Peñasquitos Creek	LPC-MLS	-	-	M	M	-	H	H	-	-	-	-	H	H	H
	LPC-TWAS-1	-	-	H	M	-	H	M	-	-	-	-	-	H	H
	LPC-TWAS-2	-	-	H	H	-	H	-	-	-	-	-	H	H	H
Mission Bay / La Jolla	MB-TWAS-1	-	-	H	H	-	H	H	-	-	-	M	M	-	H
	MB-TWAS-2	-	-	H	H	-	H	-	-	-	-	M	H	H	-
	TC-MLS	-	-	H	H	-	H	-	-	-	-	-	H	-	-
San Diego River	SDR-MLS	-	-	H	M	-	H	-	-	-	-	-	H	H	H
	SDR-TWAS-1	-	-	H	H	-	H	M	-	-	-	-	H	H	H
	SDR-TWAS-2	-	-	H	H	-	H	-	-	-	-	-	H	M	H
	SDR-TWAS-3	-	-	H	H	-	H	-	-	-	-	-	M	M	H
San Diego Bay - Pueblo	CC-SD8-1	H	-	H	H	-	H	-	H	M	M	M	H	M	-
San Diego Bay - Sweetwater	SR-MLS	-	-	M	M	-	H	H	-	-	-	-	H	M	H
	SR-TWAS-1	-	-	M	M	-	H	M	-	-	-	-	H	M	H
San Diego Bay - Otay	OR-TWAS-1	M	-	M	H	-	-	M	-	-	-	-	H	-	H
Tijuana River	TJR-MLS	-	-	H	H	H	H	-	-	-	M	-	H	H	-
	TJR-TWAS-1	-	-	-	-	H	M	H	-	-	-	-	-	-	-
	TJR-TWAS-2	-	-	H	-	H	H	-	-	-	-	-	-	-	-

Note: H=High Priority, M=Medium Priority pollutant based on the monitoring station data.
Green cells represent the intersection of the site location and the high priority issues for dry conditions.

Table B-2. Final Source Loading Potentials at LPC-MLS

Source Profile #	Activities with Source Loading Potential	Metals	Oil & Grease	Sediment	Pesticides	Nutrients	Bacteria/ Pathogens	Dissolved Minerals	Organics
1	Residential Areas and Activities	L	L	L	L	L	L	L	L
2	Construction Sites > 1 acre	UL	UL	L	UL	UL	UL	L	UL
3	Construction Sites < 1 acre	UL	UL	L	UL	UL	UL	UL	UL
4	Construction Sites: ESA or hillside or sediment TMDL	UL	UL	L	UL	UL	UL	UL	UL
5	Development subject to SUSMPs (> 5,000 sq. ft. impervious area)	UK	UK	UK	UK	UK	UK	UL	UK
6	Roads, streets, highways, and parking facilities	L	L	L	UL	L	L	L	L
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	N	N	L	N	N	UK	UL	N
8	Corporate yards (incl. maintenance/storage yards)	L	L	L	UK	UK	UL	UL	L
9	Parks and Recreational Facilities - parks, golf courses, cemeteries, entertainment venues, etc.	UK	UK	UK	UK	L	UK	UL	UK
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	L	L	UL	UL	UK	UL	L	L
11	Equipment mechanical repair, maintenance, fueling, or cleaning	L	L	UL	UL	UK	UL	UL	L
12	Automobile and Other Vehicle Body Repair and Painting	L	L	UL	UL	UL	UL	L	L
13	Mobile automobile or vehicle washing	L	L	L	UL	UL	UL	UL	L
14	Mobile Power washing*	UK	UK	UK	UK	UK	UK	UK	UK
15	Auto parking lots and storage facilities	L	L	L	UK	UK	UK	UL	L
16	Retail or wholesale fueling	UK	L	UK	N	N	N	N	L
17	Pest Control Services	N	UK	N	L	N	UK	N	UK
18	Eating or drinking establishments	N	L	UL	UK	UK	L	UL	L
19	Mobile carpet, drape, or furniture cleaning	N	UK	UL	N	UK	UL	N	UL
20	General contractors for home/commercial improvements	UL	UL	L	UL	UL	UL	UL	UL
21	Botanical or zoological gardens and nurseries/greenhouses	L	UL	L	L	L	L	UL	UL
22	Mobile Landscaping	N	UL	L	L	L	L	UL	N
23	Pool and Fountain Cleaning	N	N	N	N	UK	N	N	UK
24	Marinas	L	L	N	UK	UK	UK	N	UK
25	Animal Kennels	N	UL	L	UK	L	L	N	L
26	Building Materials Retail and Storage	L	L	L	UL	UL	UL	UL	L
27	Chemical and allied products	UK	UK	UK	UK	UK	UL	N	L
28	Fabricated metal	L	L	UK	UK	UK	UL	UL	L
29	Primary metal	L	UK	UK	UK	UK	UL	N	UK
30	Recycling, Junk Yards, Scrap Metal	L	L	L	UL	UL	UL	L	L
31	Airfields	UK	UK	UK	UK	UK	N	UL	UK
32	Motor Freight	L	L	UK	UK	UK	UK	UL	L
33	POTWs (water and wastewater)	UK	UK	UK	N	UK	L	UL	UK
34	Concrete Manufacturing	L	L	L	UL	UL	UL	UL	L
35	Stone/Glass Manufacturing	L	L	L	UL	UL	UL	UL	L
36	Food Manufacturing	UL	UL	UL	UL	UL	UL	UL	UL

N = None, UK = Unknown, UL = Unlikely, L = Likely

In addition to using the SLPs, Copermittees can also use PGA associations to pollutants and other special studies to associate sources to pollutant.

