

VOLUME I

LIST OF TABLES.....	xii
LIST OF FIGURES.....	xviii
LIST OF ACRONYMS AND ABBREVIATIONS	xxiv
LIST OF CONTRIBUTORS	xxvii
 EXECUTIVE SUMMARY	 ES-1
 I.0 INTRODUCTION	 1-1
I.1 Background	1-1
I.2 Monitoring Program History.....	1-3
I.2.1 1993-1994 Objectives and Key Elements	1-4
I.2.2 1994-1995 Objectives and Key Elements	1-5
I.2.3 1995-1996 Objectives and Key Elements	1-6
I.2.4 1996 – 2000 Objectives and Key Elements	1-8
I.2.5 2000-2001 Objectives and Key Elements	1-9
I.2.6 2001-2002 Objectives and Key Elements	1-9
I.2.6.1 Water Quality Monitoring at the Mass Loading Stations	1-9
I.2.6.2 Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring	1-11
I.2.6.3 Rapid Stream Bioassessment Monitoring.....	1-11
I.2.6.4 Toxic Hot Spot Monitoring in San Diego Bay.....	1-11
I.2.6.5 Coastal Outfall Monitoring	1-12
I.2.6.6 Dry Weather Analytical and Field Screening Monitoring.....	1-12
I.2.7 2002 – 2003 Objectives and Key Elements	1-12
I.2.7.1 Water Quality Monitoring at the Mass Loading Stations	1-12
I.2.7.2 Ambient Bay, Lagoon and Coastal Receiving Water Monitoring.....	1-12
I.2.7.3 Rapid Stream Bioassessment Monitoring.....	1-13
I.2.7.4 Toxic Hot Spot Monitoring in San Diego Bay.....	1-13
I.2.7.5 Coastal Outfall Monitoring	1-13
I.2.7.6 Dry Weather Analytical and Field Screening Monitoring.....	1-13
I.2.8 2003 – 2004 Objectives and Key Elements	1-13
I.2.8.1 Water Quality Monitoring at the Mass Loading Stations	1-14
I.2.8.2 Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring	1-14
I.2.8.3 Rapid Stream Bioassessment Monitoring.....	1-14
I.2.8.4 Toxic Hot Spot Monitoring in San Diego Bay.....	1-14
I.2.8.5 Coastal Outfall Monitoring	1-14
I.2.8.6 Dry Weather Analytical and Field Screening Monitoring.....	1-15
I.2.9 2004 – 2005 Objectives and Key Elements	1-15
I.2.9.1 Water Quality Monitoring at the Mass Loading Stations	1-15
I.2.9.2 Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring	1-15
I.2.9.3 Rapid Stream Bioassessment Monitoring.....	1-16
I.2.9.4 Toxic Hot Spot Monitoring in San Diego Bay.....	1-16
I.2.9.5 Coastal Outfall Monitoring	1-16
I.2.9.6 Dry Weather Analytical and Field Screening Monitoring.....	1-16

Table of Contents

1.2.10	2005 – 2006 Objectives and Key Elements	1-16
1.2.10.1	Water Quality Monitoring at the Mass Loading Stations	1-16
1.2.10.2	Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring	1-17
1.2.10.3	Rapid Stream Bioassessment Monitoring.....	1-17
1.2.10.4	Toxic Hot Spot Monitoring in San Diego Bay.....	1-17
1.2.10.5	Coastal Outfall Monitoring	1-18
1.2.10.6	Dry Weather Analytical and Field Screening Monitoring.....	1-18
1.3	2006-2007 Scope of Work.....	1-18
1.3.1	Water Quality Monitoring at the Mass Loading Stations	1-18
1.3.2	Ambient Bay, Lagoon, and Coastal Receiving Water Monitoring	1-24
1.3.3	Rapid Stream Bioassessment Monitoring.....	1-24
1.3.4	Toxic Hot Spot Monitoring in San Diego Bay	1-24
1.3.5	Coastal Outfall Monitoring.....	1-24
1.3.6	Dry Weather Analytical and Field Screening Monitoring.....	1-24
1.4	Report Organization	1-25
2.0	STUDY AREA DESCRIPTION	2-1
2.1	Regional Setting	2-1
2.1.1	Geomorphology.....	2-1
2.1.2	Significant Regional Events	2-4
2.1.3	Rainfall and Climate.....	2-4
2.1.4	Hydrology	2-7
2.1.5	Land Areas	2-13
2.1.6	Land Use	2-15
2.1.7	Population	2-16
2.2	Monitoring Site Descriptions	2-20
2.3	Storm Event Summary	2-24
2.3.1	Representative Storm Event	2-24
2.3.2	Precipitation During Monitored Events	2-27
2.3.3	Storm Water Runoff During Monitored Events	2-29
3.0	PROGRAM MONITORING AND DATA ANALYSIS METHODS.....	3-1
3.1	Water Quality Monitoring Methods.....	3-1
3.1.1	Mass Loading Station (MLS) Site Selection.....	3-1
3.1.2	Monitoring Equipment	3-1
3.1.3	Sampling Procedures.....	3-2
3.1.3.1	Grab Samples.....	3-2
3.1.3.2	Composite Samples	3-2
3.1.4	Stream Rating Methods.....	3-3
3.1.5	Sample Handling and Processing.....	3-5
3.1.6	Laboratory Analysis.....	3-5
3.1.6.1	Chemical Constituents	3-5
3.1.6.2	Toxicity Testing	3-8
3.1.6.3	Microbiology Testing	3-11
3.2	Rapid Stream Bioassessment Methods	3-12
3.2.1	Materials and Methods.....	3-12
3.2.2	Monitoring Reaches	3-13
3.2.3	Monitoring Reach Delineation	3-18

Table of Contents

3.2.4	Sample Collection	3-18
3.2.5	Physical Habitat Quality Assessment	3-18
3.2.6	Laboratory Processing and Analysis	3-19
3.2.7	Data and Statistical Analysis	3-19
3.3	Ambient Bay and Lagoon Monitoring.....	3-21
3.4	Watershed Management Area Assessment and Long-Term Effectiveness Assessment Rating Methods.....	3-21
3.4.1	Watershed Management Area Assessment Methods	3-21
3.4.2	Water Quality Priority Ratings – Long-Term Effectiveness Assessment Methodology	3-30
3.5	Statistical Methods	3-32
3.5.1	Trend Analysis	3-32
3.5.2	Constituent Comparisons	3-34
3.6	Storm Event Loading Estimation.....	3-35
ES4	SANTA MARGARITA RIVER WMA EXECUTIVE SUMMARY	ES4-1
4.0	Santa Margarita River Watershed Management Area	4-1
4.1	Santa Margarita River Watershed Management Area Description	4-1
4.1.1	Land Use	4-3
4.1.2	Beneficial Uses	4-3
4.1.3	Regulatory Water Quality Challenges	4-4
4.1.4	Mass Loading Station Description	4-5
4.1.5	Stream Bioassessment Description.....	4-5
4.2	Watershed Water Quality Monitoring	4-6
4.2.1	2006-2007 Storm Water Monitoring and Results	4-6
4.2.1.1	Storm Water Monitoring Results	4-6
4.2.2	Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	4-9
4.2.2.1	Comparison to Benchmarks	4-9
4.2.2.2	Trends	4-10
4.2.2.3	Magnitude of Exceedance	4-11
4.2.3	Pollutant Loadings Analysis	4-12
4.2.4	2006 Dry Weather Monitoring Data Evaluation	4-12
4.2.5	Third Party Data	4-15
4.2.6	TIEs	4-15
4.2.7	Watershed Water Quality Monitoring Summary	4-15
4.3	Stream Bioassessment.....	4-16
4.3.1	Results and Discussion	4-16
4.3.2	Stream Bioassessment Summary and Conclusions	4-24
4.4	Santa Margarita River WMA Assessment	4-25
4.4.1	Santa Margarita River WMA Criterion Assessment	4-25
4.4.2	Santa Margarita River WMA Triad Decision Matrix.....	4-28
4.4.3	2001-2006 Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the Santa Margarita River WMA	4-29
4.5	Conclusions and Recommendations	4-31
ES5.0	SAN LUIS REY RIVER WMA EXECUTIVE SUMMARY	ES5-1
5.0	SAN LUIS REY RIVER WATERSHED MANAGEMENT AREA.....	5-1
5.1	San Luis Rey River Watershed Management Area Description	5-1

