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(4/1/14) Board Meeting
Final Draft IGP
Deadline: 3/4/14 by 12:00 noon

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SWRCB Clerk

March 4, 2014

Jeanine Townsend, Clerk to the Board
State Water Resources Control Board
1001 I Street, 24th Floor
Sacramento, CA 95814
Fax: (916) 341-5620
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Re: Comment Letter – April 1, 2014 Board Meeting: Final Draft Industrial General Permit

Dear State Water Resources Control Board,

Please accept these additional comments on the latest draft of the General Industrial Storm Water Permit on behalf of the California Sportfishing Protection Alliance and the California Water Impact Network (hereinafter "CSPA"). CSPA already has submitted substantive comments on the various drafts of the Permit and hereby incorporates those comments by reference. These additional comments focus on two overarching issues that continue to undermine the effectiveness of the new Permit.

24.1 First, CSPA appreciates the addition of the requisite reference to the CWA's BAT and BCT standards to Section V.A. of the Permit. However, in addition to adding that critical language, staff also has added at least one term – "practicability" – that is, on its face, plainly inconsistent with both the BAT and the BCT standard. Section V.A now reads:

> Dischargers shall implement BMPs that comply with the BAT/BCT requirements of this General Permit to reduce or prevent discharges of pollutants in their storm water discharge in a manner that reflects best industry practice considering technological availability and economic practicability and achievability.

The State Board has no authority to redefine the terms BAT and BCT contrary to the definitions established by the Clean Water Act. *See* CSPA, et al., April 29, 2011 Comments on Draft General Permit. "Practicability" is not an authorized criterion for establishing a BAT-based effluent limitation. *See* 33 U.S.C. § 1314(b)(2)(B); 40 C.F.R. § 153.2(c)(3). Nor is it an authorized criterion for BCT-based effluent limitations. *See* 33 U.S.C. § 1314. *See also* 40 C.F.R. § 153.2(c)(2). In order to be consistent with the Clean Water Act's definitions of BAT and BCT, the State Board must delete the term "practicability" from Section V.A.

24.2 Second, the NALs for hardness-dependent metals included in the Permit are based on an extremely high hardness number – 400 mg/L. Permit, Table 2 ("The NAL is the highest value used by U.S. EPA based on their hardness table in the 2008 MSGP") As a result, the NALs for zinc, copper, nickel, lead, cadmium, and silver are much higher than the benchmark values adopted by EPA in its nationwide permit and those inflated numbers are not protective of water quality for almost every waterbody in California. A hardness of 400 mg/L rarely occurs in the State's ambient waters, especially during wet weather in those areas where most industrial discharges are occurring, *i.e.* urban and suburban areas. Indeed, for most major waterbodies, such a high hardness value has and will never occur. A brief review of monitoring data compiled or collected for the Sacramento River, San Joaquin River, the Delta, Russian River, Los Angeles River, and San Gabriel River demonstrates that hardness of 400 mg/L never occurs in those rivers during wet weather. *See* accompanying data excerpts; *See* *http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/77_New/010510%20LA%20River%20Metals%20Reconsideration_Staff%20Report.pdf* (Los Angeles River hardness around 80 mg/L); *http://www.waterboards.ca.gov/losangeles/board_decisions/basin_plan_amendments/technical_documents/98_New/FINALBallonaMetalsandToxicsReopenerStaffReport21Nov13.pdf* (recommended hardness for Ballona Creek is 82 mg/L); http://www.swrcb.ca.gov/centralvalley/water_issues/irrigated_lands/monitoring_plans_reports_reviews/monitoring_report_reviews/coalitions/sanjoaquin_county_delta_waterquality/sjcdwqc_2013mar_amr.pdf (March 1, 2013 San Joaquin County & Delta Water Quality Coalition hardness data for various creeks in and around Delta well below 100 mg/L); Sacramento WWTP, Receiving Water Data from CWIQS, Sacramento River, Dec. 12, 2013, hardness equals 68 mg/L); Healdsberg WWTP, Receiving Water Data from CWIQS, Russian River, Dec. 3, 2013, hardness equals 132 mg/L; Healdsburg WWTP, Receiving Water Data from CWIQS, Russian River, Apr. 17, 2013, hardness equals 134 mg/L. And for those discharges going to saline waters, such as San Francisco Bay, the metals standards are not hardness dependent. Hence, the State Board does not have any evidentiary justification for assuming that all receiving waters throughout the State have a hardness of 400 mg/L or that NALs based on such an unnaturally high hardness value either will protect beneficial uses, meet applicable water quality standards, or be reflective of BAT/BCT. CSPA requests that the State Board recalculate the NALs to reflect a range of hardness values that would be reflective of the waterbodies into which industrial storm water discharges are occurring.