5) Incorporate Source Quantities

After determining the high priority pollutant constituents and the source loading potentials, identify the number of sources in the particular tributary/drainage area for the monitoring station. For this exercise, it is recommended that the Copermittees use the most up-to-date inventory information and GIS software, if necessary, to identify an accurate number of sources in the particular drainage area. Additionally, if it is available, the area of residential land use and any other pertinent land use should be calculated. The sources within the example drainage are shown in Figure B-3.

Once these source numbers have been compiled, consolidate the results of the number of sources, residential acreage, and source loading potential into a table for the pollutants of concern. See Tables B-3 through B-5 for the high priority constituents at LPC-MLS. If only using a single-pollutant approach, follow up the single table with the prioritization.

6) Incorporate Other Criteria as Desired

At this point, the Copermittees should look to consider other criteria that may be important in deciding upon which sources are of greatest importance. Taken from the LTEA (Section 4), the following are additional considerations.

In selecting the source(s) to evaluate for the TTWQ, some additional considerations the Copermittee(s) should evaluate are as follows:

1) Land use (quantity and activity) should be included and the following considered:
    a. Wet weather TTWQ processes should include an evaluation of the land use areas in the area of focus
    b. Need a surrogate value for residential and open space land areas to compare to inventoried sources
2) Special studies information regarding sources in the focus area
3) Potential sources that are not easily quantifiable including: bacterial regrowth in MS4 systems; erosion in open space areas; accelerated erosion in creeks (hydromodification); and aerial deposition

For the purposes of this example, the residential land-use is identified as being of great importance. In order to compare the residential land acres to the number of inventoried sources, a conservative assumption is made for this tributary watershed area – average lot size of 0.5 acres, therefore ***each acres of residential land use equates to two (2) residential units***.

7) Develop Priority Ranking of Sources

For the multi-pollutant approach, the process combines the single-pollutant tables (Tables B-3 through B-5) into a single master table where sources can be ranked on the basis of source loading potential and number of sources in the associated tributary watershed area. See Table B-6 for the results of the example process. Using this process, and the consideration that residential areas are of great importance, ***the highest TTWQ source is the residential areas in the tributary watershed area.***