Table of Contents

5.1.1	Land Use	5-3
5.1.2	Beneficial Uses	5-3
5.1.3	Regulatory Water Quality Challenges	5-4
5.1.4	Mass Loading Station Site Description	5-5
5.1.5	Stream Bioassessment Description.....	5-6
5.2	Watershed Water Quality Monitoring	5-6
5.2.1	2006-2007 Water Quality Monitoring and Results	5-6
5.2.2	Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	5-11
	5.2.2.1 Comparison to Benchmarks	5-11
	5.2.2.2 Trends.....	5-11
	5.2.2.3 Magnitude of Exceedance	5-14
5.2.3	Wet Weather Constituent Loading Analysis	5-15
5.2.4	2006 Dry Weather Monitoring Data Evaluation	5-17
5.2.5	Third Party Data	5-19
5.2.6	Watershed Water Quality Monitoring Summary	5-20
5.3	Stream Bioassessment.....	5-21
5.3.1	Results and Discussion	5-21
5.3.2	Stream Bioassessment Summary	5-30
5.4	San Luis Rey River WMA Assessment	5-31
5.4.1	San Luis Rey River WMA Criterion Assessment	5-31
5.4.2	Triad Decision Matrix	5-34
5.4.3	2001-2006 Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Luis Rey WMA.....	5-34
5.5	Conclusions and Recommendations	5-36
ES6.0	CARLSBAD WMA EXECUTIVE SUMMARY	ES6-1
6.0	CARLSBAD WATERSHED MANAGEMENT AREA.....	6-1
6.1	Carlsbad Watershed Management Area Description	6-1
6.1.1	Land Use	6-4
6.1.2	Beneficial Uses	6-5
6.1.3	Regulatory Water Quality Challenges	6-5
6.2	Agua Hedionda Creek Watershed	6-7
6.2.1	Agua Hedionda Creek Mass Loading Station Site Description	6-7
6.2.2	Stream Bioassessment Description.....	6-7
6.2.3	Agua Hedionda Creek Water Quality Monitoring	6-8
	6.2.3.1 2006-2007 Storm Water Monitoring and Results.....	6-8
	6.2.3.2 Storm Water Monitoring Results.....	6-9
6.2.4	Agua Hedionda Creek Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	6-15
	6.2.4.1 Comparison to Benchmarks	6-15
	6.2.4.2 Trends.....	6-16
	6.2.4.3 Magnitude of Exceedance.....	6-19
6.2.5	Agua Hedionda Creek Wet Weather Constituent Loadings Analysis.....	6-20
6.2.6	2006 Agua Hedionda Creek Dry Weather Monitoring Data Evaluation	6-23
6.2.7	TIEs	6-26
6.2.8	Agua Hedionda Creek Water Quality Monitoring Summary	6-26
6.2.9	Agua Hedionda Creek Stream Bioassessment.....	6-27
	6.2.9.1 Results and Discussion.....	6-27

Table of Contents

	6.2.9.2	Third Party Bioassessment Data.....	6-35
	6.2.9.3	Agua Hedionda Creek Bioassessment Summary.....	6-36
	6.2.10	Agua Hedionda Creek Watershed Assessment	6-36
	6.2.10.1	Agua Hedionda Watershed Criterion Assessment	6-38
	6.2.10.2	Agua Hedionda Creek Triad Decision Matrix	6-40
	6.2.11	Agua Hedionda Creek Watershed Conclusions	6-40
6.3		Escondido Creek Watershed	6-42
	6.3.1	Escondido Creek Mass Loading Station Site Description	6-42
	6.3.2	Escondido Creek Stream Bioassessment Description	6-42
	6.3.3	Escondido Creek Water Quality Monitoring	6-42
	6.3.3.1	2006-2007 Storm Water Monitoring and Results.....	6-43
	6.3.3.2	Storm Water Monitoring Results.....	6-44
	6.3.4	Escondido Creek Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	6-47
	6.3.4.1	Comparison to Benchmarks	6-47
	6.3.4.2	Trends.....	6-48
	6.3.4.3	Magnitude of Exceedance.....	6-50
	6.3.5	Escondido Creek Wet Weather Constituent Loadings Analysis.....	6-51
	6.3.6	2006 Escondido Creek Dry Weather Monitoring Data Evaluation	6-53
	6.3.7	Escondido Creek Third Party Data.....	6-56
	6.3.8	TIEs	6-59
	6.3.9	Escondido Creek Watershed Water Quality Monitoring Summary	6-59
	6.3.10	Escondido Creek Stream Bioassessment.....	6-60
	6.3.10.1	Results and Discussion.....	6-60
	6.3.10.2	Third Party Bioassessment Data.....	6-66
	6.3.11	Escondido Creek Bioassessment Summary	6-67
	6.3.12	Escondido Creek Watershed Assessment	6-67
	6.3.12.1	Escondido Creek Watershed Criterion Assessment	6-67
	6.3.13	Escondido Creek Triad Decision Matrix.....	6-70
6.4		Escondido Creek Watershed Conclusions.....	6-72
6.5		2006 Carlsbad WMA Dry Weather Monitoring Data Evaluation.....	6-73
6.6		Carlsbad WMA Third Party Data.....	6-76
	6.6.1	Restoration of Riparian/Wetlands Habitat in the Carlsbad Hydrologic Unit Grant Program Data	6-76
	6.6.2	Third Party HARRF Data	6-76
	6.6.3	Third Party SWAMP Data.....	6-77
6.7		2001-2006 Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the Carlsbad WMA.....	6-79
6.8		Carlsbad WMA Conclusions and Recommendations.....	6-81
ES7.0		SAN DIEGUITO RIVER WMA EXECUTIVE SUMMARY	ES7-1
7.0		SAN DIEGUITO RIVER WATERSHED MANAGEMENT AREA.....	7-1
	7.1	San Dieguito River Watershed Management Area Description.....	7-1
	7.1.1	Land Use	7-3
	7.1.2	Beneficial Uses	7-3
	7.1.3	Regulatory Water Quality Challenges	7-4
	7.1.4	Mass Loading Station Site Description	7-5
	7.1.5	Stream Bioassessment Site Description.....	7-5
	7.2	Watershed Water Quality Monitoring	7-6

Table of Contents

7.2.1	2006-2007 Storm Water Monitoring and Results	7-6
7.2.2	Storm Water Monitoring Results	7-8
7.2.3	Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	7-11
7.2.3.1	Comparison to Benchmarks	7-11
7.2.3.2	Trends.....	7-13
7.2.3.3	Magnitude of Exceedance.....	7-14
7.2.4	Wet Weather Constituent Loadings Analysis.....	7-16
7.2.5	2006 Dry Weather Monitoring Data Evaluation	7-18
7.2.6	Third Party Data	7-20
7.2.7	TIEs	7-21
7.2.8	Watershed Water Quality Monitoring Summary	7-21
7.3	Stream Bioassessment.....	7-22
7.3.1	Results and Discussion	7-22
7.3.2	Stream Bioassessment Summary and Conclusions	7-28
7.4	San Dieguito River WMA Assessment	7-29
7.4.1	San Dieguito River WMA Criterion Assessment.....	7-29
7.4.2	Triad Decision Matrix	7-32
7.4.3	2001-2006 Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Dieguito River WMA.....	7-32
7.5	Conclusions and Recommendations	7-35
ES8.0	LOS PEÑASQUITOS WMA EXECUTIVE SUMMARY.....	ES8-1
8.0	LOS PEÑASQUITOS CREEK WATERSHED MANAGEMENT AREA.....	8-1
8.1	Los Peñasquitos Watershed Management Area Description.....	8-1
8.1.1	Land Use	8-3
8.1.2	Beneficial Uses	8-3
8.1.3	Regulatory Water Quality Challenges.....	8-4
8.1.4	Mass Loading Station Site Description	8-5
8.1.5	Stream Bioassessment Site Description.....	8-5
8.1.6	Ambient Bay and Lagoon Monitoring Site Description.....	8-5
8.2	Watershed Water Quality Monitoring	8-6
8.2.1	2006-2007 Storm Water Monitoring and Results	8-6
8.2.2	Monitoring Results: Comparison to Benchmarks/Statistical Analyses/Trends	8-11
8.2.2.1	Comparison to Benchmarks	8-11
8.2.2.2	Trends.....	8-12
8.2.2.3	Magnitude of Exceedance.....	8-13
8.2.3	Wet Weather Constituent Loadings Analysis.....	8-14
8.2.4	2006 Dry Weather Monitoring Data Evaluation	8-17
8.2.5	Third Party Data	8-19
8.2.6	TIEs	8-20
8.2.7	Watershed Water Quality Monitoring Summary	8-20
8.3	Stream Bioassessment.....	8-21
8.3.1	Results and Discussion	8-21
8.3.2	Stream Bioassessment Summary and Conclusions	8-26
8.4	Ambient Bay and Lagoon Monitoring Program.....	8-28
8.5	Los Peñasquitos Creek WMA Assessment	8-28
8.5.1	Los Peñasquitos Creek WMA Criterion Assessment	8-28

