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9.1 Mission Bay Watershed Management Area Descriptions

The Mission Bay Watershed Management Area (WMA) includes the Rose and Tecolote Creek Watersheds which is the smallest watershed management area in San Diego County. The Mission Bay WMA land area is 43,244 acres (Figure 9-1). The watershed includes three hydrologic areas: Scripps (HA 906.30), Miramar (HA 906.40) and Tecolote (HA 906.50). The watershed is drained by the Rose creek which discharges into the northern portion of Mission Bay and Tecolote Creek which discharges to the southern portion of Mission Bay. In the 1940's much of the existing coastal marshland encompassed by Mission Bay was converted to a 4000-acre aquatic park and residential use area. Annual precipitation ranges from 10.5 inches near the coast to 13.5 inches in the eastern portion of the watershed (Figure 9-1).

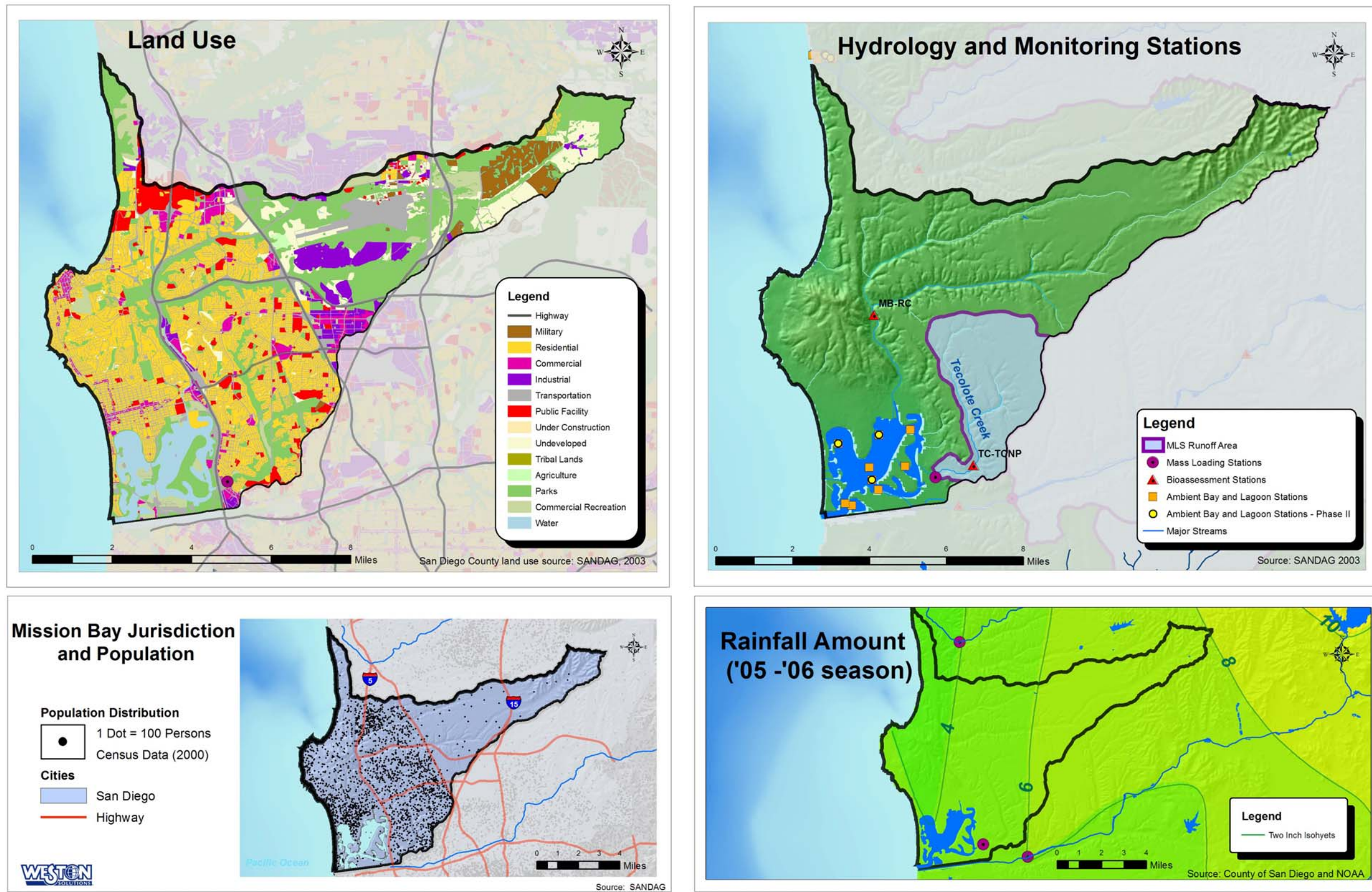


Figure 9-1. Mission Bay Watershed Management Area.

9.1.1 Land Use

The Mission Bay WMA is entirely contained within the City of San Diego. Land use within the watershed is primarily parks (26.2%) and residential (26.2%). Other uses are public facilities/utilities (4.7%), industrial (4%), commercial (3%), transportation (18%), and agriculture (0.2%), as illustrated in Figure 9-2 (SANDAG, 2003). Over 60% of the watershed is privately-owned land. The remaining portions are mostly locally-owned with a small percentage of land being state and federally-owned.

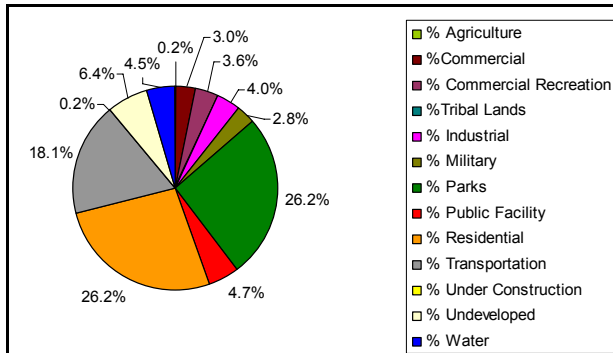


Figure 9-2. Percent Land Use for Mission Bay WMA

9.1.2 Beneficial Uses

The Mission Bay WMA supports a variety of ecosystems and provides many beneficial uses. A listing of the beneficial uses from the San Diego Basin Plan is presented in Table 9-1. Contact and non-contact recreation, cold and warm freshwater habitat and wildlife and endangered species habitat uses are supported in the inland surface waters. The coastal waters of Mission Bay support a variety of anthropogenic uses including contact and non-contact recreation as well as a variety of estuarine, wildlife, marine, and rare, threatened, and endangered species habitats, and shellfish harvesting uses. In addition to water resources the watershed contains Mission Bay Park which provides 4,235 acres of land and aquatic recreation areas.

Table 9-1. Beneficial uses within the Mission Bay Watershed (Rose and Tecolote Creeks).

Beneficial Uses	Inland Surface Waters ^(a)	Coastal Waters ^(b)	Ground Waters
Municipal and Domestic Supply			
Agricultural Supply			
Industrial Service Supply	○	●	
Industrial Process Supply			
Ground Water Recharge			
Navigation			
Contact Water Recreation	●	●	
Non-Contact Water Recreation	●	●	
Commercial and Sport Fishing		●	
Warm Freshwater Habitat	●		
Cold Freshwater Habitat	●		
Biological Habitats of Special Significance			
Estuarine Habitat		●	
Wildlife Habitat	●	●	
Rare, Threatened, or Endangered Species	●	●	
Marine Habitat		●	
Migration of Aquatic Organisms		●	
Shellfish Harvesting		●	
Aquaculture			
Spawning, Reproduction and/or Early Development			

● = Existing

○ = Potential

^(a) Rose Canyon and Tecolote

^(b) Mission Bay

Source: Basin Plan September 8, 1994 (Tables 2-2, 2-3, 2-4, 2-5)

9.1.3 Regulatory Water Quality Challenges

Major impacts to the Mission Bay WMA include surface water quality degradation, beach closures, sedimentation, habitat degradation and loss, invasive species, natural sources, and eutrophication (San Diego County, 2006). Table 9-2 presents the water bodies in the Mission Bay Watershed that have been placed on the SWRCB 303(d) list.

The San Diego Regional Water Quality Control Board is considering a Basin Plan amendment to incorporate proposed bacteria indicator TMDLs developed in “Project I - Beaches and Creeks in the San Diego Region”. Project I involved calculating TMDLs for numerous surface waters throughout the San Diego Region. TMDLs are only proposed for coastal shorelines and creeks discharging to shorelines. Creeks discharging to lagoons, bays, or harbors were not included. TMDLs for the Pacific Ocean shoreline at the 14 beaches within the Mission Bay WMA have been proposed. Several municipalities have been identified as responsible parties. Interim and final goals for reducing fecal coliform and enterococcus loading over 10 years have been identified. These reductions are to be achieved by the municipalities through conditions written in the MS4 Storm Water Permit.

Mission Bay WMA

The 2006 303(d) list is in the process of being finalized by the State Water Resources Control Board (SWRCB). The list includes several additions to the Mission Bay WMA. This list has not been formally adopted by the SWRCB but can be found on the SWRCB website (http://www.waterboards.ca.gov/tmdl/303d_lists2006.html).

Table 9-2. Water bodies on the SWRCB 303(d) List in the Mission Bay Watershed.

Water Body Name	Hydrologic Sub Area (HSA)	HSA #	Pollutant/Stressor
Pacific Ocean Shoreline	Scripps	906.30	Bacteria Indicators
Mission Bay	Miramar	906.40	Bacteria Indicators, Eutrophic, Lead
Tecolote Creek	Tecolote	906.50	Bacterial Indicators, Cadmium, Copper, Lead, Toxicity, Zinc

Source: SWRCB, 2003

9.1.4 Mass Loading Station Site Description



The Tecolote Creek (TC, SD5) mass loading station is located along a trapezoidal, concrete-lined open channel on the east side of Morena Boulevard in San Diego. The contributing runoff area covers over 5,992 acres, which is approximately 14% of the Mission Bay WMA. The primary land uses within the contributing runoff area are residential (43%), and transportation (21%).

The mass loading station located on Tecolote Creek maintained the same configuration as in previous years. Initial attempts to monitor instream flow utilizing conventional monitoring equipment failed due to the large amount of debris present at the monitoring site during storm events. Accordingly, flow is monitored at this location by utilizing an ultrasonic down-looking level sensor mounted on the West Morena Boulevard Bridge. The ultrasonic sensor accurately measures flow and appropriately composites a weighted sample during storm events but is limited in its ability to accurately estimate low and dry flow conditions. Further, large vegetative mats grow in the channel during the summer months during dry periods between storm events at this site. These vegetative mats often interfere with accurate flow data collection and require manual removal following the storm events. Therefore, the stream channel has also been surveyed to produce a runoff equation utilizing the Manning equation to accurately estimate flow based on stage height. Evidence of trash and paint debris is commonly observed in the channel within the vicinity of this site during equipment installations and monitoring events.

9.1.5 Stream Bioassessment Site Description

Stream bioassessment monitoring in the Mission Bay WMA has occurred at sites in Rose Creek and Tecolote Creek. The Rose Creek site is located just downstream of the Highway 52 over-crossing. The in-stream habitat of the riffles consists of moderately stable, smooth cobble and has perennial water flow. Tecolote Creek monitoring has occurred at two sites. The upstream site located is at the Mt. Acadia Blvd. crossing. The downstream site located upstream of the Cross St. over-crossing, just upstream of the channelized lower portion of the creek. Both sites are within the Tecolote Canyon Natural Park. The in-stream habitats of both sites are described as mostly undisturbed riparian with primarily

unconsolidated gravel riffle substrate with moderate treefall and roots within the streambed. Flow in Tecolote Creek is year-round at the lower site, but is generally low in the dry season.

9.1.6 Ambient Bay and Lagoon Monitoring Site Description

The Mission Bay is included in the Ambient Bay and Lagoon Monitoring (ABLM) monitoring program. The Bay consists of numerous smaller bays, coves, inlets, and large stretches of open water. Three ABLM monitoring sites in Mission Bay are located throughout Mission Bay (Figure 9-1). Tecolote and Rose Creeks provide the majority of the freshwater input to Mission Bay, but over 100 storm drains also discharge into the bay. Both Rose and Tecolote Creeks and the majority of the storm drains that discharge into Mission Bay are connected to a diversion system that diverts dry weather flow to the sanitary sewer. However the diversion system is not operational during wet weather. Mission Bay is connected to the ocean through a large channel on the Bay's southwest corner.

9.2 Watershed Water Quality Monitoring

Watershed water quality monitoring data is one leg of the triad approach used in performing the watershed management assessments. This includes the analysis of chemistry, bacteria, and toxicity data collected from three storm water events at the MLS, dry weather data collected from the dry weather monitoring program, and available third party data.

9.2.1 2005-2006 Storm Water Results

Annual storm water monitoring has occurred at the Tecolote Creek MLS since the 1993-1994 wet weather monitoring season. Three storm events were monitored at the MLS during the 2005-2006 wet weather monitoring period occurring on October 17, 2005, February 19, 2006 and February 28, 2006.

9.2.1.1 Storm Water Monitoring Summary

The first storm of the 2005-2006 wet weather monitoring season occurred on October 18, 2005. On October 16, 2005 a storm approached northern San Diego County from the northeast. This northeasterly approaching storm was unusual for San Diego County, as typically storms approach southern California primarily from the northwest and occasionally from the southwest. Due to the unusual approach direction for this storm, it was characterized by rainfall that began in the east and spread generally southwest towards the coast. After 24 hours, the storm system produced sufficient rainfall in the Tecolote Creek Watershed to provide runoff and wet weather monitoring was initiated. The storm produced a total of 0.20" of rainfall. Rainfall statistics for the Mission Bay MLS are presented in Table 9-3. A total of 26 one-liter composite sample aliquots were collected at a rate such that one sample for every 80,000 cubic feet of water that passed by the monitoring station. Additionally, grab samples were collected for those constituents not conducive to composite sampling prior to the peak of the storm hydrograph. Monitoring was conducted over a 10-hour period which captured the rise and initial peak of the runoff produced by the storm.

Table 9-3. 2005-2006 Rainfall Statistics for the Mission Bay Mass Loading Station.

Date Start	Total Rain (in)	Duration (hr)	Intensity (in/hr)	Antecedent Dry Days
10/17/2005	0.20	12	0.02	27
2/19/2006	0.34	8	0.04	47
2/28/2006	0.88	16	0.06	8

The second storm monitored at the San Diego MLS during the 2005-2006 wet weather monitoring season occurred on February 19, 2006. On February 17, 2006 a storm began to move into San Diego County. After monitoring the storm for 48 hours, the storm produced sufficient rainfall to provide runoff in the Tecolote Creek Watershed and wet weather monitoring was initiated. The storm produced a total of 0.34" of rainfall (Table 9-3). A total of 66 one-liter composite sample aliquots were collected at rate such that one sample was collected for every 175,000 cubic feet of water that passed by the monitoring station. Additionally, grab samples were collected for those constituents not conducive to composite sampling prior to the peak of the storm hydrograph. Monitoring was conducted over a 9-hour period which captured the rise and initial peak of the runoff produced by the storm.

The third storm monitored at the San Diego MLS during the 2005-2006 wet weather monitoring season occurred on February 28, 2006. On February 27, 2006 a fast moving storm moved into San Diego County. The storm quickly produced sufficient rainfall to provide runoff in the Tecolote Creek Watershed and monitoring was initiated. The storm produced a total of 0.88" of rainfall (Table 9-3). A total of 13 one-liter composite sample aliquots were collected at a rate such that one sample was collected for every 85,000 cubic feet of water that passed by the monitoring station. Additionally, grab samples were collected for those constituents not conducive to composite sampling prior to the peak of the storm hydrograph. Monitoring was conducted over a 12-hour period which captured the rise and initial peak of the runoff produced by the storm.

Hydrographs from each storm event are presented in Appendix A.

9.2.1.2 Storm Water Monitoring Results

Three storm events were monitored at the Tecolote Creek MLS during the 2005-2006 wet weather monitoring period. Monitoring occurred on October 17, 2005 and February 19 and February 28, 2006. Analytical results from these events are presented with the historical results for the Tecolote Creek MLS in Table 9-4. A detailed description of the WQO sources and the technical reasoning of how the results are compared to the WQO are provided in Section 3.4. Discussion of sample results occur in groups; conventional parameters, bacteriological, pesticides, metals, and toxicity. A comparison of these results to previous monitoring data is presented in Section 9.2.2.