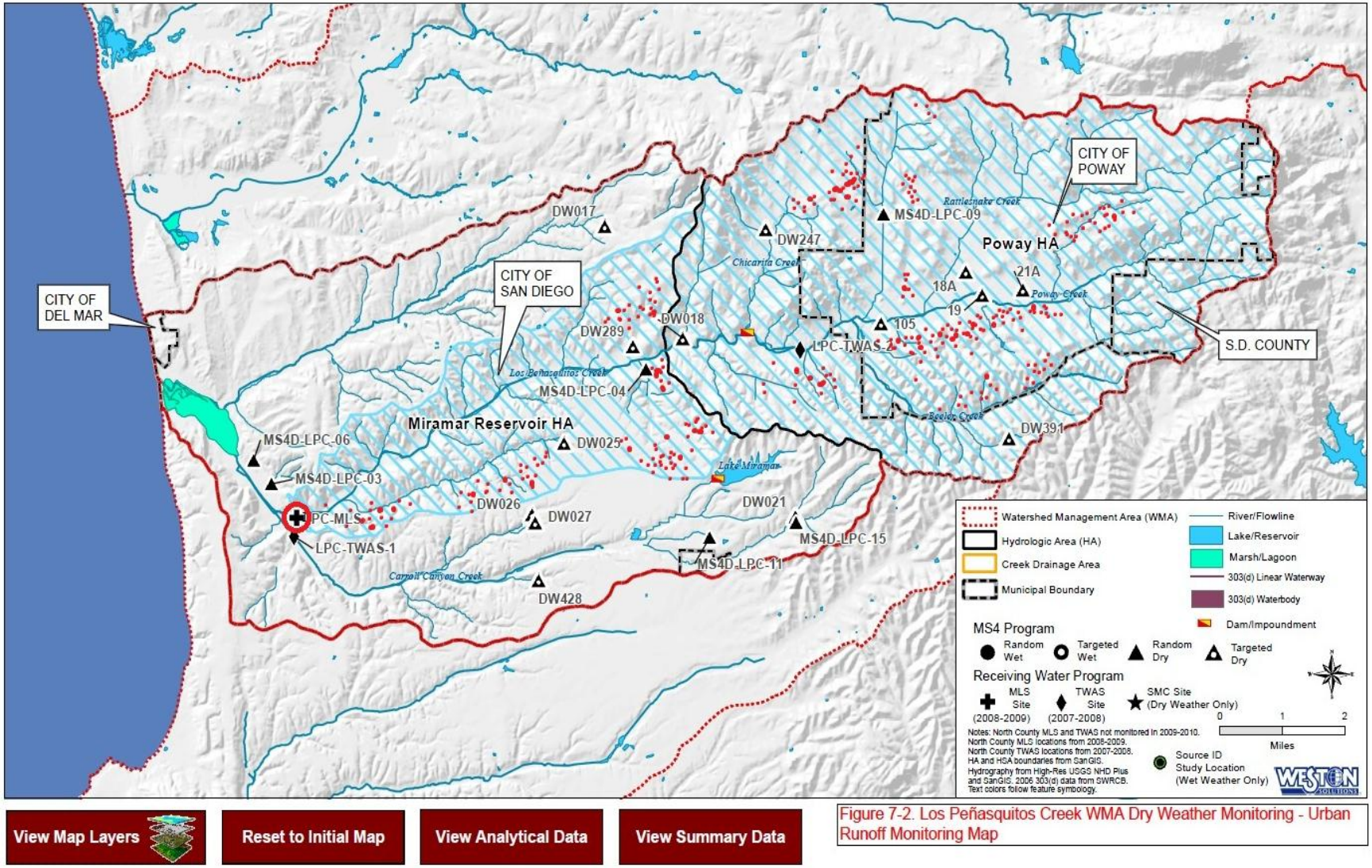

Figure B-3. Los Peñasquitos Creek Monitoring Map showing tributary drainage and potential sources above Mass Loading Station LPC-MLS.

Table B-3. Source Quantities, Water Quality Priority, and SLPs for Bacteria/Pathogens at LPC-MLS.

LPC-MLS				
Bacteria/Pathogens		# Sources	Water Quality Priority	Source Loading Potential
Source ID	Source			
1	Residential Areas and Activities – 4,468 acres	8,936		L
2	Sites > 1 acre	-		L
3	Sites < 1 acre	-		UL
4	ESA or Hillside or Sediment TMDL	-		UL
5	Development Subject to SUSMPs (> 5,000 sq. ft. Impervious Area)	-		UL
6	Roads, Streets, Highways, and Parking Facilities	-		UL
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	-		UL
8	Corporate Yards (incl. Maintenance/Storage Yards)	2		UL
9	Parks and Recreational Facilities - Parks, Golf Courses, Cemeteries, Entertainment Venues, etc.	4		UL
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	59		UL
11	Equipment Mechanical Repair, Maintenance, Fueling, or Cleaning	-		N
12	Automobile and Other Vehicle Body Repair and Painting	3		UL
13	Mobile Automobile or Vehicle Washing	-		UL
14	Mobile Power Washing	-		N
15	Auto Parking Lots and Storage Facilities	-		UL
16	Retail or Wholesale Fueling	35		N
17	Pest Control Services	-		UL
18	Eating or Drinking Establishments	421		L
19	Mobile Carpet, Drape, or Furniture Cleaning	-	H	UL
20	General Contractors for Home/Commercial Improvements	-		UL
21	Botanical or Zoological Gardens and Nurseries/Greenhouses	3		L
22	Mobile Landscaping	-		UL
23	Pool and Fountain Cleaning	-		UL
24	Marinas	-		UL
25	Animal Kennels, Horse Stables	-		UL
26	Offices with Onsite and Outdoor Storage Facilities	-		N
27	Building Materials Retail and Storage	-		N
28	Chemical and Allied Products	-		UL
29	Fabricated Metal	-		UL
30	Primary Metal	-		UL
31	Recycling, Junk Yards, Scrap Metal	-		UL
32	Airfields	-		N
33	Motor Freight	-		UL
34	POTWs (Water and Wastewater)	1		UL
35	Concrete Manufacturing	-		N
36	Stone/Glass Manufacturing	-		N
37	Food Manufacturing	-		UL

N = None, UK = Unknown, UL = Unlikely, L = Likely

Table B-4. Source Quantities, Water Quality Priority, and SLPs for Nutrients at LPC-MLS.

LPC-MLS				
Nutrients		# Sources	Water Quality Priority	Source Loading Potential
Source ID	Source			
1	Residential Areas and Activities – 4,468 acres	8,936		L
2	Sites > 1 acre	-		L
3	Sites < 1 acre	-		UL
4	ESA or Hillside or Sediment TMDL	-		UL
5	Development Subject to SUSMPs (> 5,000 sq. ft. Impervious Area)	-		UL
6	Roads, Streets, Highways, and Parking Facilities	-		L
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	-		UL
8	Corporate Yards (incl. Maintenance/Storage Yards)	2		UL
9	Parks and Recreational Facilities - Parks, Golf Courses, Cemeteries, Entertainment Venues, etc.	4		UL
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	59		L
11	Equipment Mechanical Repair, Maintenance, Fueling, or Cleaning	-		N
12	Automobile and Other Vehicle Body Repair and Painting	3		UL
13	Mobile Automobile or Vehicle Washing	-		UL
14	Mobile Power Washing	-		N
15	Auto Parking Lots and Storage Facilities	-		UL
16	Retail or Wholesale Fueling	35		N
17	Pest Control Services	-		N
18	Eating or Drinking Establishments	421		L
19	Mobile Carpet, Drape, or Furniture Cleaning	-	H	N
20	General Contractors for Home/Commercial Improvements	-		UL
21	Botanical or Zoological Gardens and Nurseries/Greenhouses	3		L
22	Mobile Landscaping	-		L
23	Pool and Fountain Cleaning	-		N
24	Marinas	-		UL
25	Animal Kennels, Horse Stables	-		UL
26	Offices with Onsite and Outdoor Storage Facilities	-		UL
27	Building Materials Retail and Storage	-		N
28	Chemical and Allied Products	-		UL
29	Fabricated Metal	-		UL
30	Primary Metal	-		UL
31	Recycling, Junk Yards, Scrap Metal	-		UL
32	Airfields	-		N
33	Motor Freight	-		UL
34	POTWs (Water and Wastewater)	1		UL
35	Concrete Manufacturing	-		N
36	Stone/Glass Manufacturing	-		N
37	Food Manufacturing	-		UL

N = None, UK = Unknown, UL = Unlikely, L = Likely

Table B-5. TTWQ Ranking of Multi-Pollutant Approach at LPC-MLS.