Table of Contents

8.5.2	Los Peñasquitos Creek Triad Decision Matrix	8-31
8.5.3	Water Quality Priority Ratings for the Los Peñasquitos WMA	8-31
8.6	Conclusions and Recommendations	8-33
ES9.0	MISSION BAY WMA EXECUTIVE SUMMARY	ES9-1
9.0	MISSION BAY WATERSHED MANAGEMENT AREA	9-1
9.1	Mission Bay Watershed Management Area Descriptions	9-1
9.1.1	Land Use	9-3
9.1.2	Beneficial Uses	9-3
9.1.3	Regulatory Water Quality Challenges	9-4
9.1.4	Mass Loading Station Site Description	9-5
9.1.5	Stream Bioassessment Site Description	9-6
9.1.6	Ambient Bay and Lagoon Monitoring Site Description	9-6
9.2	Watershed Water Quality Monitoring	9-7
9.2.1	2006-2007 Water Quality Monitoring and Results	9-7
9.2.2	Monitoring Results: Comparison to Benchmarks/Statistical Analyses/Trends	9-15
9.2.2.1	Comparison to Benchmarks	9-15
9.2.2.2	Trends	9-16
9.2.2.3	Magnitude of Exceedance	9-18
9.2.3	Wet Weather Constituent Loading Analysis	9-20
9.2.4	2006 Dry Weather Monitoring Data Evaluation	9-22
9.2.5	Third Party Data	9-25
9.2.6	TIEs	9-25
9.2.7	Watershed Water Quality Monitoring Summary	9-25
9.3	Stream Bioassessment	9-26
9.3.1	Stream Bioassessment Results and Discussion	9-26
9.3.2	Stream Bioassessment Summary	9-32
9.4	Ambient Bay and Lagoon Monitoring Program	9-33
9.5	Mission Bay WMA Assessment	9-33
9.5.1	Mission Bay WMA Criterion Assessment	9-33
9.5.2	Triad Decision Matrix	9-36
9.5.3	Water Quality Priority Ratings for the Mission Bay WMA	9-37
9.6	Conclusions and Recommendations	9-39
ES10.0	SAN DIEGO RIVER WMA EXECUTIVE SUMMARY	ES10-1
10.0	SAN DIEGO RIVER WATERSHED MANAGEMENT AREA	10-1
10.1	San Diego River Watershed Management Area Description	10-1
10.1.1	Land Use	10-3
10.1.2	Beneficial Uses	10-3
10.1.3	Regulatory Water Quality Challenges	10-4
10.1.4	Mass Loading Station Site Description	10-5
10.1.5	Stream Bioassessment Site Description	10-6
10.2	Watershed Water Quality Monitoring	10-7
10.2.1	2006-2007 Storm Water Monitoring and Results	10-7
10.2.1.1	Storm Water Monitoring Event Summary	10-8
10.2.1.2	Storm Water Monitoring Results	10-8
10.2.2	Monitoring Results: Comparison to Benchmarks/Statistical Analyses/Trends	10-11

Table of Contents

	10.2.2.1 Comparison to Benchmarks	10-11
	10.2.2.2 Trends.....	10-13
	10.2.2.3 Magnitude of Exceedance.....	10-14
	10.2.3 Wet Weather Constituent Loading Analysis	10-15
	10.2.4 2006 Dry Weather Monitoring Data Evaluation	10-17
	10.2.5 Third Party Data	10-20
	10.2.5.1 Padre Dam Data.....	10-20
	10.2.5.2 Third Party SWAMP Data.....	10-21
	10.2.5.3 Third Party Data (La Mesa)	10-21
	10.2.6 TIEs	10-22
	10.2.7 Watershed Water Quality Monitoring Summary	10-22
10.3	Stream Bioassessment.....	10-23
	10.3.1 Results and Discussion	10-23
	10.3.2 Third Party Bioassessment Data	10-30
	10.3.3 Stream Bioassessment Summary	10-33
10.4	San Diego River WMA Assessment.....	10-34
	10.4.1 San Diego River WMA Criterion Assessment.....	10-34
	10.4.2 Triad Decision Matrix	10-37
	10.4.3 Water Quality Priority Ratings for the San Diego River WMA	10-38
10.5	Conclusions and Recommendations	10-40
ES I 1.0	SAN DIEGO BAY WMA EXECUTIVE SUMMARY	ES I 1-1
11.0	SAN DIEGO BAY WATERSHED MANAGEMENT AREA	11-1
11.1	San Diego Bay Watershed Management Area Descriptions	11-1
	11.1.1 Land Use	11-4
	11.1.2 Beneficial Uses	11-6
	11.1.3 Regulatory Water Quality Challenges	11-8
11.2	Pueblo San Diego Watershed	11-11
	11.2.1 Chollas Creek Mass Loading Station Site Description	11-11
	11.2.2 Chollas Creek Stream Bioassessment Site Description	11-11
11.3	Pueblo San Diego Watershed Water Quality Monitoring	11-12
	11.3.1 2006-2007 Chollas Creek Storm Water Monitoring and Results	11-12
	11.3.1.1 Chollas Creek Storm Water Monitoring Results	11-13
	11.3.2 Chollas Creek Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	11-20
	11.3.2.1 Comparison to Benchmarks	11-20
	11.3.2.2 Trends.....	11-23
	11.3.2.3 Magnitude of Exceedance.....	11-27
	11.3.3 Chollas Creek Wet Weather Constituent Loadings Analysis.....	11-29
	11.3.4 2006 Pueblo San Diego Watershed Dry Weather Monitoring Data Evaluation.....	11-31
	11.3.5 Pueblo San Diego Watershed Third Party Data	11-35
	11.3.5.1 Third Party Wet Weather Data Results.....	11-35
	11.3.5.2 Third Party Dry Weather Data Results	11-35
	11.3.6 Chollas Creek Toxicity Identification Evaluation (TIE)	11-36
	11.3.7 Pueblo San Diego Water Quality Monitoring Summary	11-37
11.4	Chollas Creek Stream Bioassessment.....	11-39
	11.4.1 Bioassessment Results and Discussion	11-39
	11.4.2 Chollas Creek Bioassessment Summary	11-41

Table of Contents

11.5	Pueblo San Diego Watershed Assessment.....	11-43
11.5.1	Chollas Creek Criterion Assessment.....	11-45
11.5.2	Chollas Creek Triad Decision Matrix	11-49
11.6	Pueblo San Diego Watershed Data Linkage Analysis.....	11-50
11.7	Pueblo San Diego Watershed Conclusions and Recommendations	11-61
11.8	Sweetwater Watershed	11-63
11.8.1	Sweetwater River Mass Loading Station	11-63
11.8.2	Sweetwater River Stream Bioassessment Description	11-63
11.8.3	2006-2007 Sweetwater Storm Water Monitoring and Results.....	11-64
11.8.3.1	Sweetwater Storm Water Monitoring Event Summary	11-64
11.8.3.2	Sweetwater Storm Water Monitoring Results	11-65
11.8.4	Sweetwater Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	11-68
11.8.4.1	Comparison to Benchmarks	11-68
11.8.4.2	Trends.....	11-69
11.8.4.3	Magnitude of Exceedance.....	11-70
11.8.5	Sweetwater Wet Weather Constituent Loadings Analysis	11-71
11.8.6	2006 Sweetwater Dry Weather Monitoring Data Evaluation.....	11-74
11.8.7	Sweetwater River Third Party Data.....	11-77
11.8.7.1	City of La Mesa Third Party Dry Weather Data Results	11-77
11.8.7.2	Sweetwater Authority Third Party Data Results	11-77
11.8.8	Sweetwater Toxicity Identification Evaluation (TIE).....	11-78
11.8.9	Sweetwater Watershed Water Quality Monitoring Summary.....	11-78
11.9	Sweetwater River Stream Bioassessment.....	11-79
11.9.1	Results and Discussion	11-79
11.9.2	Sweetwater River Bioassessment Summary	11-85
11.10	Sweetwater River Assessment.....	11-86
11.10.1	Sweetwater River Watershed Criterion Assessment	11-86
11.10.2	Sweetwater River Triad Decision Matrix.....	11-92
11.11	Sweetwater Watershed Summary and Recommendations	11-93
11.12	Otay Watershed.....	11-94
11.13	2006 San Diego Bay WMA Dry Weather Monitoring Data Evaluation.....	11-97
11.14	2001-2006 Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the San Diego Bay WMA.....	11-100
11.15	Conclusions and Recommendations	11-102
ES12.0	TIJUANA RIVER WMA EXECUTIVE SUMMARY	ES12-1
12.0	TIJUANA RIVER WATERSHED MANAGEMENT AREA	12-1
12.1	Tijuana River Watershed Management Area Description.....	12-1
12.1.1	Land Use	12-3
12.1.2	Beneficial Uses	12-3
12.1.3	Regulatory Water Quality Challenges	12-4
12.1.4	Mass Loading Station Site Description	12-5
12.1.5	Stream Bioassessment Site Description.....	12-5
12.2	Watershed Water Quality Monitoring	12-6
12.2.1	2006-2007 Storm Water Monitoring and Results.....	12-6
12.2.2	Monitoring Results Comparison to Benchmarks/Statistical Analyses/Trends	12-11
12.2.2.1	Comparison to Benchmarks	12-11