Conventional constituent results were below their respective water quality objectives with the exception of total suspended solids (TSS) and turbidity. TSS was above the WQO of 100 mg/L during the February 19, 2006 monitoring event (1020 mg/L). The turbidity result on the February 19, 2006 monitoring event (321 NTU) was above the WQO of 20 NTU.

Fecal coliform is the only bacterial indicator with a water quality objective for wet weather monitoring. Fecal coliform results were above the REC-I WQO of 400 MPN/100 mL during all three monitoring events. Results for fecal coliform were 9,000 MPN/100 mL on the October 17, 2005 monitoring event, 13,000 MPN/100 mL on the February 19, 2006 monitoring event and 5,000 MPN/100 mL on the February 28, 2006 event. All three bacterial indicators (Enterococci, fecal coliform, and total coliform) were lower than average during the last rainfall event on February 28, 2006.

The pesticide Chlorpyrifos was not detected in any sample during the 2005-2006 wet weather monitoring season. The pesticide Diazinon was detected (0.044 $\mu\text{g/L}$) during the October 17, 2005 monitoring event but was below the WQO of 0.08 $\mu\text{g/L}$. The pesticide Malathion was detected in all three storm events (0.052 $\mu\text{g/L}$ on October 17, 2005, 0.086 $\mu\text{g/L}$ on February 19, 2006 and 0.125 $\mu\text{g/L}$ on February 28, 2006) but was below the WQO of 0.43 $\mu\text{g/L}$ in all three samples.

Several total metals were detected in storm water samples collected during the 2005-2006 wet weather monitoring season. The total metals copper and lead were detected in all three monitoring events but were above their respective WQO's during the February 19, 2006 event. The total metal zinc was detected in the monitoring events on October 17, 2005 and February 19, 2006 but was above the WQO only during the February 19, 2006 event. The results for copper, lead, and zinc were 0.054 mg/L and 0.038 mg/L, and 0.329 mg/L respectively, during the February 19, 2006 event. The results for copper and lead were above the chronic WQO and the results for zinc were above both the chronic and acute WQO. The total metals arsenic, cadmium, chromium, and nickel were all detected during storm water monitoring events but were below their respective hardness-based WQO.

Table 9-4. Analytes measured at the Tecolote Creek mass loading station.

ANALYTE	UNITS	WQO	SOURCE	1993-1994		1994-1995				1995-1996			1996-1997		1997-1998			1998-1999			1999-2000			2000-2001				
				12/1/93	1/25/94	11/10/94	12/25/94	1/11/95	2/14/95	11/1/95	1/22/96	1/31/96	10/30/96	11/21/96	11/10/97	12/6/97	3/25/98	11/8/98	1/25/99	3/15/99	2/12/00	3/5/00	4/17/00	10/27/00	1/8/01	2/13/01		
General / Physical / Organic																												
Electrical Conductivity	umhos/cm					3220	393	414	185	1040	989			2220	53.5	1130	1690	726	6070	629	542	746	823	792	2950	2350	338	
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	1.96	3.1	1.2	1.28	0.82	1.55	11.4	2.4			2.5	2.4	3.6	1.6	0.6	0.7	<0.5	<0.5	4.16	1.56	2.96	4	1	1	
pH	pH Units	6.5-8.5	Basin Plan			7.4	7.4	7.4	9.1		7.8																	
Bacteriological																												
Enterococci	MPN/100 mL																								9,000	17,000	5,000	
Fecal Coliform	MPN/100 mL	4,000	Basin Plan	2,400	<30	11,000	17,000	>160,000	160,000	>16,000	16,000			8,000	16,000	160,000	3,640	8,850	1,600	1,600	1,600	<2	1,600	<2	50,000	21,000	1,300	
Total Coliform	MPN/100 mL			240,000	240,000	50,000	>160,000	>160,000	>160,000	>16,000				160,000	24,000	160,000	20,000	20,000	241,900	125,900	613,000	240	1,600	900	170,000	220,000	8,000	
Wet Chemistry																												
Ammonia As Nitrogen	mg/L				1.1	1.2	0.3	0.3	0.4	0.41	<0.2	<0.2	0.44	0.32	0.56	0.57	0.6	0.6	0.57	0.51	1.57	<0.1	<0.1	0.91	0.5	0.4		
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan																									
Biochemical Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	20	20	23.3	<3	9.5	12.8	<5	<5	13.4	12.9	33	43	22	30	5	9	11.7	2.38	5.7	14	13.2	<2			
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	280	100	150	91	74	126	132	69	56	35	89	20	22	61	33	33	74	60	36	122	118	88			
Dissolved Organic Carbon	mg/L																											
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.2	0.4	<0.05	0.5	0.3	0.1	0.8	0.4	0.2	0.2	<0.1	0.1	0.12	0.52	0.15	0.1	<0.1	0.13	<0.1	0.14	0.28	0.27			
Nitrate As N	mg/L	10	Basin Plan	4.2	<0.1	0.8	0.8	0.8				1.1	1	1.7	0.54	0.5	0.52	0.7	0.53	3.3	0.6	2.3	1	0.7	0.6			
Nitrite As N	mg/L	1	Basin Plan	0.15	<0.05	<0.05	<0.05	<0.05							0.06	0.05	0.1	<0.05	0.05	0.065	<0.05	<0.05	0.09	0.08	<0.05			
Surfactants (MBAS)	mg/L	0.5	Basin Plan	0.31	0.77	0.52	0.23	0.17	0.26	0.14	<0.1	<0.1	<0.1	<0.1	0.05	0.2	0.51	0.08	<0.05	0.48	0.24	0.2	<0.5	<0.5	<0.5			
Total Dissolved Solids	mg/L	1000	Basin Plan	400	750	2300	260	370	680	1270	842	256	546	362	1730	447	318	1492	563	660	279	304	302	440	2320	250		
Total Kjeldahl Nitrogen	mg/L			10	3.7	3.7	2.3	3.6	3.9	2.6	0.89	2.9	2.7	1.6	<1	1.1	0.12	2.93	1.85	2.1	0.77	1.83	2.15	6.5	0.67			
Total Organic Carbon	mg/L																											
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.3	0.5	<0.05	1.1	0.4	0.5	<0.2	<0.2	0.8	0.5	0.7	0.12	0.23	0.61	0.16	0.16	0.21	0.34	0.4	0.5	0.32	0.38			
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	880	1500	140	300	76	130	140	244	92	348	104	410	503	2024	913	540	55	478	80	87	103	75	179		
Turbidity	NTU	20	Basin Plan	8	36	43	66	39	79.6	17.4	12.1	120	131	160	27	96	84	45	17	17	63	60	73.8	63	85			
Pesticides																												
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game																<0.05*		<0.5*	<0.5*	<0.5*	<0.5*	<0.05*	<0.5*	0.03	
Diazinon	µg/L	0.08	CA Dept. of Fish & Game																0.4	0.28	0.41	<0.5*	<0.5*	0.18	0.47	<0.5	0.16	
Malathion	µg/L	0.43	CA Dept. of Fish & Game																					1.8	<0.5*	<0.1		
Hardness																												
Total Hardness	mg CaCO3/L			210	550	1100	140	120	340	547	363	111	268	253	694	186	124	148	218	277	216	126	105	209	1070	107		
Total Metals																												
Antimony	mg/L	0.006	Basin Plan	0.0014	0.0012	0.0019	<0.001	<0.001	0.0012	<0.0015				<0.003	0.003	<0.0015	<32*	<32*	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.002	<0.002	<0.002
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.0069	0.013	<0.005	0.0089	<0.005	<0.005	0.008				0.009	0.007	0.001	<0.053*	<0.053*	0.004	0.0015	0.002	<0.001	0.006	0.009	0.007	0.007	0.005	
Cadmium	mg/L	(b)	40 CFR 131	0.0023	0.0027	0.0003	0.0008	0.0003	0.0003	0.0009				0.0016	0.0019	<0.00025	<0.004	<0.004	0.004	<0.00025	<0.00025	<0.00025	0.001	<0.00025	<0.001	<0.001	<0.001	
Chromium	mg/L	(b)	CTR (Cr VI)	0.0017	0.006	0.0028	0.0019	0.0028	0.0051	<0.005				0.010	<0.010	<0.005	<0.007	0.019	<0.005	0.009	0.056	<0.005	<0.005	0.006	<0.005	0.006		
Copper	mg/L	(b)	40 CFR 131	0.030	0.054	0.0068	0.025	0.010	0.012	0.033				0.050	0.020	0.009	0.056	0.146	<0.005	<0.005	<0.005	0.036	0.017	<0.005	0.023	0.012	0.016	
Lead	mg/L	(b)	40 CFR 131	0.140	0.200	0.003	0.035	0.019	0.013	0.0173				0.050	0.026	<0.001	<0.042*	<0.042*	0.040	0.003	0.023	0.027	<0.001	<0.001	0.015	0.008	0.018	
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.022	0.018	0.016	0.0065	<0.005	0.005	0.014				<0.010	<0.010	<0.005	<0.015	<0.015	0.020	<0.005	0.009	<0.005	<0.005	<0.005	0.011	0.009	0.005	
Selenium	mg/L	0.02	40 CFR 131	<0.0005	0.0006	<0.0005	0.0012	0.0006	0.0005	0.0023				0.002	0.003	<0.001	<0.075*	<0.075*	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.006	<0.002	
Zinc	mg/L	(b)	40 CFR 131	0.780	0.490	0.034	0.170	0.059	0.062	0.137				0.230	0.120	0.069	0.068	0.130	<0.025	<0.025	0.071	0.160	0.012	0.050	0.080	0.040	0.080	
Dissolved Metals																												
Antimony	mg/L	(e)	40 CFR 131			0.0019	0.001	<0.001	<0.001					<0.0015	<0.0015	<0.003	<0.003					<0.0015	<0.0015	<0.0015	<0.002	<0.002	<0.002	
Arsenic	mg/L	0.34 (c)	40 CFR 131			<0.005	<0.005	<0.005	<0.005					0.005	0.003	0.002	0.002					<0.001	<0.001	<0.001	0.003	0.003	0.002	
Cadmium	mg/L	(b)	40 CFR 131			0.0003	<0.0002	<0.0002	<0.0002					<0.00025	<0.00025	<0.0005	0.0005					<0.00025	<0.00025	<0.00025	<0.001	<0.001	<0.001	
Chromium	mg/L	(b)	40 CFR 131			0.0019	<0.001	0.0014	<0.001					<0.005	<0.005	<0.010	<0.010					<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Copper	mg/L	(b)	40 CFR 131			0.0059	<0.005	0.005	0.0059					<0.008	0.006	0.010	<0.010					<0.005	<0.005	<0.005	0.010	0.006	<0.005	
Lead	mg/L	(b)	40 CFR 131			0.0015	<0.001	<0.001	0.0019					0.002	<0.001	<0.002	<0.002					<0.005	<0.001	<0.001	<0.002	<0.002	0.003	
Nickel	mg/L	(b)	40 CFR 131			0.0150	<0.005	<0.005	<0.005					<0.005	<0.005	<0.010	<0.010					<0.005	<0.005	<0.005	0.009	0.008	0.002	
Selenium	mg/L	0.02 (d)	40 CFR 131			<0.0005	<0.0005	<0.0005	<0.0005					<0.001	<0.001	<0.002	<0.003					<0.001	<0.001	<0.001	<0.002	0.004	<0.002	
Zinc	mg/L	(b)	40 CFR 131			0.039	0.013	0.017	0.016					0.026	<0.025	0.230	<0.050					0.016	0.012	<0.001	0.050	0.030	<0.020	
Toxicity																												
Ceriodaphnia 96-hr	LC50 (%)	100																						25	100	100		
Ceriodaphnia 7-day survival	NOEC (%)	100																						12.5	50	100		
Ceriodaphnia 7-day reproduction	NOEC (%)	100																										
Hyalella 96-hr	NOEC (%)	100			</																							

Table 9-4. Analytes measured at the Tecolote Creek mass loading station.