LPC-MLS				
Source ID	Source	# Sources	Source Loading	
			Bacteria	Nutrients
1	Residential Areas and Activities – 4,468 acres	8,936	L	L
18	Eating or Drinking Establishments	421	L	L
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	59	UL	L
16	Retail or Wholesale Fueling	35	N	N
21	Botanical or Zoological Gardens and Nurseries/Greenhouses	3	L	L
12	Automobile and Other Vehicle Body Repair and Painting	3	UL	UL
9	Parks and Recreational Facilities - Parks, Golf Courses, Cemeteries, Entertainment Venues, etc.	4	UL	UL
8	Corporate Yards (incl. Maintenance/Storage Yards)	2	UL	UL
34	POTWs (Water and Wastewater)	1	UL	UL
2	Sites > 1 acre	-	L	L
3	Sites < 1 acre	-	UL	UL
4	ESA or Hillside or Sediment TMDL	-	UL	UL
5	Development Subject to SUSMPs (> 5,000 sq. ft. Impervious Area)	-	UL	UL
6	Roads, Streets, Highways, and Parking Facilities	-	UL	L
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	-	UL	UL
11	Equipment Mechanical Repair, Maintenance, Fueling, or Cleaning	-	N	N
13	Mobile Automobile or Vehicle Washing	-	UL	UL
14	Mobile Power Washing	-	N	N
15	Auto Parking Lots and Storage Facilities	-	UL	UL
17	Pest Control Services	-	UL	N
19	Mobile Carpet, Drape, or Furniture Cleaning	-	UL	N
20	General Contractors for Home/Commercial Improvements	-	UL	UL
22	Mobile Landscaping	-	UL	L
23	Pool and Fountain Cleaning	-	UL	N
24	Marinas	-	UL	UL
25	Animal Kennels, Horse Stables	-	UL	UL
26	Offices with Onsite and Outdoor Storage Facilities	-	N	UL
27	Building Materials Retail and Storage	-	N	N
28	Chemical and Allied Products	-	UL	UL
29	Fabricated Metal	-	UL	UL
30	Primary Metal	-	UL	UL
31	Recycling, Junk Yards, Scrap Metal	-	UL	UL
32	Airfields	-	N	N
33	Motor Freight	-	UL	UL
35	Concrete Manufacturing	-	N	N
36	Stone/Glass Manufacturing	-	N	N
37	Food Manufacturing	-	UL	UL

Rankings based on number of sources/residential acreage and Source Loading Potentials
N = None, UK = Unknown, UL = Unlikely, L = Likely

Single-Pollutant Small Area Scale TTWQ Approach

The following example uses a MS4 Outfall Station and its sampling results to illustrate the single-pollutant TTWQ approach on a smaller area scale. This example uses monitoring data from the 2011 LTEA Water Quality Report to identify pollutants exceedances above the water quality benchmarks. These constituents will then be used to determine the pollutant priority categories and ultimately the high TTWQ sources.

1) Determine Scale to Develop Threat to Water Quality

As with the multi-pollutant approach, the first step is to determine the scale and location where a particular monitoring location can characterize the flow from a tributary area. Figure B-4 shows the ***drainage area to the example MS4 outfall in the Peñasquitos watershed***.

2) Determine Wet or Dry Weather Conditions

The flow conditions should be selected at this point. For the example, a ***wet weather*** condition is selected.

3) Determine the Water Quality Issue (Pollutant) to Evaluate

Determine water quality issues by reviewing the MS4 outfall monitoring data for the appropriate watershed. Then identify the pollutants that are high priority as a result of the water quality monitoring data. Open the monitoring data table (included on LTEA compact disc- also derived from 2011 LTEA Water Quality Report) and locate the appropriate row containing info pertaining to the monitoring location. Table B-7 shows the watershed priority constituents determined by the assessment program for MS4 outfall LPC-02 in the Peñasquitos WMA. The monitoring data for the example MS4 outfall and the high priority constituents have been boxed in red to show a corresponding 'high' score represented in the data.

4) Associate Sources to Pollutant

From Table B-7, Total Nitrogen, Total Phosphorous, TDS, and Enterococcus are considered high priority analytes at MS4 monitoring station LPC-02 as monitored during both the wet and dry seasons. These analytes are then grouped into one of the nine priority pollutant categories as seen in Table B-8. The corresponding high priority pollutants are shown in Table B-8.

Using the high priority constituents determined in the step above, the next step is to review the final source loading potentials (SLPs) of sources within the LPC-MLS tributary area that are likely sources contributing to the selected pollutant(s). Using the information presented in Section 3 (LTEA Table 3-10), the activities with source loading potential with regards to mass loading station LPC-MLS have been highlighted based on the three high priority constituents (nutrients and bacteria/pathogens) –see Table B-9 below for sources.