Table of Contents

12.2.2.2	Trends.....	12-12
12.2.2.3	Magnitude of Exceedance.....	12-17
12.2.3	Wet Weather Constituent Loadings Analysis.....	12-18
12.2.4	2006 Dry Weather Monitoring Data Evaluation	12-21
12.2.5	TIEs	12-23
12.2.6	Watershed Water Quality Monitoring Summary	12-24
12.3	Stream Bioassessment.....	12-25
12.3.1	Results and Discussion	12-25
12.3.2	Stream Bioassessment Summary	12-31
12.4	Tijuana River WMA Assessment	12-32
12.4.1	Tijuana River WMA Criterion Assessment	12-32
12.4.2	Triad Decision Matrix	12-35
12.4.3	2001-2006 Baseline Long-Term Effectiveness Assessment (BLTEA) Ratings for the Tijuana River WMA.....	12-36
12.5	Conclusions and Recommendations	12-39
13.0	REGIONAL ASSESSMENTS.....	13-1
13.1	Regional Statistical Analysis	13-1
13.1.1	Statistical Analyses.....	13-6
13.1.1.1	Magnitude of Benchmark WQO Exceedance and Regional Trend Analysis Results	13-6
13.1.1.2	Cluster Results.....	13-28
13.2	Storm Water Modeling	13-31
13.2.1	Static Storm Water Modeling.....	13-31
13.3	Rapid Stream Bioassessment Results	13-36
13.3.1	Bioassessment Results and Discussion	13-36
13.3.1.1	Regional Benthic Community Structure	13-36
13.3.1.2	Physical Habitat and Water Quality	13-40
13.3.1.3	Summary Indices: Index of Biotic Integrity and O/E Ratio.....	13-41
13.3.1.4	Seasonal and Annual Trend Analysis	13-46
13.3.2	Summary and Conclusions.....	13-48
13.4	Dry Weather Data Analysis Results	13-49
13.4.1	Dry Weather Conclusions.....	13-56
13.5	Third Party Regional Data.....	13-57
13.5.1	Surface Water Ambient Monitoring Program (SWAMP).....	13-57
13.5.2	Padre Dam Water Quality Monitoring Program.....	13-58
13.5.3	La Mesa Field and Water Quality Data	13-60
13.5.4	Sweetwater Authority Monitoring.....	13-60
13.5.5	Carlsbad Watershed Copermittee Grant Data.....	13-61
13.5.6	Escondido Creek – Hale Avenue Resource Recovery Facility Third Party Data.....	13-61
13.5.7	Third Party Data Conclusions	13-63
13.6	Regional Water Quality Priority Rating	13-65
14.0	CONCLUSIONS AND RECOMMENDATIONS	14-1
14.1	Conclusions	14-1
14.1.1	Watershed Water Quality Monitoring Conclusions.....	14-1
14.1.1.1	Wet Weather Monitoring Conclusions.....	14-1
14.1.1.2	Dry Weather Monitoring Conclusions.....	14-6

- 14.1.1.3 Third Party Data Conclusions..... 14-6
- 14.1.2 Stream Bioassessment Conclusions 14-7
- 14.1.3 Ambient Bay and Lagoon Program Conclusions 14-8
- 14.1.4 Watershed Assessment Conclusions 14-8
 - 14.1.4.1 Santa Margarita River Watershed Management Area..... 14-8
 - 14.1.4.2 San Luis Rey River Watershed Management Area..... 14-9
 - 14.1.4.3 Carlsbad Watershed Management Area..... 14-10
 - 14.1.4.4 San Dieguito River Watershed Management Area 14-13
 - 14.1.4.5 Los Peñasquitos Creek Watershed Management Area 14-14
 - 14.1.4.6 Mission Bay Watershed Management Area 14-16
 - 14.1.4.7 San Diego River Watershed Management Area 14-17
 - 14.1.4.8 San Diego Bay Watershed Management Area 14-19
 - 14.1.4.9 Tijuana River Watershed Management Area 14-22
- 14.2 Program Review 14-24
- 14.3 Recommendations 14-28
 - 14.3.1 2007-2008 Recommendations 14-28

- 15.0 REFERENCES 15-1

VOLUME II

APPENDICES

- A Hydrographs
- B Stream Bioassessment Data
- C Scatterplots and Trend Data
- D Dry Weather Data Land Use and MS4 Type by Watershed
- E Attachment A - Coastal Storm Drain Monitoring
- F Attachment B - Toxic Hot Spots Monitoring
- G Watershed Water Quality Priority Rating Tables
- H Third Party Data
- I Toxicity Identification Evaluation Reports for Chollas Creek and Sweetwater River
- J Response to Comments for Draft 2006-2007 Urban Runoff Monitoring Report
- K California Toxics Rule - Hardness Based Water Quality Objectives

TABLES

1-1.	Analytical Requirements for Each Type of Monitoring Site as Specified in RWQCB Order 95-76 (Woodward-Clyde, 1998).	1-7
1-2.	Wet Weather Monitoring Stations 1993-1994 Through 2006-2007.	1-20
1-3.	Analytical Requirements for Mass Loading Stations 2006-2007.....	1-22
1-4.	Additional Constituents Analyzed for Mass Loading Stations 2006-2007 (not required by permit).	1-23
1-5.	Synthetic Pyrethroids Analyzed for Selected Mass Loading Stations During 2006-2007 (not required by permit).	1-23
1-6.	Report Organization.	1-25
2-1.	Rainfall Statistics for San Diego International Airport (1948 through 1986).	2-6
2-2.	Hydrologic Areas in the San Diego Region.	2-9
2-3.	Reservoirs in the San Diego Region.	2-12
2-4.	Watershed Acreages by Jurisdiction.....	2-14
2-5.	Overall Land Use Distribution in Watershed Management Areas.....	2-16
2-6.	Estimate of % of Impervious Surface for each WMA.....	2-16
2-7.	Population Distribution in San Diego County (Census, 2000).	2-17
2-8.	Population Estimates and Projections by WMA.....	2-19
2-9.	Estimate of % of Impervious Surface for each MLS Drainage Area	2-24
2-10.	Rainfall Summary by Mass Loading Station for Monitored Storm Events.	2-27
3-1.	Analytical Requirements for Mass Loading Stations 2006-2007.....	3-6
3-2.	Additional Constituents Analyzed for Mass Loading Stations 2006-2007 (not required by permit).	3-7
3-3.	Synthetic Pyrethroids Analyzed for Selected Mass Loading Stations during 2006-2007 (not required by permit).	3-7
3-4.	San Diego County: Stream Bioassessment Monitoring Sites. June 2001 to May 2007.	3-13
3-5.	Bioassessment Metrics Used to Characterize BMI Communities.	3-20
3-6.	Benchmark Water Quality Objectives for Wet Weather Monitoring at Mass Loading Stations.....	3-22
3-7.	Toxicity Benchmark Water Quality Objectives for Wet Weather Monitoring at Mass Loading Stations.	3-24
3-8.	Dry Weather Action Levels.....	3-25
3-9.	Matrix of Findings.....	3-27
3-10.	Interim Criteria for Evaluating Mass Loading and Dry Weather Station Data.	3-28
3-11.	Triad Definitions for San Diego Storm Water Monitoring Program.....	3-29
3-12.	Tabular Decision Matrix – Chemical, Toxicity, and Benthic Assemblage Data Available (adapted from SMC Model Storm Water Monitoring Program, 2004).	3-29
4-1.	Beneficial Uses Within the Santa Margarita Watershed.....	4-4
4-2.	Water Bodies on the SWRCB 303(d) List in the Santa Margarita Watershed.	4-5
4-3.	Analytes Measured at the Santa Margarita River Mass Loading Station.	4-7
4-4.	Summary of the 2006 Dry Weather Monitoring Results in the Santa Margarita WMA.	4-13
4-5.	Santa Margarita River WMA 2006 Dry Weather Exceedance Matrix.....	4-13
4-6.	Selected Biological Metrics and Physical Measures of the Santa Margarita Watershed Management Area.	4-17
4-7.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for Santa Margarita River WMA.....	4-18