ANALYTE	UNITS	WQO	SOURCE	2001-2002			2002-2003			2003-2004			2004-2005			2005-2006			Frequency Above WQO	Mean Ratio to WQO	
				11/29/01	2/17/02	3/8/02	11/8/02	12/16/02	2/11/03	11/1/03	11/12/03	2/3/04	10/27/04	02/11/05	02/18/05	10/17/05	2/19/06	2/28/06			
General / Physical / Organic																					
Electrical Conductivity	umhos/cm			3300	5090	3650	1694	311	322	4740	4490	850	167	473	199	7260	549	472			
Oil And Grease	mg/L	15	USEPA Multi-Sector General Permit	<1	<1	2	2.00	1.69	3.16	1.05	<1	<1	<1	1.32	<1	<1	<1	<1	0%	0.12	
pH	pH Units	6.5-8.5	Basin Plan	7.7	7.4	7.7	6.67	7.61	7.55	7.67	7.73	6.85	6.78	6.90	7.14	7.71	8.13	7.88	0%	0.00	
Bacteriological																					
Enterococci	MPN/100 mL			7,000	7,000	3,000	35,000	23,000	14,000	11,000	8,000	80,000	300,000	50,000	30,000	17,000	50,000	13,000			
Fecal Coliform	MPN/100 mL	4,000	Basin Plan	3,000	5,000	7,000	110,000	13,000	2,200	50,000	17,000	13,000	70,000	13,000	17,000	9,000	13,000	5,000	68%	6.79	
Total Coliform	MPN/100 mL			5,000	22,000	11,000	300,000	50,000	30,000	230,000	50,000	50,000	800,000	130,000	130,000	170,000	110,000	80,000			
Wet Chemistry																					
Ammonia As Nitrogen	mg/L			0.9	0.19	0.28	0.44	0.34	0.26	0.38	<0.1	0.14	0.39	0.35	<0.1	0.16	0.51	0.13			
Un-ionized Ammonia as N	µg/L	25 (a)	Basin Plan				0.64	3.79	2.4	5.19	0.79	0.24	0.6	0.1	0.5	2.5	14.8	2.6	0%	0.04	
Biochemical Oxygen Demand	mg/L	30	USEPA Multi-Sector General Permit	3.6	4.5	4.6	6.75	22.4	25.4	22.9	4.19	68.4	7.45	7.75	3.65	5.62	5.36	4.41	8%	0.44	
Chemical Oxygen Demand	mg/L	120	USEPA Multi-Sector General Permit	60	155	57	79	67	125	211	99	148	173	88	25	71	115	40	26%	0.74	
Dissolved Organic Carbon	mg/L						8.3	13.2	15.9	26.1	20.5	6.46	34	7.8	4.44	11.4	19.5	11.4			
Dissolved Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.11	0.4	0.13	0.16	0.32	0.82	0.47	0.27	0.06	0.89	0.46	<0.05	0.2	0.16	0.24	0%	0.13	
Nitrate As N	mg/L	10	Basin Plan	0.4	0.5	0.4	0.81	0.84	0.90	1.84	0.95	0.55	0.53	0.5	0.42	1.11	1.11	0.51	0%	0.09	
Nitrite As N	mg/L	1	Basin Plan	<0.05	<0.05	<0.05	<0.05	0.06	0.06	0.07	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0%	0.04	
Surfactants (MBAS)	mg/L	0.5	Basin Plan	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	8%	0.44	
Total Dissolved Solids	mg/L	1000	Basin Plan	1890	2200	2490	757	220	373	2660	1070	1190	174	627	285	3190	404	377	32%	0.92	
Total Kjeldahl Nitrogen	mg/L			2.2	2	0.39	2.1	1.4	3.7	3	1.8	3.4	6	1	6.2	1.6	7.9	1.2			
Total Organic Carbon	mg/L						21.9	27.0	15.4	35.5	20	18.8	36.4	12.1	8.27	25.1	32.2	23.3			
Total Phosphorus	mg/L	2	USEPA Multi-Sector General Permit	0.24	0.65	0.22	0.6	1.84	1.03	1.14	0.34	0.58	2.87	0.47	0.5	0.24	0.75	0.37	3%	0.27	
Total Suspended Solids	mg/L	100	USEPA Multi-Sector General Permit	34	68	33	158	346	301	102	<20	<20	2180	229	245	47	1020	76	66%	3.75	
Turbidity	NTU	20	Basin Plan	21.3	8.99	10.7	102	200	200	34.7	13.5	201	540	44.7	67.4	19.9	321	16.5	71%	4.14	
Pesticides																					
Chlorpyrifos	µg/L	0.02	CA Dept. of Fish & Game	<0.03*	<0.03*	<0.03*	<0.03*	0.087	<0.03*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	18%	0.78	
Diazinon	µg/L	0.08	CA Dept. of Fish & Game	0.22	0.19	0.09	0.185	0.095	0.155	0.116	0.073	0.053	<0.01	0.051	<0.01	0.044	<0.02	<0.02	62%	1.89	
Malathion	µg/L	0.43	CA Dept. of Fish & Game				<0.10	<0.10	0.87	<0.01	0.269	0.085	<0.01	0.063	<0.01	0.052	0.086	0.125	12%	0.48	
Hardness																					
Total Hardness	mg CaCO3/L			962	1180	1350	344	245	298	1470	1300	591	126	330	152	1700	272	195			
Total Metals																					
Antimony	mg/L	0.006	Basin Plan	<0.002	<0.002	<0.002	<0.002	0.006	0.009	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	6%	0.31	
Arsenic	mg/L	0.34/0.05	40 CFR 131/ Basin Plan	0.001	0.004	0.004	0.008	0.015	0.013	0.009	0.006	0.016	0.006	0.009	<0.002	0.01	0.006	0.003	0%	0.13	
Cadmium	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001	<0.001	3%	0.18	
Chromium	mg/L	(b)	CTR (Cr VI)	0.006	0.006	<0.005	<0.005	0.02	0.018	0.005	<0.005	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.02	
Copper	mg/L	(b)	40 CFR 131	0.008	0.009	0.009	0.03	0.050	0.038	0.011	0.009	0.044	0.038	0.018	0.010	0.01	0.054	0.010	47%	1.45	
Lead	mg/L	(b)	40 CFR 131	0.004	0.004	<0.002	0.018	0.052	0.040	0.006	0.003	0.034	0.065	0.019	0.011	0.003	0.038	0.002	56%	3.07	
Nickel	mg/L	(b)/0.1	40 CFR 131/ Basin Plan	0.005	0.006	0.006	0.008	0.011	0.012	0.007	0.005	0.012	0.012	0.005	0.003	0.008	0.012	0.003	0%	0.07	
Selenium	mg/L	0.02	40 CFR 131	<0.002	0.003	0.002	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.09	
Zinc	mg/L	(b)	40 CFR 131	0.022	0.028	0.034	0.096	0.208	0.235	0.047	0.033	0.206	0.237	0.086	0.065	0.066	0.329	<0.02	14%	0.52	
Dissolved Metals																					
Antimony	mg/L	(e)	40 CFR 131	<0.002	<0.002	<0.002	0.002	0.002	0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		
Arsenic	mg/L	0.34 (c)	40 CFR 131	0.001	0.001	0.002	0.003	0.004	0.003	0.004	0.003	0.003	<0.002	<0.002	<0.002	0.004	<0.001	<0.001	0%	0.01	
Cadmium	mg/L	(b)	40 CFR 131	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0%	0.07	
Chromium	mg/L	(b)	40 CFR 131	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.02	
Copper	mg/L	(b)	40 CFR 131	0.006	<0.005	<0.005	0.008	0.006	0.042	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	0.006	0.006	0.006	3%	0.31	
Lead	mg/L	(b)	40 CFR 131	<0.002	<0.002	<0.002	<0.002	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	3%	0.22	
Nickel	mg/L	(b)	40 CFR 131	0.004	0.005	0.005	0.004	<0.002	0.003	0.005	0.003	0.003	<0.002	0.003	<0.002	0.004	0.003	0.002	0%	0.03	
Selenium	mg/L	0.02 (d)	40 CFR 131	<0.002	<0.002	<0.002	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0%	0.01	
Zinc	mg/L	(b)	40 CFR 131	<0.020	0.029	<0.020	0.021	0.039	0.144	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.052	0.024	<0.02	0%	0.12	
Toxicity																					
Ceriodaphnia 96-hr	LC50 (%)	100		>100	>100	>100	>100	>100	70.71	>100	>100	>100	>100	>100	>100	>100	>100	>100	11%	0.30	
Ceriodaphnia 7-day survival	NOEC (%)	100		50	100	100	100	100	50	100	100	100	100	100	100	100	100	100	22%	0.78	
Ceriodaphnia 7-day reproduction	NOEC (%)	100		50	100	100	100	100	50	100	100	100	100	100	100	50	100	100	27%	0.53	
Hyalella 96-hr	NOEC (%)	100		100	100	100	100	100	100	100	100	100	100	100	100	100	25	100	17%	0.89	
Selenastrum 96-hr	NOEC (%)	100		100	25	100	100	100	100	100	100	100	100	100	100	100**	100	100	7%	0.29	

See last page for footnotes and source references

Table 9-4. Analytes measured at the Tecolote Creek mass loading station.

Blank spaces have been verified and no data is available due to changes in the monitoring program.

- (a) Un-ionized Ammonia is a calculated value, non-detectable values calculated at the detection limit. Basin Plan WQO is 0.025 mg/L; values shown here have been converted to $\mu\text{g/L}$.
- (b) Water Quality Objective for dissolved metal fractions are based on total hardness and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
- (c) Water Quality Objectives for dissolved metal fractions are based on water effects ratios (WER) and are calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
- (d) Water Quality Objective is based on the total recoverable form as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000.
- (e) USEPA has not published an aquatic life criterion value.

Shaded text – bold values exceed the **CCC** water quality objective and bold/underlined results exceed the **CMC** water quality objective.

* Indicates detection limit exceeds water quality objective.

** Indicates results should be interpreted with care due to method protocol discrepancy.

Sources

USEPA National Pollutant Discharge Elimination System (NPDES) Storm Water Multi-Sector General Permit for Industrial Activities, 65 Federal Register (FR) 64746, Final Reissuance, October 30, 2000. Table 3 - Parameter benchmark values.

Siepmann and Finlayson 2000.

Basin Plan, September 8, 1994.

Assembly Bill 411 - Title 17 of the California Code of Regulations, Section 7958.

USEPA Federal Register Document 40 CFR Part 131, May 18, 2000.

The dissolved metals copper and nickel were detected in all three storm water samples collected during the 2005-2006 wet weather monitoring season but were below their respective hardness-based WQO (copper: 0.006 mg/L for all events; nickel: 0.004 mg/L on October 17, 2005, 0.003 mg/L on February 19, 2006, and 0.002 mg/L on February 28, 2006). Dissolved zinc was detected in the monitoring events on October 17, 2005 (0.052 mg/L) and February 19, 2006 (0.024 mg/L) but was below the hardness based WQO. Dissolved arsenic was only detected in the monitoring events on October 17, 2005 (0.004 mg/L) but was below the hardness based WQO. All dissolved metals were below their respective hardness based WQO for both the CCC and the CMC.

Toxicity was observed for the chronic reproduction endpoint for the species *Ceriodaphnia dubia* and the acute survival endpoint for the freshwater amphipod *Hyalella azteca* during storm water monitoring events during the 2005-2006 wet weather monitoring season. Toxicity was observed for the 7-day reproduction endpoint (NOEC=50%) for *Ceriodaphnia dubia* during the October 17, 2005 monitoring event. In comparison to the control result, which had a mean number of *Ceriodaphnia dubia* young produced per adult of 14.3, the 100% concentration sample had a mean number of young produced per adult of 10.3 which was statistically significant. However, it should be noted that the control organisms for this test did not meet the acceptability criteria of 60 percent of the surviving females producing at least three broods, with an average of 15 or more young per surviving female. Also, the percent minimum significant difference (pMSD) exceeded the upper-bound limit of 47 percent for reproduction due to high variability among replicates. As a result, the ability to detect toxic responses may have been compromised, so the reproduction results should be interpreted with care. It should be noted, however, that all test concentrations had at least 80% survival at test termination and all test concentrations except the 100% test solution had higher reproduction averages than the control.

Toxicity was observed for the *Hyalella* acute survival endpoint during the February 19, 2006 monitoring event. *Hyalella* survival in the 100% test solution sample was 47.5% and was 70% in the 50% test solution sample compared to 95% survival in the control sample. Therefore the No Observed Effect Concentration (NOEC) for *Hyalella* was 25% compared to the WQO of 100% for the February 19, 2006 monitoring event.

No toxicity was observed for the *Selenastrum* growth endpoint in any of the monitoring events. It should be noted however that for the October 17, 2006 event, light intensity readings on day two and three of the test were slightly above the protocol range. The percent minimum significant difference (PMSD) exceeded the upper bound limit of 29 percent and the coefficient of variation (CV) exceeded the limit of 20 percent. As a result, the ability to detect toxic responses may have been compromised in this test so the results should be interpreted with care.

9.2.2 Relationships/Analyses

An evaluation of storm water monitoring data collected at the Tecolote Creek MLS over the past thirteen years was performed. Several constituents have consistently had analytical results measured above their respective WQO. Fecal coliform, TSS, turbidity, and total lead have all had results above their respective WQO in greater than 50% of the monitoring events. Turbidity has most frequently exceeded the WQO (71% of monitoring events).

Conventional constituents that have had results measured above their respective WQO, but less frequently include the following:

- Biochemical Oxygen Demand (BOD) (8% of monitored events)
- Chemical Oxygen Demand (COD) (26% of monitored events)
- Surfactants (MBAS) (8% of monitored events).

Analysis of the results indicate a significant downward trend for surfactants ($R^2=0.15$) and ammonia ($R^2=0.16$), two constituents which have never been detected at concentrations above their respective WQO.

Total coliform and enterococcus have had consistently elevated levels in storm water monitoring events. Visual inspection of the bacteriological results indicate results for the first storm of each monitoring season have tended to be the higher than results for storms that occur later in the monitoring season. Analysis of the results indicate a significant increasing trend for enterococcus ($R^2=0.30$) concentrations.

Chlorpyrifos, Diazinon, and Malathion were not detected during any storm events monitored during the 2005-2006 monitoring season. Chlorpyrifos results were above the WQO during the 2000-2001 and 2002-2003 monitoring seasons. However, chlorpyrifos has not been detected over the past three monitoring seasons. Diazinon results were above the water quality objective during the 1998-1999, 1999-2001, 2000-2001, 2001-2002, and 2002-2003 wet weather monitoring seasons. However, diazinon results have not exceeded the water quality objective and have decreased in detected concentration over the past two years of monitoring. Analysis of the results indicate that there is a significant downward trend in Diazinon ($R^2=0.30$) concentrations.

During the last five years of monitoring, four total metals (antimony, copper, lead, and zinc) have had results above their respective WQO. Antimony was detected above both the acute and chronic WQO during an event in both the 2003-2003 and 2003-2004 monitoring seasons. In the 2002-2003 monitoring season the results for copper and lead were above the WQO during all three monitored storm events. In the past three years of monitoring, copper has been above the WQO in 3 out of 9 monitored events and lead has been above the WQO in 5 out of 9 events. Zinc has been above both the acute and chronic WQO in a single event for each of the past two monitoring seasons. Analysis of the results indicate a significant decreasing trend for total lead ($R^2=0.17$) concentrations.

Results for dissolved metals have never been above their respective hardness based acute or chronic WQO over the past five years of monitoring at the Tecolote Creek MLS except for a single copper exceedance for an event in the 2002-2003 monitoring season. There are no significant upward or downward trends evident for dissolved metals at the Tecolote Creek MLS.

Toxicity has only been observed in six monitoring events over the past five years of monitoring at the Tecolote Creek MLS. The first occasion of observed toxicity was in the chronic survival and reproduction endpoints for *Ceriodaphnia dubia* on November 29, 2001. Toxicity was also observed for the *Selenastrum capricornutum* acute endpoint for the event on February 17, 2002. Toxicity was observed for the *Ceriodaphnia dubia* chronic and acute endpoints for the event on February 11, 2003 and for the chronic reproduction endpoint for the events on November 1, 2003.

In order to illustrate the magnitude of the water quality exceedances for the 2005-2006 wet weather monitoring season, the ratio of water quality results to the WQOs were plotted for common constituents of concern (Figure 9-3). The average magnitude of water quality exceedances was also determined for each constituent by calculating the mean ratio of water quality results to the WQOs from all storm events from October 2001 through April 2005.

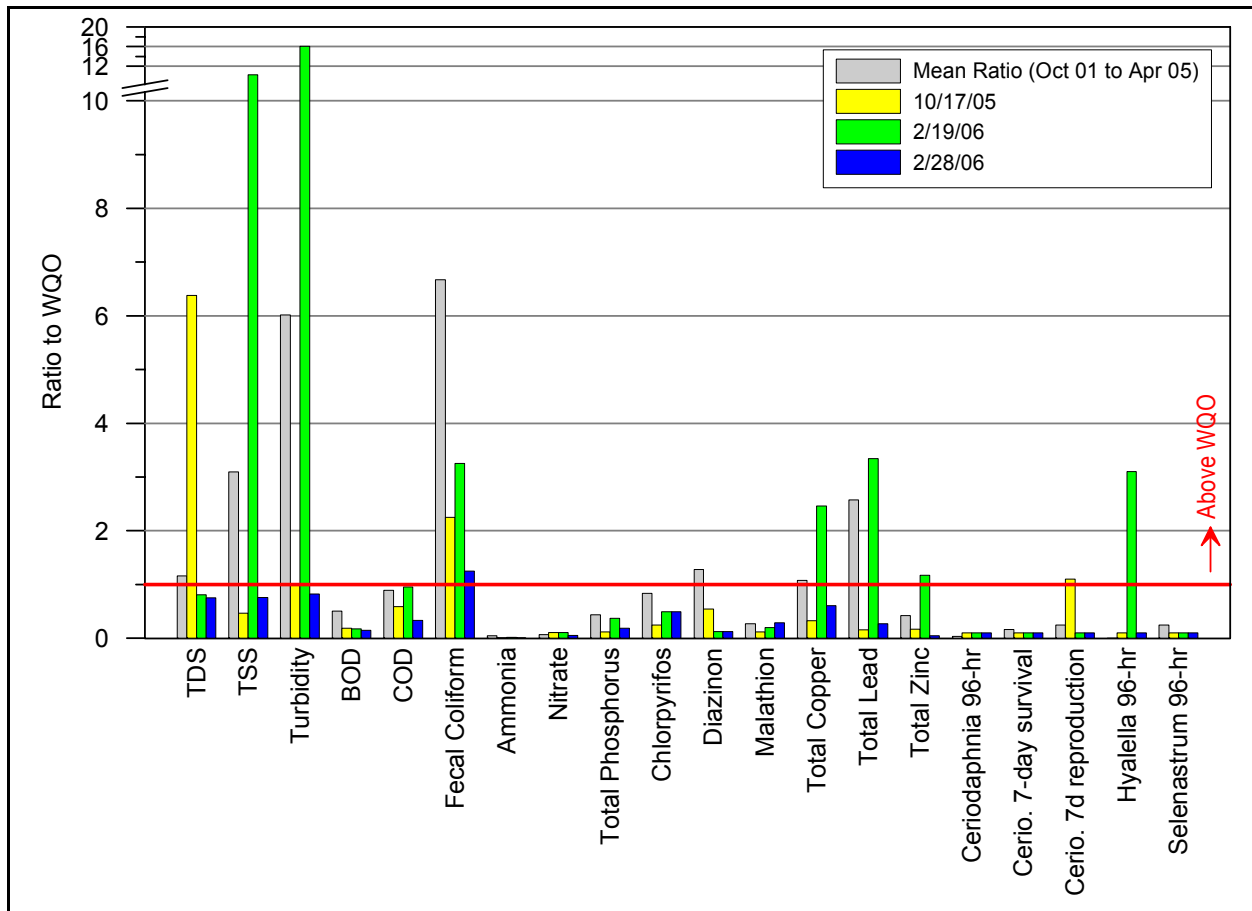


Figure 9-3. Mission Bay water quality ratios.