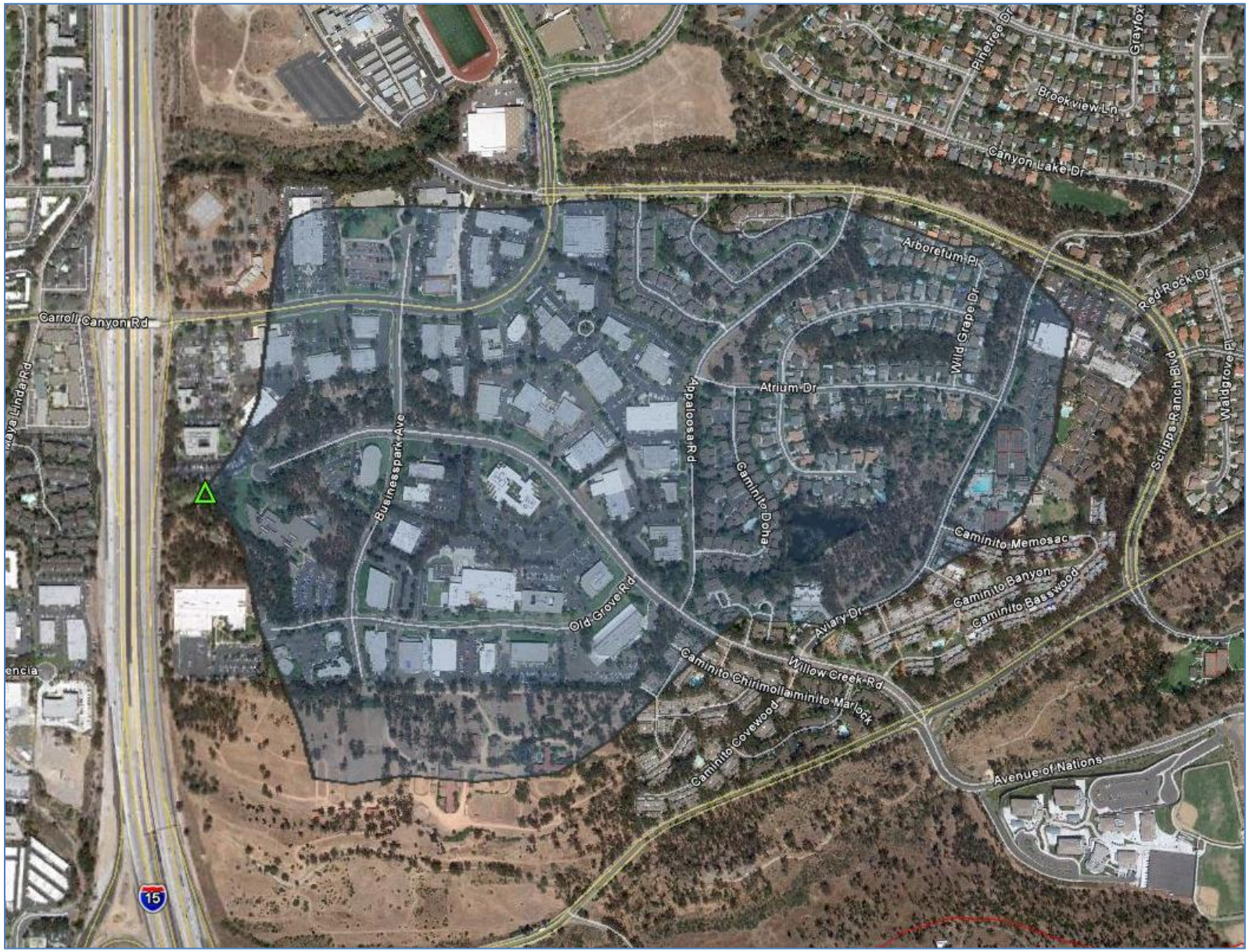

Figure B-4. Map of MS4-LPC-02 Monitoring Station and Drainage Area

Table B-7. Watershed Priority Constituents determined by MS4 monitoring data at LPC-02