4-8.	Watershed Assessment Data Set	4-25
4-9.	Wet Weather Constituent Exceedances in the Santa Margarita River WMA.	4-26
4-10.	Triad Decision Matrix Results for Santa Margarita River WMA.	4-28
4-11.	2001-2006 Water Quality Priority Ratings for the Santa Margarita River WMA.	4-29
5-1.	Beneficial Uses Within the San Luis Rey Watershed.	5-4
5-2.	Water Bodies on the SWRCB 303(d) List in the San Luis Rey Watershed.	5-5
5-3.	2006-2007 Rainfall Statistics for Monitored Storm Events for the San Luis Rey River WMA.	5-6
5-4.	Analytes Measured at the San Luis Rey River Mass Loading Station.	5-9
5-5.	Modeled Loading Values Compared to Measured Loading Values for San Luis Rey River (SLR) Mass Loading Station.	5-16
5-6.	Summary of the 2006 Dry Weather Monitoring Results in the San Luis Rey WMA.	5-17
5-7.	San Luis Rey WMA 2006 Dry Weather Exceedance Matrix.	5-19
5-8.	Selected Biological Metrics and Physical Measures of the San Luis Rey River Watershed Management Area.	5-22
5-9.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for San Luis Rey River Watershed Management Area.	5-23
5-10.	Watershed Assessment Data Set	5-31
5-11.	Wet Weather Constituent Exceedances in the San Luis Rey River WMA.	5-32
5-12.	Triad Decision Matrix Results for the San Luis Rey River WMA.	5-34
5-13.	2001-2006 Water Quality Priority Ratings for the San Luis Rey River WMA.	5-35
6-1.	Beneficial Uses Within the Carlsbad Watershed.	6-5
6-2.	Water Bodies on the SWRCB 303(d) list in the Carlsbad Watershed.	6-6
6-3.	Rainfall Statistics for Monitored Storm Events for the Agua Hedionda Creek Mass Loading Station.	6-8
6-4.	Analytes Measured at the Agua Hedionda Creek Mass Loading Station.	6-10
6-5.	Organophosphorus and Pyrethroid Pesticides Results Collected at the Agua Hedionda Creek Mass Loading Station.	6-14
6-6.	Modeled Loading Values Compared to Measured Loading Values for Agua Hedionda Creek (AHC) Mass Loading Station.	6-22
6-7.	Summary of the 2006 Dry Weather Monitoring Results in the Agua Hedionda Creek Watershed.	6-23
6-8.	Agua Hedionda Creek Watershed 2006 Dry Weather Exceedance Matrix.	6-24
6-9.	Selected Biological Metrics and Physical Measures of the Agua Hedionda Creek Sub- Watershed.	6-28
6-10.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for Agua Hedionda Creek Sub-Watershed	6-29
6-11.	Index of Biotic Integrity Scores for Agua Hedionda Monitoring Sites. 2001-2006.	6-36
6-12.	Watershed Assessment Data Set	6-36
6-13.	Wet Weather Constituent Exceedances in Agua Hedionda Creek.	6-37
6-14.	Triad Decision Matrix Results for Agua Hedionda Creek.	6-40
6-15.	Rainfall Statistics for Monitored Storm Events for the Escondido Creek Mass Loading Station.	6-43
6-16.	Analytes Measured at the Escondido Creek Mass Loading Station.	6-45
6-17.	Modeled Loading Values Compared to Measured Loading Values for Escondido Creek (EC) Mass Loading Station.	6-52

6-18.	Summary of the 2006 Dry Weather Monitoring Results in the Escondido Creek Watershed.....	6-53
6-19.	Escondido Creek Watershed 2006 Dry Weather Exceedance Matrix.....	6-54
6-20.	Selected Biological Metrics and Physical Measures of the Escondido Creek Sub-Watershed.....	6-61
6-21.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for Escondido Creek Sub-Watershed.....	6-62
6-22.	Index of Biotic Integrity Scores for Escondido Creek Sites by SELC.....	6-66
6-23.	Watershed Assessment Data Set.....	6-67
6-24.	Wet Weather Constituent Exceedances in Escondido Creek.....	6-68
6-25.	Triad Decision Matrix Results for Escondido Creek.....	6-70
6-26.	Summary of the 2006 Dry Weather Monitoring Results in the Carlsbad WMA.....	6-73
6-27.	Carlsbad WMA 2006 Dry Weather Exceedance Matrix.....	6-74
6-28.	2001-2006 Water Quality Priority Ratings for the Carlsbad WMA.....	6-79
7-1.	Beneficial Uses Within the San Dieguito River Watershed.....	7-4
7-2.	Water Bodies on the SWRCB 303(d) List in the San Dieguito River Watershed.....	7-5
7-3.	2006-2007 Rainfall Statistics for the San Dieguito River Mass Loading Station.....	7-6
7-4.	Analytes Measured at the San Dieguito River Mass Loading Station.....	7-9
7-5.	Modeled Loading Values Compared to Measured Loading Values for San Dieguito River (SDC) Mass Loading Station.....	7-17
7-6.	Summary of the 2006 Dry Weather Monitoring Results in the San Dieguito WMA.....	7-18
7-7.	San Dieguito River WMA 2006 Dry Weather Exceedance Matrix.....	7-20
7-8.	Selected Biological Metrics and Physical Measures of the San Dieguito River Watershed Management Area.....	7-23
7-9.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for San Dieguito River Watershed Management Area.....	7-24
7-10.	Watershed Assessment Data Set.....	7-29
7-11.	Wet Weather Constituent Exceedances in the San Dieguito River WMA.....	7-30
7-12.	Triad Decision Matrix Results for the San Dieguito River WMA.....	7-32
7-13.	2001-2006 Water Quality Priority Ratings for the San Dieguito River WMA.....	7-33
8-1.	Beneficial Uses Within the Los Peñasquitos Watershed.....	8-4
8-2.	Water Bodies on the SWRCB 303(d) List in the Los Peñasquitos Watershed.....	8-4
8-3.	2006-2007 Rainfall Statistics for the Los Peñasquitos Creek Mass Loading Station.....	8-6
8-4.	Analytes Measured at the Los Peñasquitos Creek Mass Loading Station.....	8-8
8-5.	Modeled Loading Values Compared to Measured Loading Values for Los Peñasquitos Creek (PC) Mass Loading Station.....	8-16
8-6.	Summary of the 2006 Dry Weather Monitoring Results in the Los Peñasquitos Creek WMA.....	8-17
8-7.	Los Peñasquitos WMA 2006 Dry Weather Exceedance Matrix.....	8-19
8-8.	Selected Biological Metrics and Physical Measures of the Los Peñasquitos Watershed Management Area.....	8-22
8-9.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for Los Peñasquitos Watershed Management Area.....	8-23
8-10.	Watershed Assessment Data Set.....	8-28
8-11.	Wet Weather Constituent Exceedances in the Los Peñasquitos WMA.....	8-29
8-12.	Triad Decision Matrix Results for the Los Peñasquitos WMA.....	8-31
8-13.	Updated Water Quality Priority Ratings for the Los Peñasquitos WMA.....	8-32