The conventional constituent total dissolved solids found to be in exceedance of the WQO by over six times during the storm event on October 17, 2005. The magnitude of exceedance for this event is greater than the average TDS result for all storm events monitored from October 2001-April 2005. Total suspended solids also noticeably exceeded the WQO (> 10 times the WQO) during the February 19, 2006 storm event which is greater than the historical exceedance ratio. There was also a noticeable single exceedance for turbidity (16 times the WQO) during the February 19, 2006 monitoring event which is greater than the historical exceedance ratio.

Fecal coliform exceeded the WQO during all three monitoring events for the 2005-2006 monitoring season. However, for monitoring events at the Tecolote Creek MLS from October 2001 through April 2004 fecal coliform has on average, exceeded the WQO by over six times.

The pesticides Chlorpyrifos, Diazinon, and Malathion did not exceed the water quality objective during the 2005-2006 monitoring season. For the monitoring events conducted between October 2001 through April 2005 at the Tecolote Creek MLS, Diazinon have on average exceeded the water quality objective. However the average magnitude of exceedance value is largely the result of monitoring events prior to the 2003-2004 monitoring season. There has only been one pesticide exceedance (Diazinon during the event on November 1, 2003) in the past three monitoring seasons.

The total metals copper, lead and zinc each exceeded the WQO during the monitoring event on February 19, 2006. The observed magnitude of exceedance for total copper is greater than to the historical magnitude of exceedance for copper for monitoring events at the Tecolote Creek MLS from October 2001 through April 2004. The observed magnitude of exceedance for total lead is greater than to the historical magnitude of exceedance for lead for monitoring events at the Tecolote Creek MLS from October 2001 through April 2004 (Average ratio of exceedance 1.4 times the WQO). The total metal Zinc has not historically exceeded the WQO at the Tecolote Creek MLS.

The toxicity result for the *Ceriodaphnia* 7-day reproduction test showed a magnitude of exceedance of 1.1 times the WQO for the October 17, 2005 monitoring event. For monitoring events at the Tecolote Creek MLS from October 2001 through April 2004 *Ceriodaphnia* toxicity results did not exceed the water quality objectives. Also, test acceptability criteria deviations during the October 17, 2005 test may limit the ability to detect toxic responses during this test (see Section 9.2.1.2). The toxicity result for *Hyalella* exceeded the WQO by 3.1 times during the February 19, 2006 monitoring event. For monitoring events at the Tecolote Creek MLS from October 2001 through April 2004 *Hyalella* toxicity results did not exceed the water quality objectives. Also, protocol deviations during the test may limit the ability to detect toxic responses during this test (see Section 9.2.1.2).

9.2.3 Wet Weather Constituent Loadings Analysis

Loading values for each constituent sampled were derived using the event mean concentration (EMC) values obtained from composite samples collected at the Tecolote Creek MLS site and the recorded volume of water discharged during the sampling period. For each of the three storm events, the mean and coefficient of variation were calculated and are reported in Table 9-5.

The constituent EMC loads at the Tecolote Creek MLS site were compared to the mean water quality objective (WQO) load, calculated by multiplying the mean flow (Table 9-5) by constituent WQOs. This comparison shows that fecal coliform, TDS, TSS, total copper, and total lead mean EMC loads were greater than their corresponding mean WQO loads. These results correspond to the EMC exceedances reported in the wet weather chemistry tables, except for TDS. Total dissolved solids was not above the water quality objective for any one wet weather sampling event, but due to the volume of storm water runoff the mean EMC load was 213 kg/day greater than the WQO load. This is 0.32% greater than the WQO load, a negligible amount. Fecal coliform EMC load results were an order of magnitude greater than the WQO load. The EMC load for fecal coliform was 16.8 trillion MPN/day, compared to the WQO load of 6.92 trillion MPN/day. The EMC load for TSS was 105,757 kg/day, compared to the WQO load of 17,318 kg/day. Loads for total copper and total lead were less extreme. The EMC load for total copper was 6.06 kg/day, compared to the WQO load of 5.28 kg/day, while the EMC load for total lead was 3.89 kg/day, compared to the WQO load of 3.22 kg/day.

These loading estimates do not include additional loading delivered to the receiving water after the composite sample collection was completed since continual base flows have not been monitored under this program. Continual flow monitoring will be performed during the 2006-2007 wet weather monitoring season in order to capture the annual base flow conditions. Constituent concentrations during base flow conditions will not be monitored until the 2007-2008 season after the adoption of the revised storm water permit (Order R9-2006-0011). Annual loading estimates will be performed in future reports when this data is available.

Table 9-5. Loading Statistics for Tecolote Creek (TC) mass loading station.

Constituent	Units	Mean TC Load	Coefficient of Variation (%)	Mean TC WQO Load
General/ Physical/Organic				
Flow	cfs	71	81	-
Oil and Grease (O&G)	kg/day	87	81	2,598
Bacteriological				
Total Coliform	MPN/day	1.74E+14	84	na
Fecal Coliform	MPN/day	1.68E+13	114	6.92E+12
Enterococci	MPN/day	5.91E+13	131	na
Wet Chemistry				
Total Dissolved Solids (TDS)	kg/day	86,804	33	86,591
Total Suspended Solids (TSS)	kg/day	105,757	160	17,318
Phosphorus, Total	kg/day	101	110	346
Phosphorus, Dissolved	kg/day	33	76	346
Nitrate	kg/day	151	104	1,732
Nitrite	kg/day	4	81	173
Total Kjeldahl Nitrogen (TKN)	kg/day	869	146	na
Ammonia	kg/day	60	132	na
Biochemical Oxygen Demand, 5-day (BOD ₅)	kg/day	865	85	5,195
Chemical Oxygen Demand (COD)	kg/day	14,507	118	20,782
Total Organic Carbon (TOC)	kg/day	4,922	91	na
Dissolved Organic Carbon (DOC)	kg/day	2,770	101	na
Methylene Blue Active Substances (MBAS)	kg/day	43	81	87
Pesticides				
Diazinon	kg/day	0.002	53	0.014
Chlorpyrifos	kg/day	0.002	81	0.003
Malathion	kg/day	0.017	81	0.074
Total Metals				
Antimony (Sb), Total	kg/day	0.43	81	1.04
Arsenic (As), Total	kg/day	0.86	94	8.66
Cadmium (Cd), Total	kg/day	0.14	107	1.27
Chromium (Cr), Total	kg/day	0.43	81	111.56
Copper (Cu), Total	kg/day	6.06	142	5.28
Lead (Pb), Total	kg/day	3.89	163	3.22
Nickel (Ni), Total	kg/day	1.44	128	29.19
Selenium (Se), Total	kg/day	0.43	81	3.46
Zinc (Zn), Total	kg/day	33.46	164	67.17
Dissolved Metals				
Antimony (Sb), Dissolved	kg/day	0.43	81	na
Arsenic (As), Dissolved	kg/day	0.19	56	58.88
Cadmium (Cd), Dissolved	kg/day	0.09	81	1.08
Chromium (Cr), Dissolved	kg/day	0.43	81	35.25
Copper (Cu), Dissolved	kg/day	1.04	81	5.07
Lead (Pb), Dissolved	kg/day	0.17	81	1.90
Nickel (Ni), Dissolved	kg/day	0.46	88	29.13
Selenium (Se), Dissolved	kg/day	0.43	81	3.46
Zinc (Zn), Dissolved	kg/day	3.39	95	65.69

9.2.4 Watershed Storm Water Modeling

The estimated average pollutant storm load and the expected loads are compared in this section and are based on the modeling methods provided in Section 3. This comparison can provide watershed managers with additional information on what pollutants are causing unexpectedly high loads.

Figure 9-4 shows the mean modeled loads calculated in GIS for the Tecolote Creek Watershed based on the rainfall from the three monitored events, land use impervious values, and assumed constituent concentrations. Both load estimates base the runoff volume on the storm rainfall interpolated across the watershed from the County's ALERT rain gage network and the watershed's imperviousness. The loads represent the average amount during the monitored events. The measured loads are calculated by using the mean measured concentrations found during the 2005-2006 storm season. The modeled loads are calculated by assuming the concentrations running off the different land uses in the watershed correspond to the median land use event mean concentrations found in the National Stormwater Quality Database. A more detailed description of the modeling methods is provided in Section 3.

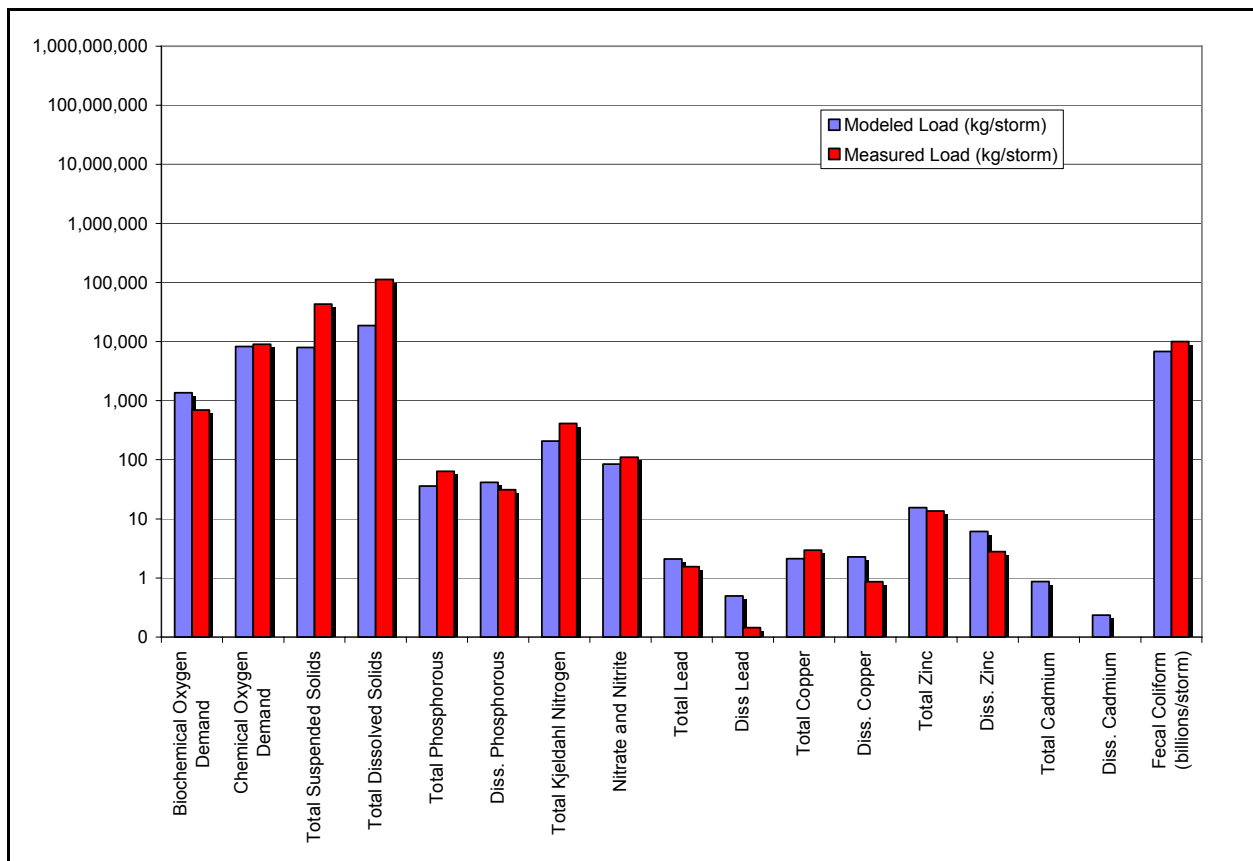


Figure 9-4. Mean modeled and measured loads for the Tecolote Creek Watershed.

Loads of total suspended and total dissolved solids based on measured concentrations are higher than might be expected from the land use characteristics in the Tecolote Creek Watershed. The watershed assessment also lists total suspended solids as a high priority constituent due to frequent exceedances.

9.2.5 2005 Dry Weather Monitoring Data Evaluation

In addition to the wet weather monitoring discussed above, a separate dry weather monitoring program is carried out by each jurisdiction. Dry weather monitoring reports are provided separately by each jurisdiction in its Jurisdictional Urban Runoff Management Program (JURMP) Annual Report. Dry weather data is also provided in a regional data sharing format which is used for the watershed management area assessments and regional comparisons in this report as described in Section 3.5. Dry weather monitoring sites with field parameter and chemistry results are presented in this section and are shown on Figure 9-5.

Water quality monitoring was performed at 62 locations in the Mission Bay WMA during the 2005 dry weather monitoring program. Of these, 14 sites are located upstream of the mass loading station on Tecolote Creek. A summary of the 2005 dry weather monitoring results for the Mission Bay WMA are presented below in Table 9-6.

Table 9-6. Summary of the 2005 Dry Weather Monitoring Results in the Mission Bay WMA.

Analyte	Units	DW Action Level	No. Samples	Minimum	Mean	Maximum
Conductivity*	mS/cm		62	1.0	4.9	20.0
Oil & Grease	mg/L	15	15	1.5	2.3	3.3
pH	pH units	6.5-8.5	62	7.0	8.1	9.6
Enterococcus	MPN/100mL	10,000	15	1	11,780	110,000
Fecal Coliform	MPN/100mL	20,000	15	10	13,457	140,000
Total Coliform	MPN/100mL	50,000	15	10	89,699	900,000
Ammonia (NH ₃ -N)	mg/L	1	56	<0.1	0.4	2.1
Nitrate (NO ₃ -N)	mg/L	10	61	<0.1	1.0	10.3
MBAS	mg/L	1	15	0.1	0.2	0.7
Ortho-phosphate (PO ₄ -P)	mg/L	2	60	<0.05	0.5	2.2
Turbidity	NTU	20	55	0.3	75.1	1,000
Chlorpyrifos	µg/L	0.5	15	<0.05	<0.05	<0.05
Diazinon	µg/L	0.5	15	<0.05	na	0.160
Total Hardness	mg CaCO ₃ /L		15	330	1,447	5,730
Cadmium, Diss	µg/L	(a)	15	<5	na	<5
Copper, Diss	µg/L	(a)	15	<5	6.34	24.20
Lead, Diss	µg/L	(a)	15	<5	na	<5
Zinc, Diss	µg/L	(a)	15	<20	9.29	31.0

* All data are as reported by co-permittees. No unit conversions were made

Mean values are calculated including non-detect results at half the reporting limit. If the mean value was less than the reporting limit, then the mean was not included in the table

(a) Dry weather action level for dissolved metal fraction based on total hardness and calculated as described by the USEPA Federal Register Doc. 40 CFR Part 131, May 18, 2000. If Total Hardness was greater than 400 mg/L, then 400 mg/L was used to calculate dissolved metals water quality objectives

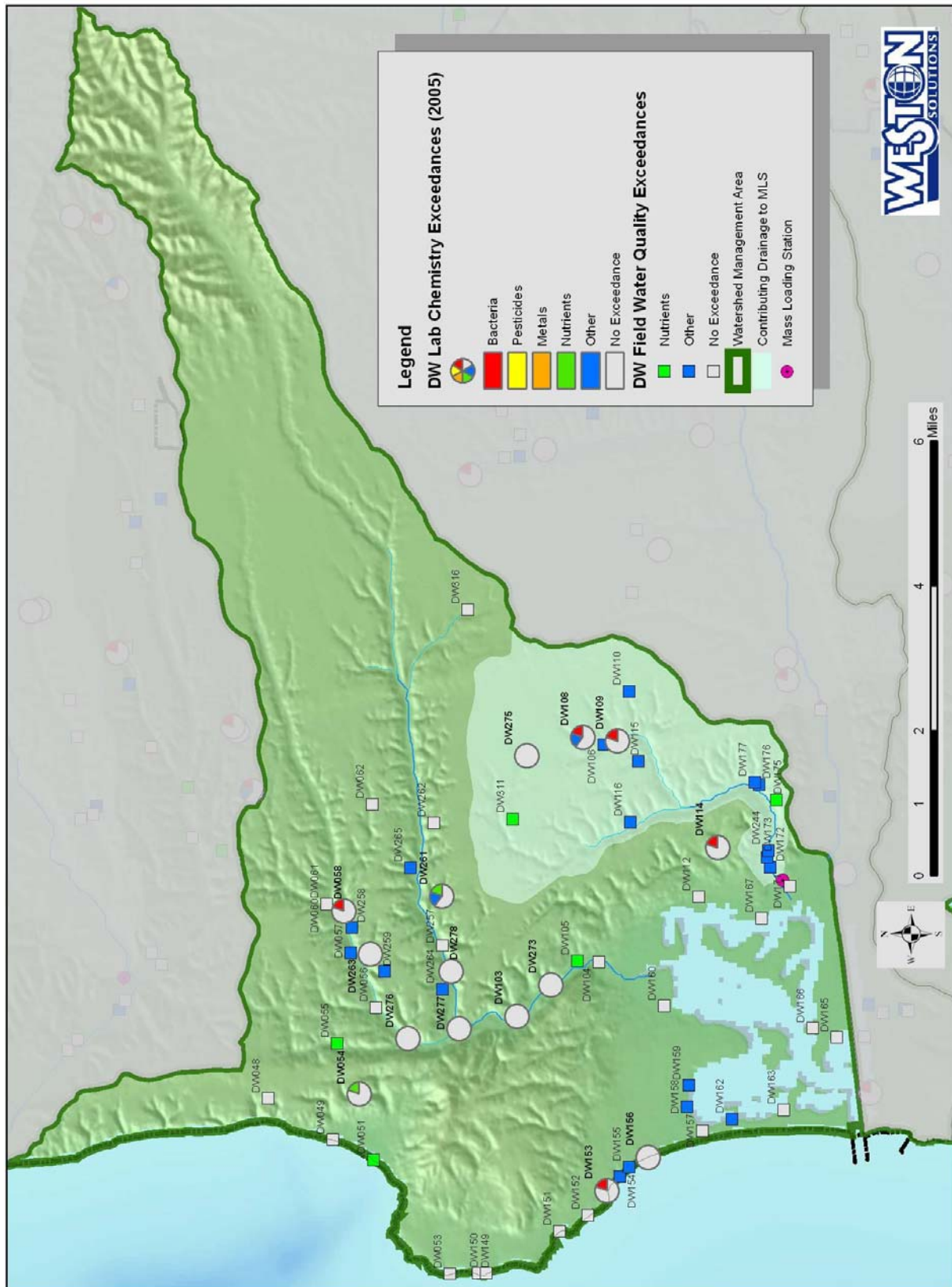


Figure 9-5. Mission Bay WMA dry weather exceedance map.