Station	Dry and Wet	HSA	Analyte																		Analyte									
			pH		Nitrate as N		Nitrate/Nitrite as N		Nitrite as N		Total Nitrogen (calculated)		Phosphorus, Total		Total Suspended Solids		Total Dissolved Solids		Fecal Coliform		Enterococcus		Ammonia-N		Turbidity		Copper (Cu), Dissolved		Diazinon		MBAS	
			n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria	n	% > Criteria
19	Dry	906.20	0	NA	0	NA	2	0%	0	NA	2	50%	2	50%	2	0%	2	100%	2	0%	2	0%	0	NA	0	NA	0	NA	0	NA	0	NA
105	Dry	906.20	0	NA	0	NA	2	0%	0	NA	2	100%	2	100%	2	0%	2	100%	2	100%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
80024778	Wet	906.1	2	50%	1	0%	2	0%	1	0%			2	0%	2	0%	2	0%	2	50%												
18A	Dry	906.20	0	NA	0	NA	2	100%	0	NA	2	100%	2	50%	2	0%	2	100%	2	100%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
21A	Dry	906.20	0	NA	0	NA	2	0%	0	NA	2	100%	2	100%	2	0%	2	100%	2	100%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
DW017	Dry	906.10	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	2	0%	2	100%	2	0%	2	50%	0	NA	0	NA	0	NA	0	NA	0	NA
DW018	Dry	906.20	1	0%	1	0%	0	NA	0	NA	2	50%	2	50%	2	0%	3	100%	3	33%	3	100%	1	0%	1	0%	0	NA	0	NA	1	0%
DW021	Dry	906.10	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	2	0%	2	100%	2	50%	2	100%	0	NA	0	NA	0	NA	2	0%	0	NA
DW025	Dry	906.10	0	NA	0	NA	0	NA	0	NA	2	100%	2	100%	2	0%	2	100%	2	50%	2	100%	0	NA	0	NA	2	0%	0	NA	0	NA
DW026	Dry	906.10	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	2	0%	2	100%	2	0%	2	100%	0	NA	0	NA	2	50%	2	0%	2	0%
DW027	Dry	906.10	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	2	0%	2	100%	2	50%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
DW247	Dry	906.20	0	NA	0	NA	0	NA	0	NA	2	100%	2	100%	2	0%	2	100%	2	50%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
DW289	Dry	906.10	0	NA	0	NA	0	NA	0	NA	2	100%	2	0%	2	0%	2	100%	2	50%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
DW391	Dry	906.20	0	NA	0	NA	0	NA	0	NA	2	100%	2	100%	2	0%	2	100%	2	100%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
DW428	Dry	906.10	0	NA	0	NA	0	NA	0	NA	0	NA	0	NA	2	50%	2	100%	2	50%	2	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-01-2008	Wet	906.2	1	0%	0	NA	1	0%	0	NA			1	0%	1	0%	1	0%	1	100%												
LPC-02-2009	Wet	906.1	1	0%	1	0%	1	0%	1	0%			1	0%	1	0%	1	0%	1	100%												
LPC-03-2008	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	0%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-03-2008	Wet	906.1	1	0%	1	0%	1	0%	1	0%			1	0%	1	0%	1	100%	1	0%												
LPC-03-2009	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-04-2008	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	100%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-04-2009	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	0%	1	100%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-06-2008	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	0%	1	100%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-06-2009	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-06-2009	Wet	906.1	1	0%	1	0%	1	0%	1	0%			1	0%	1	0%	1	0%	1	0%												
LPC-09-2008	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-09-2009	Dry	906.20	1	0%	1	0%	1	0%	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-09-2009	Wet	906.2	1	100%	1	0%	1	0%	1	0%			1	0%	1	100%	1	0%	1	100%												
LPC-10-2008	Dry	906.20	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	0%	1	100%	1	100%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-10-2008	Wet	906.2	1	0%	1	0%	1	0%	1	0%			1	0%	1	0%	1	0%	1	100%												
LPC-11-2009	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-12-2008	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	100%	1	0%	1	100%	1	100%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-12-2008	Wet	906.1	0	NA	1	0%	1	0%	1	0%			1	0%	1	0%	0	NA	1	100%												
LPC-12-2009	Wet	906.1	1	0%	1	0%	1	0%	1	0%			1	0%	1	0%	1	0%	1	0%												
LPC-13-2008	Wet	906.2	0	NA	1	0%	1	0%	1	0%			1	0%	1	0%	0	NA	1	100%												
LPC-15-2009	Dry	906.10	1	0%	1	0%	1	0%	1	0%	1	100%	1	0%	1	0%	1	100%	1	0%	1	100%	0	NA	0	NA	0	NA	0	NA	0	NA
LPC-18-2009	Wet	906.2	1	0%	1	0%	1	0%	1	0%			1	0%	1	0%	1	100%	1	100%												

Note: Orange=High Priority, Yellow=Medium Priority pollutant based on the monitoring station data.

Table B-8: Pollutant Categories

Metals	Oil and Grease	Sediments	Pesticides	Nutrients	Bacteria/ Pathogens	Dissolved Minerals	Organics	Trash	Benthic Alterations	Toxicity	Gross Pollutants	Chemistry
Antimony	Oil and Grease	TSS	Chlorpyrifos	Dissolved Phosphorus	Enterococcus	TDS	Total Organic Carbon	Trash	Poor IBI	Ceriodaphnia survival	BOD	Chloride
Arsenic		Turbidity	Diazinon	Orthophosphate	Fecal Coliforms				O/E	Ceriodaphnia reproduction	COD	Sulfate
Cadmium			Malathion	Total Phosphorus	Total Coliforms				IBI	Hyalellasurvival	MBAS	
Chromium			Allethrin	Total Kjeldahl Nitrogen					CRAM	Selenastrumsurvival	Dissolved Oxygen	
Copper			Bifenthrin	Total Nitrogen							pH	
Lead			Cyfluthrin	Eutrophication							Conductivity	
Nickel			Cypermethrin	Benthic Algae							Nitrate as N	
Selenium			Danitol								Ammonia as N	
Zinc			Deltamethrin									
			Esfenvalerate									
			Fenvalerate									
			Fluvalinate									
			L-Cyhalothrin									
			Permethrin									
			Prallethrin									