9-1.	Beneficial Uses Within the Mission Bay Watershed (Rose and Tecolote Creeks).....	9-4
9-2.	Water Bodies on the SWRCB 303(d) List in the Mission Bay Watershed.	9-5
9-3.	2006-2007 Rainfall Statistics for the Mission Bay Mass Loading Station.	9-7
9-4.	Analytes Measured at the Tecolote Creek Mass Loading Station.....	9-10
9-5.	Pesticides and Pyrethroid Results Collected at the Tecolote Creek Mass Loading Station.	9-14
9-6.	Modeled Loading Values Compared to Measured Loading Values for Tecolote Creek (TC) Mass Loading Station.	9-21
9-7.	Summary of the 2006 Dry Weather Monitoring Results in the Mission Bay WMA.	9-24
9-8.	Mission Bay WMA 2006 Dry Weather Exceedance Matrix.	9-24
9-9.	Selected Biological Metrics and Physical Measures of the Mission Bay Watershed Management Area.	9-27
9-10.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for Mission Bay Watershed Management Area	9-28
9-11.	Watershed Assessment Data Set	9-33
9-12.	Wet Weather Constituent Exceedances in the Mission Bay WMA.	9-34
9-13.	Triad Decision Matrix Results for the Mission Bay WMA.	9-36
9-14.	Updated Water Quality Priority Ratings for the Mission Bay WMA.....	9-37
10-1.	Beneficial Uses Within the San Diego River Watershed.	10-4
10-2.	Water Bodies on the SWRCB 303(d) List in the San Diego River Watershed.....	10-5
10-3.	2006-2007 Rainfall Statistics for Monitored Storm Events for the San Diego River Mass Loading Station.....	10-7
10-4.	Analytes Measured at the San Diego River Mass Loading Station.....	10-9
10-5.	Modeled Loading Values Compared to Measured Loading Values for San Diego River (SDR) Mass Loading Station.	10-17
10-6.	Summary of the 2006 Dry Weather Monitoring Results in the San Diego River WMA.	10-18
10-7.	San Diego River WMA 2006 Dry Weather Exceedance Matrix.	10-20
10-8.	Selected Biological Metrics and Physical Measures of the San Diego River Watershed Management Area.	10-24
10-9.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for San Diego River Watershed Management Area	10-25
10-10.	Third Party Data, Index of Biotic Integrity Scores for San Diego River Monitoring Sites.....	10-30
10-11.	Watershed Data Assessment Set	10-34
10-12.	Wet Weather Constituent Exceedances in the San Diego River WMA.....	10-35
10-13.	Triad Decision Matrix Results for the San Diego River WMA.	10-37
10-14.	Updated Water Quality Priority Ratings for the San Diego River WMA	10-38
11-1.	Beneficial Uses Within the Pueblo San Diego Watershed.	11-6
11-2.	Beneficial Uses Within the Sweetwater Watershed.	11-7
11-3.	Beneficial Uses Within the Otay Watershed.....	11-8
11-4.	Water Bodies on the SWRCB 303(d) List in the Pueblo San Diego Watershed.....	11-9
11-5.	Water Bodies on the SWRCB 303(d) List in the Sweetwater Watershed.....	11-10
11-6.	Water Bodies on the SWRCB 303(d) List in the Otay Watershed.	11-10
11-7.	2006-2007 Rainfall Statistics for Monitored Storm Events for the Chollas Creek Mass Loading Station.....	11-12
11-8.	Analytes Measured at the Chollas Creek Mass Loading Station.	11-15
11-9.	Analytical Results for Synthetic Pyrethroids in Storm Water Samples in Chollas Creek During the 2006-2007 Wet Weather Season.	11-19

11-10. Modeled Loading Values Compared to Measured Loading Values for Chollas Creek (CC) Mass Loading Station.....	11-30
11-11. Summary of the 2006 Dry Weather Monitoring Results in the Pueblo San Diego Watershed.....	11-31
11-12. Pueblo San Diego 2006 Dry Weather Exceedance Matrix.....	11-32
11-13. Selected Biological Metrics and Physical Measures of the San Diego Bay Watershed Management Area.....	11-40
11-14. Macroinvertebrate Community Summary: Five Most Abundant Taxa for San Diego Bay WMA.....	11-40
11-15. Pueblo San Diego Watershed Assessment Data Set.....	11-43
11-16. Wet Weather Constituent Exceedances in the Chollas Sub-watershed.....	11-44
11-17. Summary of BLTEA, Dry Weather, Wet Weather COCs, and Assessment Changes for the Chollas Creek Watershed.....	11-47
11-18. Triad Decision Matrix Results for the Pueblo San Diego Watershed.....	11-50
11-19. Monitoring Program Data Gap Evaluation.....	11-50
11-20. List of Potential Likely and Unknown Heavy Metals Sources for the San Diego Bay WMA.....	11-52
11-21. List of Potential Likely and Unknown Sediment Sources for the San Diego Bay WMA.....	11-53
11-22. List of Potential Likely and Unknown Pesticide Sources for the San Diego Bay WMA.....	11-54
11-23. List of Potential Likely and Unknown Bacteria Sources for the San Diego Bay WMA.....	11-55
11-24. 2006-2007 Rainfall Statistics for Monitored Storm Events for the Sweetwater River Mass Loading Station.....	11-64
11-25. Analytes Measured at the Sweetwater River Mass Loading Station.....	11-66
11-26. Modeled Loading Values Compared to Measured Loading Values for Sweetwater River (SR) Mass Loading Station.....	11-73
11-27. Summary of the 2006 Dry Weather Monitoring Results in the Sweetwater Watershed.....	11-74
11-28. Sweetwater 2006 Dry Weather Exceedance Matrix.....	11-75
11-29. Selected Biological Metrics and Physical Measures of the San Diego Bay Watershed Management Area.....	11-80
11-30. Macroinvertebrate Community Summary: Five Most Abundant Taxa for San Diego Bay Watershed Management Area.....	11-81
11-31. Sweetwater River Watershed Assessment Data Set.....	11-86
11-32. Wet Weather Constituents of Concern in the Sweetwater Watershed.....	11-87
11-33. Summary of BLTEA, Dry Weather, Wet Weather COCs, and Assessment Changes for the Sweetwater River.....	11-90
11-34. Triad Decision Matrix Results for the Sweetwater Watershed.....	11-92
11-35. Summary of the 2006 Dry Weather Monitoring Results in the Otay Watershed.....	11-94
11-36. Otay Watershed 2006 Dry Weather Exceedance Matrix.....	11-95
11-37. Summary of the 2006 Dry Weather Monitoring Results in the San Diego Bay WMA.....	11-97
11-38. San Diego Bay 2006 Dry Weather Exceedance Matrix.....	11-98
11-39. 2001-2006 Water Quality Priority Ratings for the San Diego Bay WMA.....	11-101
11-40. Comparison of How Monitoring Programs Address the Core (SMC) Questions.....	11-102
12-1. Beneficial Uses Within the Tijuana River Watershed.....	12-4
12-2. Water Bodies on the SWRCB 303(d) List in the Tijuana River Watershed.....	12-5
12-3. 2006-2007 Rainfall Statistics for Monitored Storm Events for the Tijuana River Mass Loading Station.....	12-6
12-4. Analytes Measured at the Tijuana River Mass Loading Station.....	12-8
12-5. Modeled Loading Values Compared to Measured Loading Values for Tijuana River (TJR) Mass Loading Station.....	12-20
12-6. Summary of the 2006 Dry Weather Monitoring Results for the Tijuana River WMA.....	12-21
12-7. Tijuana River WMA 2006 Dry Weather Exceedance Matrix.....	12-23

12-8.	Selected Biological Metrics and Physical Measures of the Tijuana River WMA.	12-26
12-9.	Macroinvertebrate Community Summary: Five Most Abundant Taxa for the Tijuana River WMA.....	12-27
12-10.	Watershed Assessment Data Set	12-32
12-11.	Wet Weather Constituent Exceedances in the Tijuana River WMA.	12-33
12-12.	Triad Decision Matrix Results for the Tijuana River Watershed.....	12-36
12-13.	Updated Water Quality Priority Ratings for the Tijuana River WMA.....	12-37
13-1.	Results of Wet Weather Monitoring in 2006-2007.....	13-3
13-2.	Model Comparison Summary.	13-34
13-3.	Bioassessment Metrics Used to Characterize BMI Communities.	13-37
13-4.	Index of Biotic Integrity Scoring Ranges.....	13-42
13-5.	Dry Weather Exceedance Matrix (2006).....	13-50
13-6.	Constituent Exceedances by Land Use Category (2006 dry weather monitoring data).	13-51
13-7.	Constituent Exceedance Ranking by Land Use Category (2002 – 2006 dry weather monitoring data).....	13-52
13-8.	Constituent Exceedances by MS4 Conveyance Type (2006 dry weather monitoring data).	13-54
13-9.	5-Year Regional Watershed Water Quality Priority Ratings	13-67
14-1.	Mass Loading Station Persistent Wet Weather Constituents and Trends.	14-4
14-2.	Recommended Actions From the Triad Assessment.....	14-29