Table 9-7 summarizes the 2005 Dry Weather Program constituent exceedances. Constituent results that were above the dry weather action level at the dry weather monitoring sites include ammonia, enterococcus, total and fecal coliform, nitrate, ortho-phosphate, pH, and turbidity.

Constituents with average ratios of exceedance and standard deviations greater than one indicate more frequent and wider ranges of exceedances. Constituents with average ratios of exceedance and standard deviations less than one indicate exceedances that occur on a more random and infrequent basis. In the Mission Bay WMA, enterococcus, total coliform and turbidity had average ratios of exceedance greater than one.

Table 9-7. Mission Bay WMA 2005 Dry Weather Exceedance Matrix.

Constituent	Number of Exceedances	Number of Samples Collected	Average Ratio of Exceedance*	St. Dev. Ratio of Exceedance
Ammonia	5	56	0.37	0.48
Enterococcus	3	15	1.18	2.85
Fecal Coliform	2	15	0.67	1.86
Nitrate	1	61	0.10	0.16
Ortho-phosphate	2	60	0.24	0.25
pH	2	62	0.09	0.18
Total Coliform	4	15	1.79	4.56
Turbidity	24	55	3.75	8.75

* Average ratio of exceedance is equal to the average concentration for all samples collected divided by the dry weather action level.

Figure 9-5 depicts the 2005 dry weather program monitoring sample locations. Locations shown with circles have both field parameters and laboratory sample results. Locations shown as squares have field parameter results only. Pie symbols appear at dry weather stations that have had action level exceedances. The colored slices of the pie show the different constituent groups that contributed to the exceedances.

9.2.6 Third Party Data

Third party data was collected from the Mission Bay WMA under the Surface Water Ambient Monitoring Program (SWAMP) in March, April, June, and September 2002 (Appendix H). This data meets the acceptability for assessment under this program since it is performed under the SWAMP QA program. Additional third party data may be considered for future assessments upon determination of meeting the QA acceptance criteria as provided in the Methods Section 3.0.

A full suite of constituents were analyzed including organochlorine pesticides, triazine herbicides, PAHs, and PCBs in addition to metals, inorganics, and physical measurements. Two sites were sampled within the Mission Bay Watershed, one in Tecolote Creek near the mass loading station and the other in Rose Canyon Creek. Constituents with results above the WQO include sulfate, manganese and toxicity at the Tecolote Creek station. Constituents with results above the WQO at Rose Canyon Creek included sulfate, manganese, turbidity, pH, Diazinon and toxicity.

9.2.7 TIEs

Toxicity identification evaluation (TIE) testing was not performed on Tecolote Creek samples. This mass loading station has not been identified as a TIE candidate site based upon past Triad Decision Matrix evaluations. Toxicity was observed for the reproductive endpoint (NOEC=50%) for *C. dubia* during the October 17, 2005 storm event and to *Hyalella* during the February 19, 2006 storm event but neither

incidence could be attributed to any of the chemical constituents measured in the storm water samples. Toxicity was not observed during any test for the monitoring event on February 28, 2006.

9.2.8 Watershed Water Quality Monitoring Summary

Turbidity, total suspended solids and elevated levels of bacterial indicators, specifically fecal coliform, appear to be the primary water quality concerns within the watershed. Based on the period of record, there appears to be a significant downward trend in surfactants, ammonia, total lead and Diazinon concentrations at the MLS.

9.3 Stream Bioassessment

Stream bioassessment in the Mission Bay WMA included two urban affected monitoring sites representing two different watersheds. One site was in Rose Creek, downstream of the confluence with San Clemente Canyon Creek and downstream of Highway 52 (MB-RC). The other site was in Tecolote Creek in Tecolote Canyon Natural Park, near the downstream border of the Park (TC-TCNP).

In addition to the Index of Biotic Integrity, a new analysis tool has recently become available for summarizing benthic macroinvertebrate communities in California. Known as the O/E ratio, it is the ratio of organisms observed at a site (O) to the organisms expected to occur at a site (E). The “expected” value is based on percent probability of capture of specific taxa under reference conditions and also accounts for factors such as temperature, precipitation, and geology. An O/E ratio of 0.80 or higher represents an unimpacted benthic community. This represents a 20 percent loss of the biodiversity expected in the benthic community.

9.3.1 Stream Bioassessment Results and Discussion

Relative WMA Ranking and Trends Over Time

In order to graphically represent how each WMA test sites are ranked by benthic community quality within the County, rescaled IBIs based on the percent deviation from the median County score is presented in Figure 9-6 (see Section 3.2.7 for a detailed explanation of the re-scaling procedure). Relative ranking of the Mission Bay WMA sites (highlighted in blue) were rated relatively similar to the median of the County test sites. Rose Creek near Highway 52 (MB-RC) was roughly eight percent above the median, and Tecolote Creek in Tecolote Park (TC-TCNP) was about nine percent below the median.

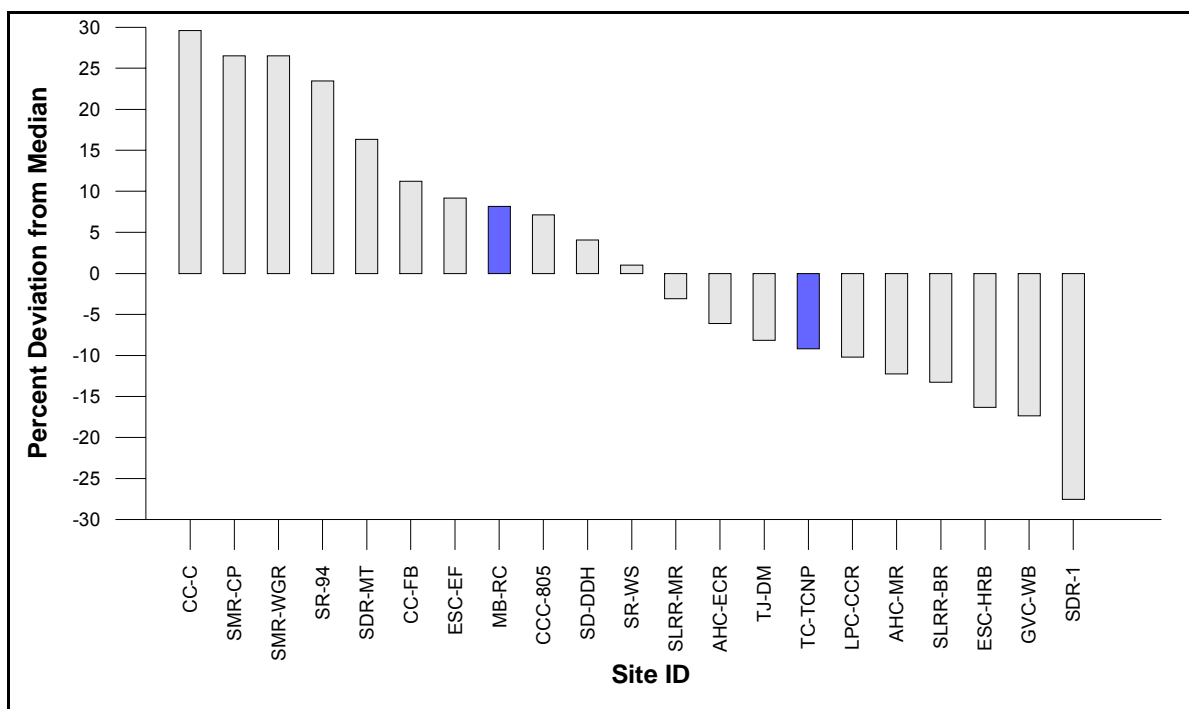


Figure 9-6. Relative Ranking of Rescaled IBI Scores for Mission Bay WMA

Figure 9-7 shows the average IBI scores for the Santa Margarita WMA sites in comparison with the San Diego County-wide average IBI score, excluding reference sites. The Mission Bay sites average IBI scores had an overall range from 0 in May 2002 (only Tecolote Creek was sampled) to 20.5 in October 2004. Seasonal variation was quite notable at these sites, with IBI scores consistently lower than the County average in spring surveys, and higher than the County average in fall surveys.

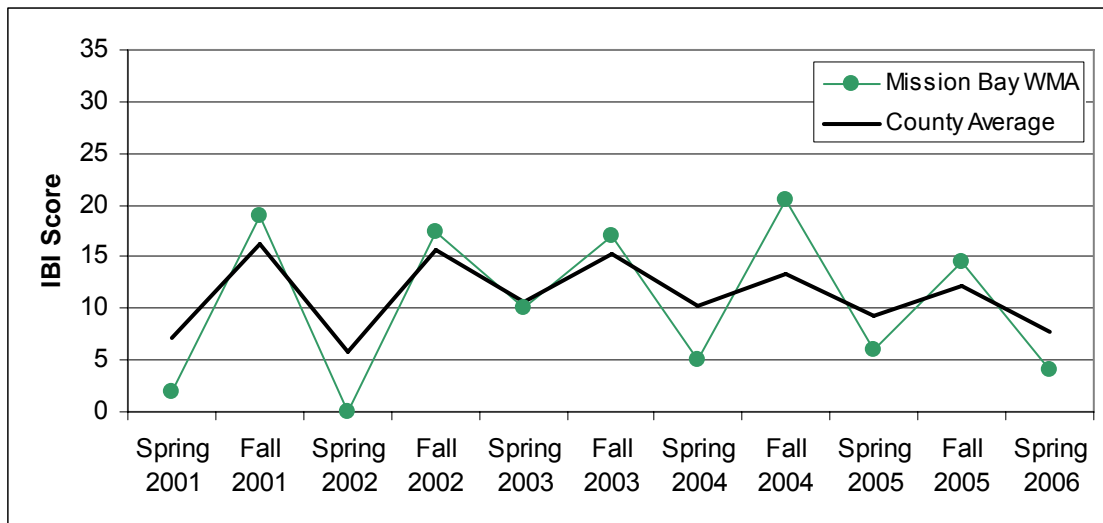


Figure 9-7. Index of Biotic Integrity Scores, WMA Average Over Time

Rose Creek near Highway 52: MB-RC



The Rose Creek monitoring site had a benthic macroinvertebrate community with an Index of Biotic Integrity rating of Poor for the October 2005 survey, and Very Poor for the May 2006 survey, with IBI scores of 16 and 3, respectively (Table 9-8). Taxa richness was also variable, with 25 and 12 unique taxa collected, and with 3 EPT taxa in October and May. There were no organisms collected that are highly intolerant to impairment, and the percent tolerant taxa comprised 31 and 46 percent of the community.

Preliminary results of the O/E analysis show that the Rose Creek monitoring site had a ratio of 0.41 (Appendix B.9). This implies that the benthic community has lost an estimated 59 percent of the biodiversity expected to occur at the site.

Table 9-8. Selected Biological Metrics and Physical Measures of the Mission Bay Watershed Management Area.

Mission Bay Watershed Management Area	Rose Creek near Highway 52 (MB-RC)		Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP)	
	Oct-05	May-06	Oct-05	May-06
Survey				
Index of Biotic Integrity/ Qualitative Rating	16 Poor	3 Very Poor	13 Very Poor	5 Very Poor
O/E Ratio		0.41		0.33
Metrics				
Taxa Richness	25	12	21	9
EPT Taxa (mayflies, stoneflies, and caddisflies)	3	3	2	2
% Intolerant Taxa	0%	0%	0%	0%
% Tolerant Taxa	31%	46%	36%	39%
Average Tolerance Value	6.2	6.7	6.7	6.8
% Collector Filterers + Collector Gatherers	81%	91%	68%	94%
Physical Measures				
Elevation	65		55	
Physical Habitat Score	169	150	147	155
Riffle Velocity (ft/sec)	2.2	1.1	0.9	0.5
Substrate Composition				
Silt		2%		2%
Sand	2%	5%	6%	17%
Gravel	19%	51%	23%	32%
Cobble	52%	33%	71%	47%
Boulder		2%		2%
Roots	27%	7%		
Bedrock/solid				
Water Quality				
Temperature (°C)	16.3	18.3	16.7	17.9
pH	7.9	7.7	7.3	7.6
Specific Conductance (mS/cm)	0.979	4.042	6.834	4.964
Dissolved Oxygen (mg/L)	3.72	7.77	6.20	6.93

*Very Poor: 0-13, Poor: 14-26, Fair: 27-40, Good: 41-55, Very Good: 56-70

The physical habitat of the reach was optimal, with a substrate of large cobble, tree roots, and emergent vegetation providing a variety of stable niche space for macroinvertebrate colonization. The live oak and sycamore riparian zone was mostly undisturbed, and the stream had good canopy cover throughout most of the reach. Water quality was somewhat impaired, with high specific conductance values of 3.979 and 4.042 mS/cm. Values for pH were of 7.9 and 7.7. Dissolved oxygen was quite low in the October survey, with a value of 3.72 mg/l.

In October 2005, the benthic community was dominated by the mayfly *Baetis*, Ostracods, and Oligochaete earthworms (Table 9-9). In May, the site was dominated by Ostracods, Chironomid midges, and *Baetis*. Historically, this site has supported a high diversity of Dipteran taxa (true flies), and these were responsible for the relatively high taxa richness in the October survey.

The Mission Bay mass loading station sampled runoff from a separate drainage from Rose Creek and storm water information cannot be correlated with the bioassessment site.