Table B-9. Final Source Loading Potentials at LPC-02

Source Profile #	Activities with Source Loading Potential	Metals	Oil & Grease	Sediment	Pesticides	Nutrients	Bacteria/ Pathogens	Dissolved Minerals	Organics
1	Residential Areas and Activities	L	L	L	L	L	L	L	L
2	Construction Sites > 1 acre	UL	UL	L	UL	UL	UL	L	UL
3	Construction Sites < 1 acre	UL	UL	L	UL	UL	UL	UL	UL
4	Construction Sites: ESA or hillside or sediment TMDL	UL	UL	L	UL	UL	UL	UL	UL
5	Development subject to SUSMPs (> 5,000 sq. ft. impervious area)	UK	UK	UK	UK	UK	UK	UL	UK
6	Roads, streets, highways, and parking facilities	L	L	L	UL	L	L	L	L
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	N	N	L	N	N	UK	UL	N
8	Corporate yards (incl. maintenance/storage yards)	L	L	L	UK	UK	UL	UL	L
9	Parks and Recreational Facilities - parks, golf courses, cemeteries, entertainment venues, etc.	UK	UK	UK	UK	L	UK	UL	UK
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	L	L	UL	UL	UK	UL	L	L
11	Equipment mechanical repair, maintenance, fueling, or cleaning	L	L	UL	UL	UK	UL	UL	L
12	Automobile and Other Vehicle Body Repair and Painting	L	L	UL	UL	UL	UL	L	L
13	Mobile automobile or vehicle washing	L	L	L	UL	UL	UL	UL	L
14	Mobile Power washing*	UK	UK	UK	UK	UK	UK	UK	UK
15	Auto parking lots and storage facilities	L	L	L	UK	UK	UK	UL	L
16	Retail or wholesale fueling	UK	L	UK	N	N	N	N	L
17	Pest Control Services	N	UK	N	L	N	UK	N	UK
18	Eating or drinking establishments	N	L	UL	UK	UK	L	UL	L
19	Mobile carpet, drape, or furniture cleaning	N	UK	UL	N	UK	UL	N	UL
20	General contractors for home/commercial improvements	UL	UL	L	UL	UL	UL	UL	UL
21	Botanical or zoological gardens and nurseries/greenhouses	L	UL	L	L	L	L	UL	UL
22	Mobile Landscaping	N	UL	L	L	L	L	UL	N
23	Pool and Fountain Cleaning	N	N	N	N	UK	N	N	UK
24	Marinas	L	L	N	UK	UK	UK	N	UK
25	Animal Kennels	N	UL	L	UK	L	L	N	L
26	Building Materials Retail and Storage	L	L	L	UL	UL	UL	UL	L
27	Chemical and allied products	UK	UK	UK	UK	UK	UL	N	L
28	Fabricated metal	L	L	UK	UK	UK	UL	UL	L
29	Primary metal	L	UK	UK	UK	UK	UL	N	UK
30	Recycling, Junk Yards, Scrap Metal	L	L	L	UL	UL	UL	L	L
31	Airfields	UK	UK	UK	UK	UK	N	UL	UK
32	Motor Freight	L	L	UK	UK	UK	UK	UL	L
33	POTWs (water and wastewater)	UK	UK	UK	N	UK	L	UL	UK
34	Concrete Manufacturing	L	L	L	UL	UL	UL	UL	L
35	Stone/Glass Manufacturing	L	L	L	UL	UL	UL	UL	L
36	Food Manufacturing	UL	UL	UL	UL	UL	UL	UL	UL

N = None, UK = Unknown, UL = Unlikely, L = Likely

In addition to using the SLPs, Copermittees can also use PGA Associations to Pollutants and other special studies to associate sources to pollutant.

5) Incorporate Source Quantities

After determining the high priority pollutant constituents and the source loading potentials, find the number of sources in the particular tributary/drainage area for the monitoring station. For this exercise, it is recommended that the Copermittees use the most up-to-date inventory information and GIS software, if necessary, to pinpoint an accurate number of sources in the particular drainage. Additionally, calculate the area of residential land use in the area, if available. The single source identified within the MS4 outfall drainage is shown in Figure B-5.

Once these numbers have been compiled, bring together the results of the number of sources, residential acreage, and source loading potential into a table for the pollutants of concern. For the sake of the single-pollutant approach example, see Table B-10 for the high priority sources and activities for bacteria/pathogens within the drainage area.

6) Incorporate Other Criteria as Desired

For this example, no additional criteria are considered.

7) Develop Priority Ranking of Sources

The final step is to prioritize the table outlining the source quantities, water quality priority, and SLPs for the priority pollutant (in this case, bacteria/pathogens). The prioritization is based off of the SLP and the number of sources and residential acreage in the drainage area (see Table B-11).

Figure B-5. Map of MS4-LPC-02 Monitoring Station and Drainage Area; note pollutant sources in red.

Table B-10. Source Quantities, Water Quality Priority, and SLPs for Bacteria/Pathogens at LPC-02

LPC-02				
Bacteria		# Sources	Water Quality Priority	Source Loading Potential
Source ID	Source			
1	Residential Areas and Activities – 49.91 acres	100	H	L
2	Sites > 1 acre	-		L
3	Sites < 1 acre	-		L
4	ESA or Hillside or Sediment TMDL	-		L
5	Development Subject to SUSMPs (> 5,000 sq. ft. Impervious Area)	-		UL
6	Roads, Streets, Highways, and Parking Facilities	-		UL
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	-		UL
8	Corporate Yards (incl. Maintenance/Storage Yards)	2		UL
9	Parks and Recreational Facilities - Parks, Golf Courses, Cemeteries, Entertainment Venues, etc.	-		UL
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	-		UL
11	Equipment Mechanical Repair, Maintenance, Fueling, or Cleaning	-		UL
12	Automobile and Other Vehicle Body Repair and Painting	-		UL
13	Mobile Automobile or Vehicle Washing	-		UL
14	Mobile Power Washing	-		UL
15	Auto Parking Lots and Storage Facilities	-		UL
16	Retail or Wholesale Fueling	-		UL
17	Pest Control Services	-		UL
18	Eating or Drinking Establishments	6		UL
19	Mobile Carpet, Drape, or Furniture Cleaning	-		UL
20	General Contractors for Home/Commercial Improvements	-		UL
21	Botanical or Zoological Gardens and Nurseries/Greenhouses	-		UL
22	Mobile Landscaping	-		UL
23	Pool and Fountain Cleaning	-		UL
24	Marinas	-		UL
25	Animal Kennels, Horse Stables	-		UL
26	Offices with Onsite and Outdoor Storage Facilities	3		UL
27	Building Materials Retail and Storage	1		UL
28	Chemical and Allied Products	-		UL
29	Fabricated Metal	-		UL
30	Primary Metal	-		N
31	Recycling, Junk Yards, Scrap Metal	-		N
32	Airfields	-		N
33	Motor Freight	-		N
34	POTWs (Water and Wastewater)	-		N
35	Concrete Manufacturing	2		N
36	Stone/Glass Manufacturing	1		N
37	Food Manufacturing	-		N