FIGURES

1-1.	Wet Weather Monitoring Stations for 1993 Through 2007.	1-21
2-1.	San Diego County Geology.....	2-1
2-2.	Hydrologic soil groups	2-3
2-3.	San Diego - Lindbergh Field Monthly Precipitation Summary 2006-2007 and Historical Mean (1948-1986).....	2-5
2-4.	San Diego - Lindbergh Field Storm Season Rainfall 1960 to 2006.	2-6
2-5.	San Diego Watershed Management Areas.....	2-8
2-6.	Major Ground Water Basins in San Diego County.	2-10
2-7.	San Diego Reservoirs.	2-11
2-8.	Watershed Areas of the San Diego Hydrologic Region.	2-13
2-9.	Land Ownership in San Diego Watersheds.	2-15
2-10.	Population Per Acre for Watersheds Entirely within the San Diego Region (Tijuana population not included).	2-18
2-11.	Population for Watershed Management Areas Entirely Within the San Diego Region.....	2-20
2-12.	Mass Loading Station Locations (runoff/capture area shown in blue).....	2-21
2-13.	Contributing Runoff Land Use Acreages by Mass Loading Station.	2-22
2-14.	Contributing Runoff Land Use Percentages by Mass Loading Station.	2-23
2-15.	San Diego County Daily Rainfall Totals During the 2006-2007 Wet Season.	2-25
2-16.	San Diego County Daily Rainfall Distribution During the 2006-2007 Wet Season.....	2-26
2-17.	San Diego County 2006-2007 Rainfall Amount and Distribution.	2-28
3-1.	Stream Bioassessment Sites Sampled October 2006 and May 2007.	3-17
3-2.	Water Quality Priority Rating Methodology.	3-32
3-3.	Interstorm Variation of EMCs.....	3-35
3-4.	NSWQ Land Use Concentrations.....	3-37
3-5.	National and Regional NSWQ Median EMCs.	3-38
3-6.	Spatial Data Use for the Loading Model Estimates.	3-40
4-1.	Santa Margarita River Watershed Management Area.	4-2
4-2.	Percent Land Use for Santa Margarita WMA.....	4-3
4-3.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen's Estimate of Slope.....	4-11
4-4.	Santa Margarita River Water Quality Ratios.....	4-12
4-5.	Santa Margarita River WMA Dry Weather Exceedance Map.	4-14
4-6.	Index of Biotic Integrity Scores for Santa Margarita River at Willow Glen Road (SMR-WGR).	4-19
4-7.	O/E Ratios for Santa Margarita River at Willow Glen Road (SMR-WGR).	4-19
4-8.	Index of Biotic Integrity for Santa Margarita River on Camp Pendleton (SMR-CP).....	4-21
4-9.	O/E Ratio for Santa Margarita River on Camp Pendleton (SMR-CP).....	4-21
4-10.	Index of Biotic Integrity for Santa Margarita River on Sandia Creek Reference Site (REF-SC2).....	4-23
4-11.	O/E Ratio for Santa Margarita River on Sandia Creek Reference Site (REF-SC2).	4-23
4-12.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in Santa Margarita River.	4-28
5-1.	San Luis Rey River Watershed Management Area.	5-2
5-2.	Percent Land Use for San Luis Rey WMA.....	5-3

5-3.	San Luis Rey River 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	5-7
5-4.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.....	5-13
5-5.	San Luis Rey River Water Quality Ratios.....	5-14
5-6.	San Luis Rey WMA Dry Weather Exceedance Map.....	5-18
5-7.	Index of Biotic Integrity for San Luis Rey River at Mission Road (SLRR-MR).....	5-25
5-8.	O/E Ratio for San Luis Rey River at Mission Road (SLRR-MR).....	5-25
5-9.	Index of Biotic Integrity for San Luis Rey River at Benet Road (SLRR-BR).....	5-27
5-10.	O/E Ratio for San Luis Rey River at Benet Road (SLRR-BR).....	5-27
5-11.	Index of Biotic Integrity for San Luis Rey River at Doane Creek Reference Site (REF-DC).....	5-29
5-12.	O/E Ratio for San Luis Rey River at Doane Creek Reference Site (REF-DC).....	5-29
5-13.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in San Luis Rey River.....	5-33
6-1.	Carlsbad Watershed Management Area.....	6-3
6-2.	Percent Land Use for Carlsbad WMA.....	6-4
6-3.	Percent Land Use for Agua Hedionda Creek Sub-Watershed.....	6-4
6-4.	Percent Land Use for Escondido Creek Sub-Watershed.....	6-4
6-5.	Agua Hedionda Creek 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	6-8
6-6.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.....	6-19
6-7.	Agua Hedionda Creek Water Quality Ratios.....	6-20
6-8.	Agua Hedionda Creek Dry Weather Exceedance Map.....	6-25
6-9.	Index of Biotic Integrity for Agua Hedionda at Melrose Drive (AHC-MR).....	6-30
6-10.	O/E Ratio for Agua Hedionda at Melrose Drive (AHC-MR).....	6-30
6-11.	Index of Biotic Integrity for Agua Hedionda at El Camino Real (AHC-ECR).....	6-32
6-12.	O/E Ratio for Agua Hedionda at El Camino Real (AHC-ECR).....	6-33
6-13.	Index of Biotic Integrity for Buena Vista Creek at College Blvd. (BVR-CB).....	6-34
6-14.	O/E Ratio for Buena Vista Creek at College Blvd. (BVR-CB).....	6-35
6-15.	Stacked Bar Chart of the Number of Wet Weather Detections Above Benchmark WQOs of Constituent Groups in Agua Hedionda Creek.....	6-39
6-16.	Escondido Creek 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	6-43
6-17.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.....	6-49
6-18.	Escondido Creek Water Quality Ratios.....	6-50
6-19.	Escondido Creek Dry Weather Exceedance Map.....	6-55
6-20.	Escondido Creek Third Party Monitoring Sites.....	6-57
6-21.	Index of Biotic Integrity for Escondido Creek at Harmony Grove Bridge (ESC-HRB).....	6-63
6-22.	O/E Ratio for Escondido Creek at Harmony Grove Bridge (ESC-HRB).....	6-63
6-23.	Index of Biotic Integrity for Escondido Creek in Elfin Forest (ESC-EF).....	6-65
6-24.	O/E Ratio for Escondido Creek in Elfin Forest (ESC-EF).....	6-66
6-25.	Stacked Bar Chart of the Number of Wet Weather Detections Above Benchmark WQOs of Constituent Groups in Escondido Creek.....	6-70
6-26.	Carlsbad WMA Dry Weather Exceedance Map.....	6-75

7-1.	San Dieguito River Watershed Management Area.....	7-2
7-2.	Percent Land Use for San Dieguito River WMA.....	7-3
7-3.	San Dieguito River 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	7-7
7-4.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.....	7-14
7-5.	San Dieguito River Water Quality Ratios.	7-15
7-6.	San Dieguito River WMA Dry Weather Exceedance Map.....	7-19
7-7.	Index of Biotic Integrity for Green Valley Creek at West Bernardo (GVC-WB).	7-25
7-8.	O/E Ratio for Green Valley Creek at West Bernardo (GVC-WB).	7-25
7-9.	Index of Biotic Integrity for San Dieguito River on Del Dios Highway (SD-DDH).....	7-27
7-10.	O/E Ratio for San Dieguito River on Del Dios Highway (SD-DDH).....	7-28
7-11.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in San Dieguito River.....	7-31
8-1.	Los Peñasquitos Watershed Management Area.....	8-2
8-2.	Percent Land Use for Los Peñasquitos Creek WMA.....	8-3
8-3.	Los Peñasquitos River 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	8-6
8-4.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.....	8-12
8-5.	Los Peñasquitos Creek Water Quality Ratios.	8-14
8-6.	Los Peñasquitos Creek WMA Dry Weather Exceedance Map.....	8-18
8-7.	Index of Biotic Integrity for Los Peñasquitos Creek at Cobblestone Creek Road (LPC-CCR).	8-24
8-8.	O/E Ratio for Los Peñasquitos Creek at Cobblestone Creek Road (LPC-CCR).....	8-24
8-9.	Index of Biotic Integrity for Carroll Canyon Creek and Los Peñasquitos Creek at Highway 805 (CCC & LPC-805).....	8-27
8-10.	O/E Ratio for Carroll Canyon Creek and Los Peñasquitos Creek at Highway 805 (CCC & LPC-805).	8-27
8-11.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in Los Peñasquitos Creek.....	8-30
9-1.	Mission Bay Watershed Management Area.	9-2
9-2.	Percent Land Use for Mission Bay WMA.....	9-3
9-3.	Mission Bay 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	9-8
9-4.	Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.....	9-17
9-5.	Mission Bay Water Quality Ratios.	9-19
9-6.	Mission Bay WMA Dry Weather Exceedance Map.....	9-23
9-7.	Index of Biotic Integrity for Rose Creek Near Highway 52 (MB-RC).	9-29
9-8.	O/E Ratio for Rose Creek Near Highway 52 (MB-RC).	9-29
9-9.	Index of Biotic Integrity for Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP).....	9-31
9-10.	O/E Ratio Tecolote Creek in Tecolote Canyon Natural Park (TC-TCNP).	9-32
9-11.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in Mission Bay WMA.	9-36