Table 9-9. Macroinvertebrate Community Summary: Five Most Abundant Taxa for Mission Bay Watershed Management Area

		Taxon	Common Name	Percent Composition	Tolerance Value	Functional Feeding Group
Rose Creek near Highway 52 (MB-RC)	Oct-05	Baetis	minnow mayfly	20%	5	Collector Gatherer
		Ostracoda	seed shrimp	12%	8	Collector Gatherer
		Oligochaeta	earth worm	11%	5	Collector Gatherer
		Chironomidae	non-biting midges	10%	6	Collector Gatherer/Filterer
		Caloparyphus/Euparyphus	soldier fly	8%	7	Collector Gatherer
	May-06	Ostracoda	seed shrimp	45%	8	Collector Gatherer
		Chironomidae	non-biting midges	18%	6	Collector Gatherer/Filterer
		<i>Baetis</i>	minnow mayfly	15%	5	Collector Gatherer
		<i>Simulium</i>	black fly	14%	6	Collector Filterer
		<i>Hydroptila</i>	micro caddisfly	5%	6	Piercer Herbivore
Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP)	Oct-05	Chironomidae	non-biting midges	45%	6	Collector Gatherer/Filterer
		<i>Hyalella</i>	amphipod	14%	8	Collector Gatherer
		<i>Hydroptila</i>	micro caddisfly	8%	6	Piercer Herbivore
		<i>Physa</i>	snail	8%	8	Scraper
		<i>Bezzia/Palpomyia</i>	true fly	5%	6	Predator
	May-06	Chironomidae	non-biting midges	37%	6	Collector Gatherer/Filterer
		Ostracoda	seed shrimp	31%	8	Collector Gatherer
		<i>Simulium</i>	black fly	21%	6	Collector Filterer
		<i>Physa</i>	aquatic snail	5%	8	Scraper
		<i>Hyalella</i>	amphipod	2%	8	Collector Gatherer

Tecolote Creek in Tecolote Canyon Natural Park: TC-TCNP



The Tecolote Creek monitoring site had a benthic macroinvertebrate community with Index of Biotic Integrity ratings of Very Poor for both the October 2005 and May 2006 surveys, with IBI scores ranging from 13 in October to 5 in May, respectively (Table 9-8). Taxa richness was variable with 21 and 9 unique taxa collected in October and May, respectively, and with 2 EPT taxa collected in each survey. There were no organisms collected that are highly intolerant to impairment, and the percent tolerant taxa comprised 36 and 39 percent of the community,

per survey.

Preliminary results of the O/E analysis show that the Tecolote Creek monitoring site had a ratio of 0.33 (Appendix B.9). This implies that the benthic community has lost an estimated 67 percent of the biodiversity expected to occur at the site.

The physical habitat of the reach was near optimal, with a substrate primarily of unconsolidated gravel and small cobble, with tree roots and emergent vegetation providing additional niche space. The riparian zone was mostly undisturbed live oak, and the stream had good canopy cover. Water quality was poor, with the highest specific conductance value of any site in the San Diego County program in both surveys, 6.834 and 4.964 mS/cm. Values for pH were 7.3 and 7.6.

The benthic community was less seasonally variable than in past years. The October survey was dominated by Chironomid midges, the amphipod *Hyalella*, and the microcaddisfly *Hydroptila* (Table 9-9). The May survey was dominated by Chironomid midges, Ostracods, and the black fly *Simulium*.

The Tecolote Creek mass loading station was located several thousand feet downstream of the bioassessment station, and water quality measures may be correlated with the site although some urban runoff would enter the stream below the bioassessment site. Constituents of concern identified during storm water sampling that would have a negative impact on the biological community included total suspended solids, and turbidity (Table 9-4). Exceedances for total dissolved solids, pesticides, and toxicity to *Ceriodaphnia*, *Hyalella* and *Selenastrum* have occurred historically, and were evident in 2005-2006 for *Ceriodaphnia* and *Hyalella*. Total metals including copper, lead, and zinc were detected at levels that could prevent the colonization of highly sensitive organisms.

9.3.2 Stream Bioassessment Summary

The Mission Bay WMA was sampled at two sites. One site was in Rose Creek, downstream of Highway 52, and the other site was in Tecolote Creek in Tecolote Canyon Natural Park. The macroinvertebrate community of Rose Creek had Index of Biotic Integrity ratings of Poor in October and Very Poor in May, and Tecolote Creek had ratings of Very Poor for both surveys. Both of these sites had substantial seasonal variation in the total IBI scores, a pattern that has been consistent for these two sites throughout the duration of the program.

9.4 Ambient Bay and Lagoon Monitoring Program

9.4.1 Ambient Bay and Lagoon Monitoring Results and Discussion

9.4.1.1 Ambient Bay and Lagoon Monitoring Phase I Results and Discussion

Phase I sediment samples were collected in Mission Bay for the 2005 ABLM Program on June 17, 2005 (See Section 3.3 for details on the sampling approach). Mission Bay was treated as a single water body representing the receiving waters of both Rose Creek, which discharges to the northeast end of the Bay, and Tecolote Creek, which discharges to the southeast end of the Bay. The sampling locations are shown in Figure 9-8. The fines fraction of the sediment among the nine sites ranged from 1.99% at Site 1M-1 in the outer stratum to 97.65% at Site 3R-3 in the inner stratum. Sand was the dominant sediment constituent at all sites except for Site 3R-3, which had a higher percentage of silt (50.3%). TOC content ranged from 0.04% at Site 1M-1 to 1.84% at Site 2M-1.

Sites 1R-1, 2M-1 and 3R-3 were selected for Phase II assessment (Table 9-10).

Table 9-10. Results of Phase I sediment analyses and subsequent ranking for Phase II site selection at Rose Creek and Tecolote Creek outfalls in Mission Bay.

Sampling Site	TOC and Grain Size Distribution in Phase I								Ranking for Phase II				
	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Median (µm)	Mean (µm)	Fines (%)	TOC (%)	Fines Rank	TOC Rank	Rank Sum	Highest Rank	Phase II
MB 1LI	0.00	78.8	11.75	9.44	131	75	21.19	0.49	4	3	7		
MB 1MI	0.03	98.0	0.51	1.47	299	292	1.99	0.04	1	1	2		
MB 1RI	0.10	47.8	28.5	23.6	51.8	14.2	52.07	1.16	7	7	14	*	Yes
MB 2LI	0.04	57.5	30.13	12.28	81	42	42.41	0.66	6	5	11		
MB 2MI	3.49	76.5	13.0	7.04	101.3	85.8	20.04	1.84	3	9	12	*	Yes
MB 2R3	0.00	85.5	9.6	5.0	105.2	99.13	14.52	0.65	2	4	6		
MB 3LI	0.20	75.71	11.4	12.7	143.89	55.92	24.09	0.97	5	6	11		
MB 3MI	0.14	34.5	32.9	32.5	24.79	7.32	65.39	0.38	8	2	10		
MB 3R3	0.17	2.2	50.3	47.4	4.62	2.49	97.65	1.56	9	8	17	*	Yes
Mean of all sites	0.46	61.83	20.90	16.81	104.75	74.82	37.71	0.86					

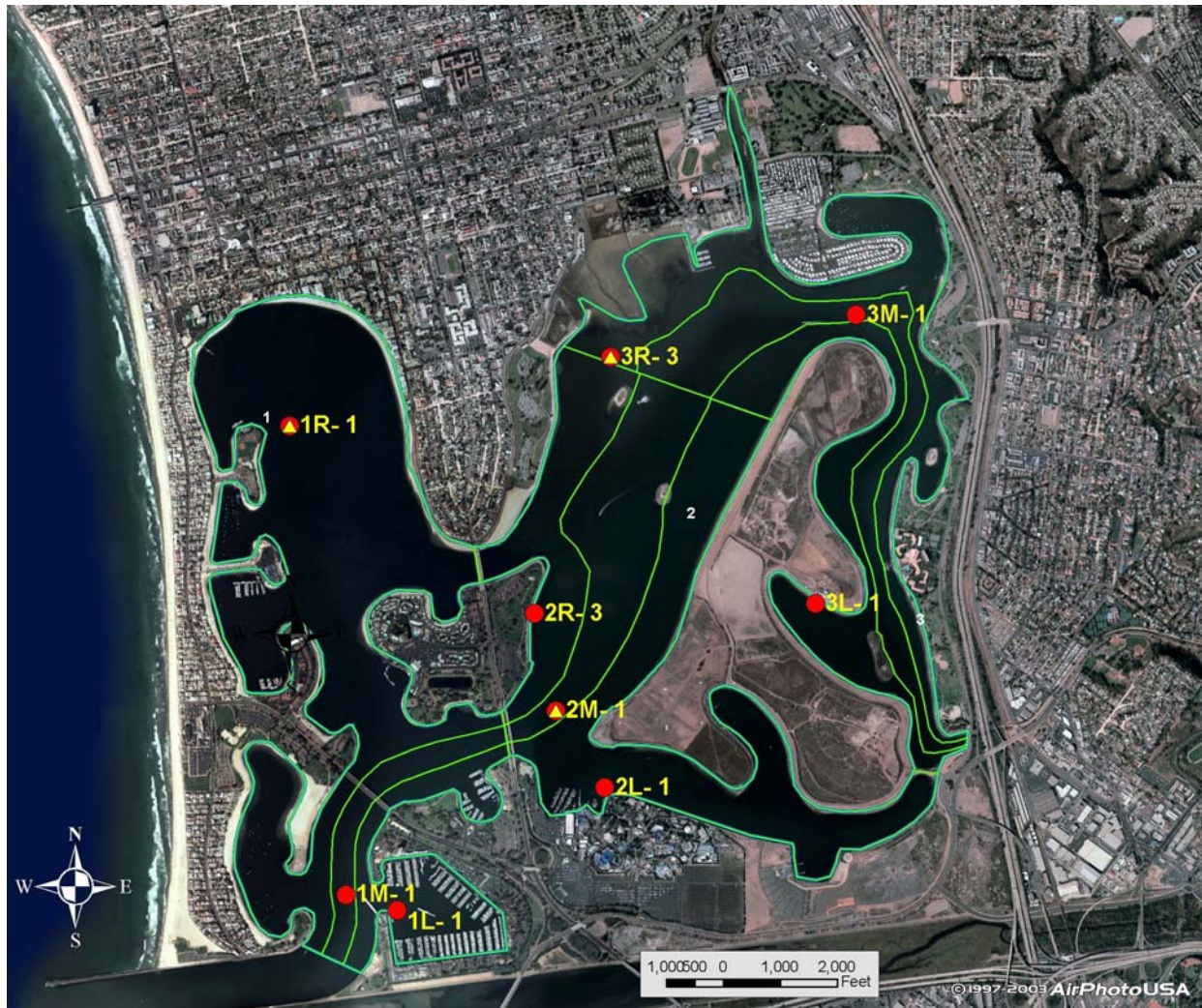


Figure 9-8. Map of Phase I site locations in Mission Bay. Sites with yellow triangles were selected for Phase II assessment.

9.4.1.2 Ambient Bay and Lagoon Monitoring Phase II Results and Discussion

The three sites selected in Mission Bay as part of Phase I were sampled in Phase II on July 11, 2005. Sediments from Sites 1R-1, 2M-1 and 3R-3 were composited and analyzed for chemistry and toxicity; individual samples were analyzed for benthic community structure. The results are summarized in Table 9-11.

Table 9-11. Summary of chemistry, toxicity, and benthic community structure in Mission Bay.

CHEMISTRY*					TOXICITY*	BENTHIC COMMUNITY						
Analyte	ERL	ERM	Result	ERM-Q		Percent Survival	Index	IR-1	2M-1	3R-3	Mean	St. Dev.
METALS (mg/kg)					85% Significantly Different from Control but not 20% less than Control	Abundance	1823	1967	505	1432	806	4295
Antimony	NA	NA	< 1.14	NA		Richness	78	109	42	76.33	33.53	162
Arsenic	8.2	70	6.06	0.09		Diversity	3.16	3.13	2.69	3.00	0.26	NA
Cadmium	1.2	9.6	0.418	0.04		Evenness	0.73	0.67	0.72	0.7	0.03	NA
Chromium	81	370	27.4	0.07		Dominance	12	14	8	11.33	3.06	NA
Copper	34	270	15.3	0.06								
Lead	46.7	218	15.5	0.07								
Nickel	20.9	51.6	7.23	0.14								
Selenium	NA	NA	< 1.14	NA								
Zinc	150	410	73.2	0.18								
PCBs (µg/kg)	NA ₁	NA ₁	ND	NA								
PAHs (µg/kg)	NA ₁	NA ₁	ND	NA								
PESTICIDES (µg/kg)	NA ₁	NA ₁	ND	NA								
Mean ERM-Q				0.09								

* Analysis performed on composite samples from the three sites.

NA-Not applicable

NA₁- ERL and ERM values are presented for detected analytes only. Refer to sediment quality guidelines for individual values.

ND-Not detected

Bold – exceeds ERL or ERM value

Sediment Chemistry. Sediments from each of the 12 coastal embayments in the ABLM Program were analyzed for four basic constituents: metals, PCBs, PAHs, and pesticides. Of these, seven metals were detected above the detection limit in Mission Bay: arsenic, cadmium, chromium, copper, lead, nickel and zinc (Table 9-11). All of these metals were also found in the other embayments assessed in the 2005 ABLM Program.

Concentrations of metals were relatively low and none exceeded their respective ERL and ERM sediment quality values. During the 2003 ABLM Program the same seven metals were detected as in the 2005 sampling and concentrations of the metals were low and none exceeded their respective ERM value. However, concentrations of arsenic, copper, and lead exceeded their respective ERL values in 2003. During the 2004 ABLM Program the same seven metals were detected as in the 2005 sampling with the exception being selenium detected instead of cadmium. Concentrations of metals were relatively high, with arsenic, copper, lead and zinc exceeding their respective ERL values, but none exceeded their respective ERM values. There were no PAHs, PCBs, or pesticides found above the detection limit in Mission Bay during the 2005 Program.

The mean ERM-Q value, which is a measure of the cumulative effects of the constituents for which ERM sediment quality values are available, was 0.09. This value did not exceed the threshold of 0.10 and was the second lowest in the 2005 ABLM Program. Sediments with mean ERM-Q values above this threshold have a higher probability of producing adverse biological effects than those with mean ERM-Q values below the threshold (Long et al., 1998). During the 2003 and 2004 ABLM Programs the threshold was exceeded with a mean ERM-Q value of 0.20 and 0.30 respectfully.

Toxicity. The mean percent survival of *E. estuarius* exposed to Mission Bay sediments in a 10-day acute toxicity test was 85% (Table 9-11). This result was significantly lower than the Control survival (97%), but was not 20% less than the Control value. Therefore test organisms exposed to the sediments of the Mission bay were determined to have a non-toxic response. This is similar to the results from the 2003 and 2004 ABLM Programs where no toxicity was also observed.

Simultaneously Extracted Metals/Acid-Volatile Sulfides Ratio. In the Mission Bay sediment, the SEM:AVS ratio was 1.34, indicating that the concentration of SEM was slightly higher than the concentration of AVS in this sediment sample. These results indicate that not all of the metals in the Bay sediment were bound up by AVS and therefore may be bioavailable and potentially toxic to benthic organisms. Toxicity was not observed in the 10-day solid phase toxicity test using *E. estuarius*; indicating that bioavailable metals found in Mission Bay sediment were not toxic to the amphipod *E. estuarius*.

Benthic Community Structure. A total of 4,295 organisms were collected from Mission Bay, representing 162 taxa (Table 9-11). During the 2003 ABLM Program a total of 2,932 organisms were collected, representing 69 taxa while in the 2004 ABLM program a total of 2,558 organisms were collected, representing 87 taxa. Taxa abundance and richness were higher at Site 2M-1 in the middle section of the Bay while evenness and diversity were higher at Site 1R-1. Dominance was lowest at site 3R-3. The abundance and diversity are representative of an open bay and the marine habitat.

The polychaete *Exogone lourei* accounted for 10% of the benthic community in Mission Bay (Table 9-12). The mollusk *Musculista senhousi* was the second most abundant organism with 8% of the benthic population collected. The barley snail *Barleeia sp.*, was the third most common species of the benthic community in Mission Bay during the 2005 program, accounting for 5% of all the organisms collected. The low percent composition of these species are also indicative of the species richness found in Mission Bay. The barley snail, *Barleeia sp.*, was the most common species of the benthic community in Mission Bay during the 2004 Program, accounting for 8.6% (32.1% in 2003) of all the organisms collected. The second most abundant species was the Polychaete *Exogone lourei*, while another polychaete worm, *Aphelochaeta sp.*, was the third most abundant.

Table 9-12. Dominant infaunal species found in the Mission Bay during the 2005 ABLM Program.