N = None, UK = Unknown, UL = Unlikely, L = Likely

Table B-11. Prioritized Source Quantities and SLPs for Bacteria/Pathogens at LPC-02

LPC-02				
Bacteria		# Sources	Water Quality Priority	Source Loading Potential
Source ID	Source			
1	Residential Areas and Activities – 49.91 acres	100	H	L
18	Eating or Drinking Establishments	6		UL
26	Offices with Onsite and Outdoor Storage Facilities	3		UL
8	Corporate Yards (incl. Maintenance/Storage Yards)	2		UL
27	Building Materials Retail and Storage	1		UL
35	Concrete Manufacturing	2		N
36	Stone/Glass Manufacturing	1		N
2	Sites > 1 acre	-		L
3	Sites < 1 acre	-		L
4	ESA or Hillside or Sediment TMDL	-		L
5	Development Subject to SUSMPs (> 5,000 sq. ft. Impervious Area)	-		UL
6	Roads, Streets, Highways, and Parking Facilities	-		UL
7	MS4s - Catch Basins, Drain Inlets, Conveyance, Pump Stations	-		UL
9	Parks and Recreational Facilities - Parks, Golf Courses, Cemeteries, Entertainment Venues, etc.	-		UL
10	Auto Mechanical Repair, Maintenance, Fueling, or Cleaning	-		UL
11	Equipment Mechanical Repair, Maintenance, Fueling, or Cleaning	-		UL
12	Automobile and Other Vehicle Body Repair and Painting	-		UL
13	Mobile Automobile or Vehicle Washing	-		UL
14	Mobile Power Washing	-		UL
15	Auto Parking Lots and Storage Facilities	-		UL
16	Retail or Wholesale Fueling	-		UL
17	Pest Control Services	-		UL
19	Mobile Carpet, Drape, or Furniture Cleaning	-		UL
20	General Contractors for Home/Commercial Improvements	-		UL
21	Botanical or Zoological Gardens and Nurseries/Greenhouses	-		UL
22	Mobile Landscaping	-		UL
23	Pool and Fountain Cleaning	-		UL
24	Marinas	-		UL
25	Animal Kennels, Horse Stables	-		UL
28	Chemical and Allied Products	-		UL
29	Fabricated Metal	-		UL
30	Primary Metal	-		N
31	Recycling, Junk Yards, Scrap Metal	-		N
32	Airfields	-		N
33	Motor Freight	-		N
34	POTWs (Water and Wastewater)	-		N
37	Food Manufacturing	-		N

Rankings based on number of sources/residential acreage and Source Loading Potentials
N = None, UK = Unknown, UL = Unlikely, L = Likely

Investigative TTWQ Approach

The following approach follows the general outline of the previous two examples with one difference – the past monitoring information is not a primary factor in the TTWQ assessment. Instead, the approach can be used to analyze current monitoring data and flows (immediate exceedance response) in an attempt to locate sources using other resources such as storm drain maps and local drainage patterns. This example uses the MS4 Random Monitoring Station identified during the single-pollutant TTWQ approach.

1) Determine Scale to Develop Threat to Water Quality

As with the single and multi-pollutant approach, the first step is to determine the scale and location where a particular monitoring location can characterize the flow from a tributary area. In addition, determine the flow and storm drain network in order to pinpoint the location of flows from the drainage. Figure B-6 shows the drainage area to the example MS4 outfall in the Peñasquitos watershed, including the storm drain map.

3) Determine the Water Quality Issue (Pollutant) to Evaluate

Determine water quality issues by reviewing the current monitoring data at the MS4 outfall. Any exceedances or readings above the water quality objectives should be further investigated using this approach. For any exceedances or readings above the water quality objectives, refer to Table B-8 above in order to determine the priority pollutants.

4) Associate Sources to Pollutant

Using the high priority pollutants, the next step is to review the final source loading potentials at LPC-02 to determine the likeliness of sources contributing to the pollutant. Using the information presented in Section 3 (Table 3-10), determine the activities with source loading potential with regards to the MS4 outfall (see example in Table B-9 above).

In addition to using the SLPs, Copermittees can also use PGA associations to pollutants and other special studies to associate sources to pollutant.

5) Identify Potential Sources of Pollutants

Based upon the resulting pollutant to source associations, one can identify the potential sources within the tributary area that are causing the exceedance at the MS4 outfall. Figure B-7 shows the resulting potential sources for this example.

Figure B-6. Map of MS4-LPC-02 Monitoring Station and Drainage Area, including storm drain network.

Figure B-7. Map of MS4-LPC-02 Monitoring Station and Drainage Area, including storm drain network and pollutant sources (red).