10-1.	San Diego River Watershed Management Area.....	10-2
10-2.	Percent Land Use for San Diego River WMA.....	10-3
10-3.	San Diego River 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	10-7
10-4.	Scatterplots of Constituents With Significant Mann-Kendall Trends and Sen's Estimate of Slope.....	10-14
10-5.	San Diego River Water Quality Ratios.	10-15
10-6.	San Diego River WMA Dry Weather Exceedance Map.....	10-19
10-7.	Index of Biotic Integrity for San Diego River in Mission Trails Regional Park (SDR-MT).	10-26
10-8.	O/E Ratio for San Diego River in Mission Trails Regional Park (SDR-MT).	10-27
10-9.	Index of Biotic Integrity for San Diego River at Morena Blvd. (SDR-I).	10-29
10-10.	O/E Ratio for San Diego River at Morena Blvd. (SDR-I).	10-29
10-11.	Index of Biotic Integrity for San Diego River at Boulder Creek Reference Site (REF-BCR).....	10-32
10-12.	O/E Ratio for San Diego River at Boulder Creek Reference Site (REF-BCR).....	10-32
10-13.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in San Diego River.....	10-37
11-1.	San Diego Bay Watershed Management Area.....	11-3
11-2.	Percent Land Use for San Diego Bay WMA.....	11-4
11-3.	Percent Land Use for Pueblo San Diego Watershed.....	11-4
11-4.	Percent Land Use for Sweetwater Watershed.....	11-5
11-5.	Percent Land Use for Otay Watershed.....	11-5
11-6.	Chollas Creek 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	11-13
11-7.	Diazinon Concentrations at the Chollas Creek MLS and Pertinent EPA Restriction Dates.....	11-21
11-8.	Scatterplots of Conventional Constituents with Significant Mann-Kendall Trends and Sen's Estimate of Slope at the Chollas Creek MLS.....	11-24
11-9.	Scatterplots of Pesticide Constituents with Significant Mann-Kendall Trends and Sen's Estimate of Slope at the Chollas Creek MLS.....	11-25
11-10.	Scatterplots of Metals Constituents with Significant Mann-Kendall Trends and Sen's Estimate of Slope at the Chollas Creek MLS.....	11-25
11-11.	Scatterplots of Toxicity Constituents with Significant Mann-Kendall Trends and Sen's Estimate of Slope at the Chollas Creek MLS.....	11-26
11-12.	Chollas Creek Water Quality Ratios.....	11-27
11-13.	Chollas Creek Dissolved Metals Water Quality Ratios.....	11-28
11-14.	Chollas Creek Dry Weather Exceedance Map.....	11-33
11-15.	Pueblo San Diego Watershed Likely Potential Sources Based on the Baseline Long-Term Effectiveness Assessment Existing Inventories List.....	11-34
11-16.	Index of Biotic Integrity for Chollas Creek at Federal Blvd. (CC-FB).	11-42
11-17.	O/E Ratio for Chollas Creek at Federal Blvd. (CC-FB).	11-42
11-18.	Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in Chollas Creek.....	11-49
11-19.	Pueblo San Diego Watershed Likely Potential Sources Based on the Baseline Long-Term Effectiveness Assessment Existing Inventories List.....	11-51
11-20.	Historical Dry Weather Total Coliform Results.....	11-56
11-21.	Historical Dry Weather Fecal Coliform Results.....	11-57
11-22.	Historical Dry Weather Enterococcus Results.....	11-58
11-23.	Historical Wet Weather Diazinon Results.	11-59
11-24.	Chollas Creek Metals Pollutant Loading Analysis.....	11-60

11-25. Sweetwater 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	11-64
11-26. Scatterplots of Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope at the Sweetwater River MLS.....	11-70
11-27. Sweetwater River Water Quality Ratios.	11-71
11-28. Sweetwater River Area Dry Weather Exceedance Map.	11-76
11-29. Index of Biotic Integrity for Sweetwater River at Highway 94 (SR-94).	11-82
11-30. O/E Ratio for Sweetwater River at Highway 94 (SR-94).	11-82
11-31. Index of Biotic Integrity for Sweetwater River Along Bonita Road (SR-WS).	11-84
11-32. O/E Ratio for Sweetwater River Along Bonita Road (SR-WS).	11-84
11-33. Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in Sweetwater Watershed.	11-91
11-34. Otay River Area Dry Weather Exceedance Map.	11-96
11-35. San Diego Bay WMA Dry Weather Exceedance Map.	11-99
12-1. Tijuana River Watershed Management Area.	12-2
12-2. Percent Land Use for Tijuana River WMA.....	12-3
12-3. Tijuana River 2006-2007 Wet Weather Monitoring Period Flow Record and Monitored Storm Events.....	12-6
12-4. Scatterplots of Conventional Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.	12-14
12-5. Scatterplots of Bacteriological Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.	12-14
12-6. Scatterplots of Pesticide Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.	12-15
12-7. Scatterplots of Metals Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.	12-16
12-8. Scatterplots of Toxicity Constituents with Significant Mann-Kendall Trends and Sen’s Estimate of Slope.	12-17
12-9. Tijuana River Water Quality Ratios.	12-18
12-10. Tijuana River WMA Dry Weather Exceedance Map.....	12-22
12-11. Index of Biotic Integrity for Campo Creek in Campo (CC-C).	12-28
12-12. O/E Ratio for Campo Creek in Campo (CC-C).	12-28
12-13. Index of Biotic Integrity for Tijuana River at the Border Fence (TJ-BF) and Dairy Mart Road (TJ-DM).....	12-30
12-14. O/E Ratio for Tijuana River at the Border Fence (TJ-BF) and Dairy Mart Road (TJ-DM)	12-31
12-15. Stacked Bar Chart of the Number of Wet Weather Exceedances of Constituent Groups in the Tijuana River.	12-35
13-1. Regional Comparison of Mean Annual Concentration to Benchmark WQO Ratio – Conventionals – Total Suspended Solids and Total Dissolved Solids.	13-8
13-2. Regional Significant Trends – Conventionals – Turbidity, Total Suspended Solids, and Total Dissolved Solids.	13-10
13-3. Regional Comparison of Mean Annual Concentration to Benchmark WQO Ratio – Nitrate, Ammonia, and Total Phosphorus.	13-12
13-4. Regional Comparison of Significant Trends – Nutrients – Nitrate, Dissolved and Total Phosphorus.	13-13
13-5. Regional Comparison of Mean Annual Concentration to Benchmark WQO Ratio – Pesticides – Diazinon and Chlorpyrifos.	13-15

13-6.	Regional Comparison of Significant Trends – Pesticides – Diazinon.	13-16
13-7.	Regional Comparison of Mean Annual Concentration to Benchmark WQO Ratio – Metals – Copper and Zinc.	13-18
13-8.	Regional Comparison of Significant Trends – Metals – Dissolved Arsenic, Total Copper, Total Lead, Total Nickel, and Total Zinc.	13-21
13-9.	Regional Comparison of Mean Annual Concentration to Benchmark WQO Ratio – Toxicity – Ceriodaphnia dubia Survival and Reproduction – Hyalella azteca Survival.	13-23
13-10.	Regional Significant Trends – Toxicity – Hyalella azteca Survival.	13-24
13-11.	Regional Comparison of Mean Annual Concentration to Benchmark WQO Ratio – Bacteria – Fecal Coliform.	13-25
13-12.	Regional Significant Trends – Bacteria – Enterococcus, Fecal, and Total Coliform.	13-27
13-13.	Results of Cluster Analysis for Wet Weather Data.	13-30
13-14.	National Storm Water Quality Land Use Concentrations.	13-31
13-15.	National and Regional National Storm Water Quality Median EMCs.	13-32
13-16.	Index of Biotic Integrity Scores for San Diego County Bioassessment Sites. October 2006.	13-43
13-17.	O/E Analysis for October 2006.	13-44
13-18.	Index of Biotic Integrity Scores for San Diego County Bioassessment Sites. May 2007.	13-45
13-19.	O/E Analysis for May 2007.	13-46
13-20.	San Diego County Average Index of Biotic Integrity Scores.	13-47
13-21.	Monitoring Sites With Analytes Above the Action Level by Conveyance Type.	13-55

VOLUME II

APPENDICES

- A Hydrographs
- B Stream Bioassessment Data
- C Scatterplots and Trend Data
- D Dry Weather Data Land Use and MS4 Type by Watershed
- E Attachment A - Coastal Storm Drain Monitoring
- F Attachment B - Toxic Hot Spots Monitoring
- G Watershed Water Quality Priority Rating Tables
- H Third Party Data
- I Toxicity Identification Evaluation Report for Chollas Creek
- J Response to Comments for Draft 2006-2007 Urban Runoff Monitoring Report
- K California Toxics Rule - Hardness Based Water Quality Objectives