Embayment	Taxa (Species)	Higher Taxa	Abundance	Percent Composition
SRE	<i>Exogone lourei</i>	Polychaeta	418	10
	<i>Musculista senhousi</i>	Mollusca	352	8
	<i>Barleeia sp.</i>	Mollusca	212	5

* Values were calculated from the total of all sites assessed.

Lagoons were analyzed using the Benthic Response Index (BRI) and Relative Benthic Index (RBI) scores as a primary indicator of lagoon health. The BRI is the abundance-weighted average pollution tolerance score of organisms occurring in a sample and is most applicable to marine environments (Smith et al., 2001; Smith et al., 2003; Ranasinghe et al., 2004). The RBI is the weighted sum of three measures of abundance: 1) total number of species, number of crustacean species, number of crustacean individuals, and number of mollusk species; 2) abundance of three positive and 3) two negative indicator organisms (Hunt et al., 2001). The RBI was included because it is less dependent on marine benthic species, and more applicable to lagoons. Mission Bay scored highest of the water bodies included in the ABLM program on the RBI evaluation due to increased species richness. The two indices indicate that biological health in Mission Bay is fair to good (Table 9-13); a lower BRI score indicates better conditions, while a higher RBI score relates to better conditions.

Table 9-13. Indices of Sediment Biological Health found in the Mission Bay during the ABLM Program.

Index	2003	2004	2005
BRI	43	41	21
RBI	0.97	0.94	1.00
* BRI-Good <31, Fair 31-53, Poor >53 RBI-Good >0.61, Fair 0.31-0.60, Poor <0.30			

Triad Relationships. The Triad method was used to assess the relationships between chemistry, biology, and toxicity for the lagoon sediments. This method is an integrated approach that depends on “weight of evidence” (Chapman, 1996) and integrates chemistry, biological observation, and toxicity endpoints, allowing the user to classify results based on a decision framework.

The results of the chemistry, toxicity, and benthic community assessments for Mission Bay are presented in Figure 9-9 for the 2003, 2004, and 2005 ABLM Monitoring Programs. For the 2005 ABLM sampling, the Bay scored good for toxicology, biology and chemistry. The three legs of the triad are consistent in 2003 and 2005 for Mission Bay.

9.4.1.3 Ambient Bay and Lagoon Monitoring Summary and Conclusions

Sediments in Mission Bay were monitored as part of the 2005 ABLM Program to assess the potential for adverse effects from the watershed and to compare sediment quality with other coastal embayments in San Diego County. In Phase I, a stratified random approach was used to identify the three sites where COCs were most likely to be found (i.e., those with the highest TOC and smallest grain size): Site 1R-1 in the outer Stratum, Site 2M-1 in the middle region, and Site 3R-3 in the inner stratum. These sites were sampled in Phase II of the assessment and analyzed for sediment chemistry, toxicity, and benthic community structure. The results of the chemistry assessment indicated that seven of the nine metals assessed were found in Mission Bay sediments. No ERL or ERM sediment quality values were exceeded. The mean ERM-Q value for Mission Bay was 0.09, which is below the published threshold value of 0.10 and therefore suggests no potential for increased toxicity. There were no PAHs, PCBs, or pesticides found above the detection limit in Mission Bay samples collected during the 2005 Program. Test organisms exposed to the sediments of the Mission bay displayed a non-toxic response. Correlated with

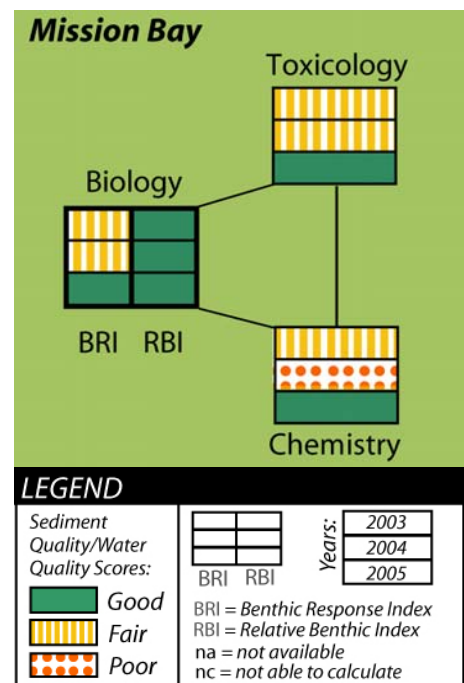


Figure 9-9. Triad relationships for Mission Bay.

the SEM:AVS Ratio, it was determined that bioavailable metals found in Mission Bay sediment were not toxic to the amphipod *E. estuarius*. The infaunal community was dominated by polychaete worms and a genus of barley snail. For the 2005 ABLM sampling, the Bay scored good for toxicology, biology and chemistry.

9.5 Mission Bay WMA Assessment

The Mission Bay WMA was assessed utilizing chemistry and toxicity data collected during storm events from a single MLS, field and chemistry data collected from up to 14 dry weather monitoring sites upstream of the MLS, and IBI scores generated at three bioassessment sites. The watershed management area assessment methods presented in Section 3.4 were applied to these data to determine which constituents were of concern and to develop a high, medium, or low frequency of occurrence for these constituents. The results of this assessment are presented in Table 9-14.

9.5.1 Mission Bay WMA Criterion Assessment

Four constituents were found to have a high frequency of occurrence in the Mission Bay WMA and are listed below:

- Total Coliform
- Fecal Coliform
- Enterococcus
- Turbidity

Fecal coliform received a three diamond rating based on Criterion No. 1. Fecal coliform met this criterion by wet weather MLS samples exceeding the WQO in 87% of the monitored events. Total coliform received a three diamond rating based on Criterion No. 2. Total coliform met this criterion by wet weather MLS samples exceeding the WQO in six of the last six monitored events. Turbidity and enterococci each received a three diamond rating based on Criterion No. 3. Turbidity met this criterion by wet weather MLS samples exceeding the WQO in 67% of the monitored events and dry weather results exceeding the action level in 100% of the samples during the 2005 monitoring season. Enterococcus met this criterion by wet weather MLS samples exceeding the WQO in 73% of the monitored events and dry weather results exceeding the action level in 33% of the samples from the 2005 monitoring season.

Two constituents were found to have a medium frequency of occurrence and are listed below:

- Total Suspended Solids (TSS)
- Total Lead

Total suspended solids received a two diamond rating based on Criterion No. 6. Total suspended solids met this criterion by wet weather MLS samples exceeding the WQO in 53% of all the monitored events. Total lead received a two diamond rating based on Criterion No. 5. Total lead met this criteria by wet weather MLS samples exceeding the WQO in 53% of all the monitored events.

Chemical Oxygen Demand (COD) was found to have a low frequency of occurrence and received one diamond based on Criterion No. 9.

Table 9-14. Constituent exceedances in the Mission Bay WMA.

Tecolote Creek																
WITH ANY WET WEATHER (MLS) WQO OR DRY WEATHER ACTION LEVEL EXCEEDANCE	MLS (Wet Weather) Results												Dry Weather Results *		Frequency of Occurrence	Criterion No.
	2001/2002		2002/2003		2003/2004		2004/2005		2005/2006		CUMULATIVE		2005			
	#/3	%	#/3	%	#/3	%	#/3	%	#/3	%	#/15	%	#	%		
Conventional Parameters																
BOD	0	0	0	0	1	33	0	0	0	0	1	8	NA	NA	-	-
COD	1	33	1	33	2	67	1	33	0	0	5	33	NA	NA	♦	9
Total Suspended Solids	0	0	3	100	1	33	3	100	1	33	8	53	NA	NA	♦♦	6
Turbidity	1	33	3	100	2	67	3	100	1	33	10	67	12	100	♦♦♦	3
Nutrients																
Orthophosphate	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	0	0	1	7	-	-
Total Phosphorus	0	0	0	0	0	0	1	33	0	0	1	7	NA	NA	-	-
Ammonia	0	0	0	0	0	0	0	0	0	0	0	0	2	10	-	-
Bacteriological																
Total Coliform	0	0	2	67	3	100	3	100	3	100	11	73	2	67	♦♦♦	2
Fecal Coliform	2	67	2	67	3	100	3	100	3	100	13	87	1	33	♦♦♦	1
Enterococcus	0	0	3	100	2	67	3	100	3	100	11	73	1	33	♦♦♦	3
Pesticides																
Chlorpyrifos	0	0	1	33	0	0	0	0	0	0	1	7	NA	NA	-	-
Diazinon	3	100	3	100	1	33	0	0	0	0	7	47	NA	NA	-	-
Malthion	NA	NA	1	33	0	0	0	0	0	0	1	7	NA	NA	-	-
Total Metals																
Antimony	0	0	1	33	1	33	0	0	0	0	2	13	NA	NA	-	-
Copper	0	0	3	100	1	33	1	33	1	33	6	40	NA	NA	-	-
Lead	0	0	3	100	1	33	3	100	1	33	8	53	NA	NA	♦♦	5
Zinc	0	0	0	0	0	0	1	33	1	33	2	13	NA	NA	-	-
Dissolved Metals																
Copper	0	0	1	33	0	0	0	0	0	0	1	7	0	0	-	-
Toxicity																
Ceriodaphnia 96-hour	0	0	1	33	0	0	0	0	0	0	1	7	NA	NA	EVIDENCE OF PERSISTENT TOXICITY? No	
Ceriodaphnia 7-day survival	1	33	1	33	0	0	0	0	0	0	2	13	NA	NA	No	
Ceriodaphnia 7-day reproduction	1	33	1	33	1	33	0	0	1	33	4	27	NA	NA	No	
Hyalella 96-hr	0	0	0	0	0	0	0	0	1	33	1	7	NA	NA	No	
Selenastrum 96-hour	1	33	0	0	0	0	0	0	0	0	1	7	NA	NA	No	
Bioassessment																
	IBI Rating														EVIDENCE OF BENTHIC ALTERATION?	
Rose Creek	NA	Very Poor	Poor	Poor	Very Poor	Poor	Very Poor	Poor	NA					Yes		
Tecolote Creek	Very Poor	Poor	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	Very Poor	NA							

* = Total number of observations varied among constituents.
 NA = Not assessed
 - = Constituent results are below the defined requirements for a Low Frequency of Occurrence rating.
 ♦ = Low Frequency of Occurrence rating.
 ♦♦ = Medium Frequency of Occurrence
 ♦♦♦ = High Frequency of Occurrence rating.

Toxicity tests have showed evidence of toxicity at least once in all five types of toxicity tests during the 15 monitored storm events since 2001. However, the highest toxicity to any test organisms was observed in only 4 of the 15 (27%) tests performed over this period. During the 2005-2006 monitoring season, toxicity was observed for the 7-day reproduction endpoint for *Ceriodaphnia* and for the acute *Hyalella* test. Therefore, there is no evidence of persistent toxicity in the Mission Bay WMA.

IBI scores resulting from bioassessment monitoring on Mission Bay WMA have consistently indicated a rating of Poor or Very Poor at the Tecolote and Rose Creek bioassessment sites. The Rose Creek site received a rating of Poor in the 2003-2004 and 2004-2005 monitoring seasons and a rating of Very Poor in the 2002-2003 and 2005-2006 monitoring seasons. The Tecolote Creek site received a rating of Poor in the 2002-2003 monitoring season and a rating of Very Poor in the 2003-2004, 2004-2005 and 2005-2006 monitoring seasons. Therefore, there are indications of benthic alteration within the Mission Bay WMA.

Figure 9-10 summarizes the number of water quality exceedances for six categories of constituents. The categories include conventional, nutrients, bacteria, pesticides, metals and toxicity. The stacked bars represent the number of exceedances using values from the wet weather MLS results in Table 9-14 for each constituent category. The overall number of water quality objective exceedances at the Mission Bay MLS has overall decreased during the last four monitoring seasons. The figure indicates that conventional, nutrient, bacteriological, pesticide, metals, and toxicity parameters have all exceeded the WQO during the past five years but conventional, bacteriological, and metals parameters are the most consistent groups to exceed the WQO.

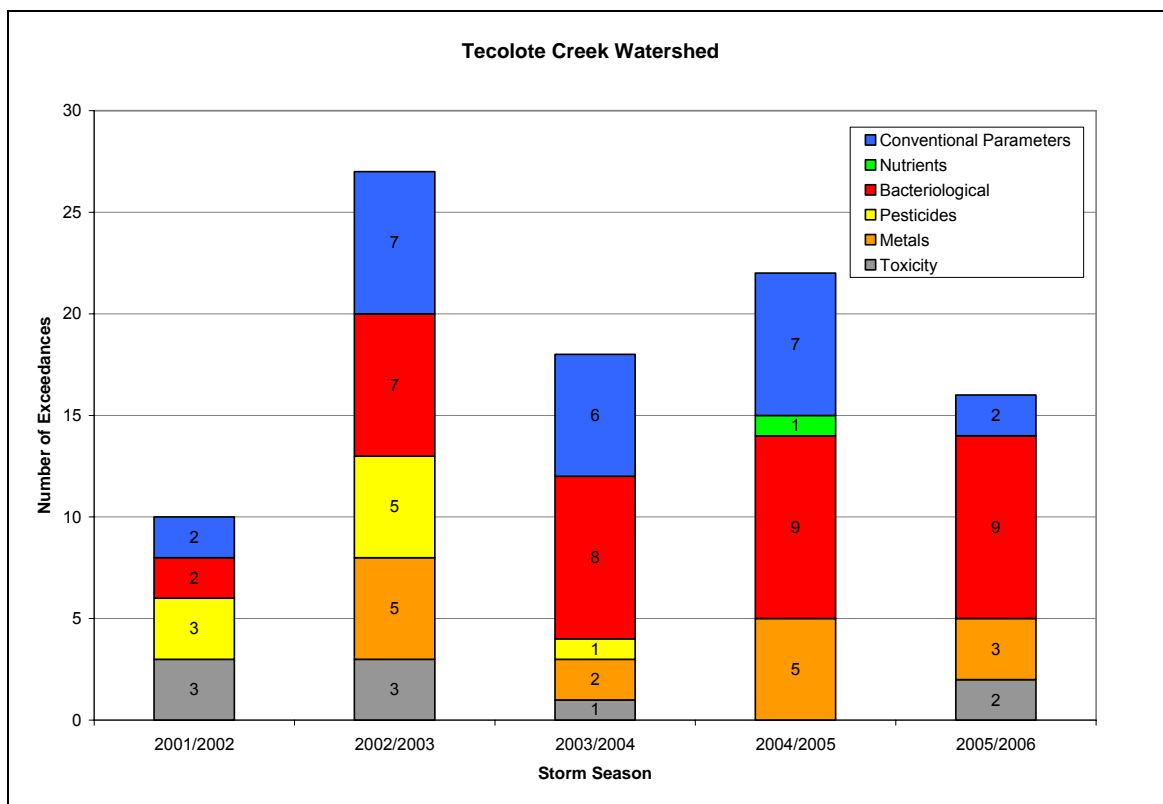


Figure 9-10. Stacked bar chart of the number of wet weather exceedances of constituent groups in Mission Bay WMA.

Evaluation of scatterplots presented in Appendix C indicate significant downward trends for surfactants ($R^2=0.15$), ammonia ($R^2=0.16$), Diazinon ($R^2=0.30$), and total lead ($R^2=0.17$) concentrations. Analysis of the results indicate a significant increasing trend for enterococcus ($R^2=0.30$) concentrations. There was no significant trend for the constituents receiving diamond ratings for High, Medium, and Low frequencies of occurrence (COD, total suspended solids, turbidity, total coliform, and fecal coliform).

Mission Bay WMA

9.5.2 Triad Decision Matrix

The triad decision matrix combines the occurrence of COC with the toxicity and bioassessment results to draw potential conclusions about the watershed and provide possible actions for future monitoring or assessment. Table 9-15 summarizes the results and lists possible conclusions and actions.

Table 9-15. Triad Decision Matrix Results for the Mission Bay WMA.

Chemistry	Toxicity	Benthic Alteration	Possible Conclusion(s)	Possible Actions or Decisions
Persistent exceedances of water quality objectives (high frequency COC identified)	No evidence of persistent toxicity	Indications of alteration	Benthic impact due to habitat disturbance, not toxicity. Test organisms not sensitive to problem pollutants.	1) Continue monitoring to gather long-term trend information. 2) Evaluate upstream source identification as a high priority. 3) Consider whether different test organisms should be evaluated. 4) Consider potential role of physical habitat disturbance. 5) TIE would not provide useful information with no evidence of toxicity.

Based on the triad decision matrix, there was evidence of persistent exceedances of WQO (turbidity), no evidence of persistent toxicity, and evidence of benthic alteration. Therefore, it is recommended to investigate possible upstream sources that may cause increased turbidity. It is possible that land use activities may contribute to higher turbidity concentrations. It is also recommended to continue monitoring to gather long-term trend information and to consider the potential role of physical habitat disturbance as factor influencing benthic alteration.

9.5.3 Water Quality Priority Ratings for the Mission Bay WMA

The purpose of the water quality priority ratings is to identify water quality priorities within a watershed based on weighted averages of the sub-watershed ratings. Because it is a weighted average, larger sub-watersheds will have a greater influence in the overall watershed rating.

The water quality priority ratings presented in Table 9-16 are based on the methodology presented in the BLTEA report (WESTON, MOE, & LWA, 2005) and are presented in the Methods Section 3.4. Constituent groups and stressor groups are given a ranking from A to D with A being the highest priority rating and D the lowest priority rating. Items ranked with a D indicate that the constituent group or stressor is a low priority or does not have sufficient data to support a higher ranking. The ratings were based on current results presented in this 2005-2006 annual report and data from the following programs:

- Storm water Mass Loading Monitoring (MLS) – Wet Weather Data (2000-2006)
- Co-permittee Dry Weather Data Monitoring (2003-2005)
- Available Third Party Data (SWAMP, 2002)
- Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring (2003-2005)
- Urban Stream Bioassessment Monitoring (2000-2006)
- Triad Assessment – Toxicity Testing of Storm water (2000-2006)
- 303(d) Listing (2003)

Table 9-16. Updated Water Quality Priority Ratings for the Mission Bay WMA

Watersheds/Sub-watersheds	Percentage of Total Area	Priority Ratings*										
		Constituent Groups										Stressor Groups
		Heavy Metals	Dissolved Minerals	Organics	Oil and Grease	Sediments	Pesticides	Nutrients	Gross Pollutants	Bacteria/Pathogens	Benthic Alterations	Toxicity
Mission Bay WMA	100%	A	A	D	D	B	D	A	B	A	D	A
Scripps HA (906.30)	15%	C	D	D	D	B	D	A	B	A	D	D
Miramar HA (906.4)	64%	A	A	D	D	B	D	A	B	A	D	A
Tecolote HA (906.5)	21%	A	A	D	D	A	C	D	B	A	A	A
Frequency of Occurrence Rating High ¹						◆◆◆				◆◆◆		
Constituents of Concern						Turbidity				Total Coliform Fecal Coliform Enterococcus		

1. High frequency of occurrence ratings are derived from the constituent exceedances tables and are provided for comparison purposes.

Notes:

* = Rating Calculated Based on Area Weighted Averages of Score Value from the sub-watershed areas.

** = Priority Level (Highest-A to Lowest-D)

High Priority Level Based on Data

303d listing

For the overall Mission Bay WMA, heavy metals, dissolved minerals, nutrients, bacteria, and toxicity were identified as a high priority (A) rated constituents. The dissolved minerals category did not exist in the BLTEA report and was created to address constituents that did not apply to the other constituent categories and to better assess the sediment category. Categories receiving a B priority rating include sediments and gross pollutants. All other categories received a D rating. A regional evaluation and summary of the BLTEA process is presented in the Regional Assessment Section 13. The complete tables used to calculate the ratings are presented in Appendix G.

High frequency of occurrence ratings from the WMA criterion assessments were included in the water quality priority rating summary table above. High frequency of occurrence ratings were determined for turbidity, total and fecal coliform, and enterococcus for the Mission Bay WMA. In comparison, the water quality priority ratings found high priority (A) ratings for the heavy metals, dissolved minerals, nutrients, bacteria, and toxicity categories but a B rating for the sediments category.

The high priority (A) rating for metals is primarily due to the 303(d) listings for metals in the Miramar and Tecolote sub-watershed and which account for a combined 85% of the overall WMA area, and due to noted metals exceedances in the Tecolote sub-watershed. Because it is a weighted average, larger sub-watersheds will have a greater influence in the overall watershed rating. The high priority (A) rating for dissolved minerals is primarily due to the exceedances of manganese and sulfate from the limited third party SWAMP data. The high priority (A) rating for nutrients is primarily due to the 303(d) listing for eutrophic conditions in the Miramar sub-watershed and due to less frequent dry weather exceedances. The high priority (A) rating for bacteria is primarily due to the 303(d) listing for bacteria in all sub-

watersheds, frequent wet weather exceedances, and less frequent dry weather exceedances. The high priority (A) rating for toxicity is primarily due to the limited third party SWAMP data which showed toxicity to *Hyalella* and *Ceriodaphnia* in the Miramar sub-watershed, and the 303(d) listing for toxicity and wet weather data showing toxicity towards *Hyalella* in the Tecolote sub-watershed.

A list of potential likely or unknown sources for the heavy metals, nutrients, and bacteria categories in the Mission Bay WMA that are based on the threat to water quality inventory ratings tables from the BLTEA report (WESTON, MOE, & LWA, 2005) were ranked and are provided below in Table 9-17, Table 9-18, and Table 9-19 respectively. The tables are not an all inclusive summary of sources in each WMA (e.g., does not consider naturally occurring sources). The tables were developed from the following list of potential sources that were agreed upon by the Copermitttee Long-Term Effectiveness workgroup:

- Copermitttees developed inventories
- County Department of Environmental Health Hazardous Material Database
- County Agriculture, Weights & Measures Database
- County Department of Environmental Health Food and House Database
- Thomas Brothers Maps
- Online Yellow Pages
- State Water Board list of dischargers subject to construction and industrial storm water general permit.
- Pretreatment Records

The basis of the source list was to identify sources that can be regulated and have the potential to discharge the pollutant types that are of focus of the urban runoff management programs.

Table 9-17. List of potential likely and unknown heavy metals sources for the Mission Bay WMA.

Potential Heavy Metals Sources	Number of Sources	Source Loading Potential
Auto mechanical repair, maintenance, fueling, or cleaning	119	Likely
Automobile and other vehicle body repair and painting	12	Likely
Botanical or zoological gardens and nurseries/greenhouses	11	Likely
Fabricated metal	10	Likely
Motor Freight	10	Likely
Boat mechanical repair, maintenance, fueling, or cleaning	3	Likely
Marinas	2	Likely
Primary metal	2	Likely
Airplane mechanical repair, maintenance, fueling, or cleaning	1	Likely
Corporate yards (incl. maintenance/storage yards)	1	Likely
Automobile wholesale	1	Likely
Mobile automobile or vehicle washing	-	Likely
Auto parking lots and storage facilities	-	Likely
Home automobile associated activities, home and garden care activities, waste disposal	-	Likely
Roads, streets, highways, and parking facilities	-	Likely
Retail or wholesale fueling	56	Unknown
Chemical and allied products	6	Unknown
Active or closed municipal landfills	6	Unknown
POTWs (water and wastewater)	1	Unknown
Park and Recreational facilities	-	Unknown
Sites for disposing and treating sewage sludge	-	Unknown

Source: Baseline Long-Term Effectiveness Assessment Report (Weston, MOE, & LWA, 2005).

“-“ signifies that no inventory information is available

Based on limited inventory data provided by Copermittees in 2005

Table 9-18. List of potential likely and unknown nutrients sources for the Mission Bay WMA.

Potential Nutrient Sources	Number of Sources	Source Loading Potential
Animal Facilities	34	Likely
Botanical or zoological gardens and nurseries/greenhouses	11	Likely
Landscaping - parks, golf courses, cemeteries, etc.	7	Likely
Home automobile associated activities, home and garden care activities, waste disposal	-	Likely
Roads, streets, highways, and parking facilities	-	Likely
Park and Recreational facilities	-	Likely
Eating or drinking establishments	982	Unknown
Auto mechanical repair, maintenance, fueling, or cleaning	119	Unknown
Fabricated metal	10	Unknown
Motor Freight	10	Unknown
Chemical and allied products	6	Unknown
Active or closed municipal landfills	6	Unknown
Marinas	2	Unknown
Primary metal	2	Unknown
Airplane mechanical repair, maintenance, fueling, or cleaning	1	Unknown
Corporate yards (incl. maintenance/storage yards)	1	Unknown
POTWs (water and wastewater)	1	Unknown
Automobile wholesale	1	Unknown
Auto parking lots and storage facilities	-	Unknown
Mobile carpet, drape, or furniture cleaning	9	Unknown
Pool and Fountain cleaning	7	Unknown
Development subject to SUSMPs	0	Unknown
Sites for disposing and treating sewage sludge	-	Unknown

Source: Baseline Long-Term Effectiveness Assessment Report (Weston, MOE, & LWA, 2005).

“-“ signifies that no inventory information is available

Based on limited inventory data provided by Copermittees in 2005

Table 9-19. List of potential likely and unknown bacteria sources for the Mission Bay WMA.

Potential Bacteria Sources	Number of Sources	Source Loading Potential
Eating or drinking establishments	982	Likely
Animal Facilities	34	Likely
Botanical or zoological gardens and nurseries/greenhouses	11	Likely
Landscaping - parks, golf courses, cemeteries, etc.	7	Likely
POTWs (water and wastewater)	1	Likely
Home automobile associated activities, home and garden care activities, waste disposal	-	Likely
Roads, streets, highways, and parking facilities	-	Likely
Sites for disposing and treating sewage sludge	-	Likely
Motor Freight	10	Unknown
Active or closed municipal landfills	6	Unknown
Marinas	2	Unknown
Automobile wholesale	1	Unknown
Auto parking lots and storage facilities	-	Unknown
Pest Control Services	6	Unknown
Flood management projects and flood control devices	-	Unknown
MS4s	-	Unknown
Park and Recreational facilities	-	Unknown

Source: Baseline Long-Term Effectiveness Assessment Report (Weston, MOE, & LWA, 2005).

"-" signifies that no inventory information is available

Based on limited inventory data provided by Copermittees in 2005

The high priority rating for dissolved minerals was based primarily on the limited third party data (SWAMP) where manganese and sulfate results were above the WQO. Dissolved minerals are typically associated with naturally occurring processes. However, land use activities may result in increased concentrations of these parameters.

There are currently no inventories of potential sources that may contribute dissolved minerals based on the threat to water quality ratings provided in the BLTEA report (WESTON, MOE, & LWA, 2005). However, naturally occurring groundwater discharges as a result of increased irrigation, importation of water, dry weather flows, and agricultural water use may contribute to increases in dissolved minerals throughout the watershed. TDS is a high frequency COC based on storm water monitoring data even though parameters such as sulfate, manganese, and chloride are currently not measured under this program or under the dry weather program as was done in the SWAMP monitoring program. Additionally, this program is primarily focused on addressing urban runoff pollution which should be considered when addressing naturally occurring groundwater associated discharges.

9.6 Conclusions and Recommendations

The Mission Bay WMA is the smallest watershed in San Diego County. The contributing runoff area to the Tecolote Creek MLS is approximately 14% of the Mission Bay Watershed land area. The major land uses within the contributing runoff area residential (43%), and transportation (21%).

For the Mission Bay WMA, turbidity, total coliform, fecal coliform and enterococcus were identified as high frequency of occurrence COC followed by TSS and the total metal lead, which was identified as a medium frequency of occurrence COC. A review of the scatterplots and trends indicate significant downward trends for surfactants, ammonia, Diazinon, and total lead concentrations. A significant increasing trend for enterococcus concentrations was also observed. Third party data collected under the SWAMP program in 2002 was conducted at two sites within the Mission Bay Watershed, one in Tecolote Creek near the mass loading station and the other in Rose Canyon Creek. Constituents with results above the water quality objective (WQO) include sulfate, manganese and toxicity at the Tecolote Creek station. Constituents with results above the WQO at Rose Canyon Creek included sulfate, manganese, turbidity, pH, Diazinon and toxicity.

The constituent EMC loads at the Tecolote Creek MLS site were compared to the mean water quality objective (WQO) load, calculated by multiplying the mean flow by constituent WQOs. This comparison shows that fecal coliform, TDS, TSS, total copper, and total lead mean EMC loads were greater than their corresponding mean WQO loads. These results correspond to the EMC exceedances reported in the wet weather chemistry tables, except for TDS. Total dissolved solids was not above the water quality objective for any one wet weather sampling event, but due to the volume of storm water runoff the mean EMC load was 213 kg/day greater than the WQO load. This is 0.32% greater than the WQO load, a negligible amount. Fecal coliform EMC load results were an order of magnitude greater than the WQO load, while loads for total copper and total lead were less extreme.

The mean modeled loads calculated in GIS for the Mission Bay Watershed indicate that loads of total suspended and total dissolved solids based on measured concentrations are higher than might be expected from the land use characteristics in the Tecolote Creek Watershed.

Two stream bioassessment monitoring sites were sampled in the Mission Bay WMA. One site was in Rose Creek, downstream of Highway 52, and the other site was in Tecolote Creek in Tecolote Canyon Natural Park. The macroinvertebrate community of both sites had Index of Biotic Integrity ratings of Poor in October and Very Poor in May, with substantial seasonal variation in the total IBI scores.

The 2005 Ambient Bay and Lagoon Monitoring assessment for Mission Bay analyzed sediment chemistry, toxicity, and benthic community structure. The results for the 2005 chemistry assessment indicated that metals common to all embayments were also found in Mission Bay sediments. Concentrations were low and none exceeded their respective ERL and ERM sediment quality values. There were no PAHs, PCBs, or pesticides found above the detection limit in Mission Bay samples collected during the 2005 Program. Test organisms did not display a toxic response to the Mission Bay sediment collected. Correlated with the SEM:AVS Ratio, it was determined that bioavailable metals found in the Mission Bay sediment were not toxic to the amphipod *E. estuarius*. The infaunal community was dominated by polychaete worms and a genus of barley snail. For the 2005 ABLM sampling, the Bay scored good for toxicology, biology and chemistry.

In addition to the WMA assessment findings, the water quality priority ratings found high priority (A) ratings for the heavy metals, dissolved minerals, nutrients, bacteria, and toxicity categories but found a B priority rating for the sediments category.

The information provided from the triad matrix results used in conjunction with the water quality priority ratings can assist the jurisdictions in making informed decisions in developing their WURMP programs. The two reports also allow for an evaluation of where data gaps exist and where efforts should be targeted.

Utilizing the BLTEA rating methods for future data evaluations would also allow for long-term BMP effectiveness assessment. Incorporation of additional useable data from other third party sources such as POTWs and non-profit organizations would also help to increase the confidence of the water quality priority ratings and overall WMA assessments.

Several considerations should be made with respect to the findings provided in this watershed management area assessment. The recommendations for this watershed are to continue monitoring to gather long-term trend information, identify where data gaps exist and do not allow for informed decision making, and consider where watershed resources may be more effectively targeted to reduce heavy metals, dissolved minerals, nutrients, bacterial indicators, toxicity, and impacts to the physical stream habitats. Assessment of water quality priority ratings should be continued on an annual basis. Storm water managers should be aware that several changes to the water quality priority ratings may be expected based on the additional parameters added in the proposed 2006 303(d) list. The draft monitoring order (R9-2006-0011) calls for two temporary watershed assessment stations for this watershed (Rose Canyon and Tecolote Creek). These two stations should be placed with respect to addressing the spatial distribution of heavy metals, dissolved minerals, nutrients, bacteria, and toxicity. Future monitoring stations associated with the outfall monitoring and source identification studies should be located with respect to assessing the spatial distribution of constituents of concern and with respect to watershed priority activities. As watershed activities are developed based on the high water quality priority ratings, watershed monitoring stations may need to be located strategically to be able to effectively measure the pollutant load changes (either additions or reductions) with respect to location and sensitivity. In this manner, BMP strategies and decisions can be made to adjust and fine tune future BMP implementation in order to reach the desired load reductions necessary to meet the water quality objectives throughout the watershed and protect the beneficial uses.