CSPA and C-WIN look forward to the April 1, 2014 hearing and discussing these recommended changes to the final draft permit, as well as other concerns that remain from our previous comments.

Sincerely,

/s/ *Michael Lozeau*

Lozeau Drury LLP
On behalf of CSPA and C-WIN

ESMR At-A-Glance Report

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General Information

Agency	Facility	Reporting Period	Due Date	Date Received	Certified By
Sonoma Cnty Water Agency (SCWA) R1	SCWA Russian River CSD	04/01/2013 to 04/30/2013	06/01/2013	05/30/2013	Brian Anderson

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Monitoring Locations

Name	Type	Lat/Long	Associated Discharge Point	Receiving Water	Description(+)
EFF-001	Effluent Monitoring	None	Russian River CSD Discharge Point 001	N/A	Treated wastewater after disinfection (and dechlorination) but prior to storage
EFF-002	Effluent Monitoring	None	Russian River CSD Discharge Location 002	N/A	Location following storage where representative samples of treated disinfected e
GW-001	Groundwater Monitoring	None	None	N/A	A minimum of three groundwater monitoring wells shall be established as require
GW-002	Groundwater Monitoring	None	None	N/A	A minimum of three groundwater monitoring wells shall be established as require
GW-003	Groundwater Monitoring	None	None	N/A	A minimum of three groundwater monitoring wells shall be established as require
INF-001	Influent Monitoring	None	None	N/A	Untreated influent wastewater collected at the tplant headworks, at a representa
INT-001	Internal process monitoring for ELGs	None	None	N/A	Location for monitoring filtration rate through AWT filters
INT-002	Internal process monitoring for ELGs	None	None	N/A	Treated wastewater immediately following the AWT process for monitoring AWT turb
LND-001	Effluent Monitoring	None	Russian River CSD Discharge Point 003	N/A	Location where representative samples of treated wastewater, to be used for irri
REC-001	Effluent Monitoring	None	Russian River CSD Discharge Point 004	N/A	Location where representative samples of treated wastewater, to be reclaimed at
RSW-001	Receiving Water Monitoring	None	None	Russian River	During the discharge season (October 1 through May 14) upstream receiving water
RWS-002	Receiving Water Monitoring	None	None	Russian River	During the discharge season (October 1 through May 14) downstream receiving wate

Total Monitoring Locations: 12

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No Discharge Dates

Discharge Point Name	Description(+)	Dates of No Discharge	Comments
Russian River CSD Discharge Location 002	Discharge to the Russian River. This sample is collected from a sampling tap th		None
Russian River CSD Discharge Point 001	Discharge of fully treated, disinfected effluent to effluent storage pond		None
Russian River CSD Discharge Point 003	Discharge of treated, disinfected effluent for irrigation on the Burch Property	04/01/2013 - 04/30/2013	There was no irrigation on the Burch Property during the month of April.
Russian River CSD Discharge Point 004	Discharge of treated, disinfected effluent to the Northwood Golf Course	04/01/2013 - 04/09/2013	There was no irrigation on the Northwood Golf Course on Apr 1 thru Apr 9.

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Data Summary-Analytical

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	MDL	ML	RL	Comments
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/03/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/10/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/17/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/24/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/01/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/02/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/03/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/04/2013	None	None	None	None

EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/05/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/06/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/07/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/08/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/09/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/10/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/11/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/12/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/13/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/14/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/15/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/16/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/17/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/18/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/19/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/20/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/21/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/22/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/23/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/24/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/25/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/26/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/27/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/28/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/29/2013	None	None	None	None
EFF-001	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/30/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/01/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/02/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/03/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/04/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/05/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/06/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/07/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/08/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/09/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/10/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/11/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/12/2013	None	None	None	None
EFF-001	Total Coliform		<	2	MPN/100 mL	04/13/2013	None	None	None	None

		Data Unavailable								
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/14/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/15/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/16/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/17/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/18/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/19/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/20/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/21/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/22/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/23/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/24/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/25/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/26/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/27/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/28/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/29/2013	None	None	None	None
EFF-001	Total Coliform	Data Unavailable	<	2	MPN/100 mL	04/30/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	=	2.3	mg/L	04/03/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	=	1.1	mg/L	04/10/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	=	1.4	mg/L	04/17/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	=	1.4	mg/L	04/24/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/01/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.3	SU	04/02/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.5	SU	04/03/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.5	SU	04/04/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.5	SU	04/05/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.2	SU	04/06/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.5	SU	04/07/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/08/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/09/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.2	SU	04/10/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.2	SU	04/11/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.4	SU	04/12/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.3	SU	04/13/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.2	SU	04/14/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/15/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/16/2013	None	None	None	None
EFF-001	pH		=	7.6	SU	04/17/2013	None	None	None	None

		Data Unavailable								
EFF-001	pH	Data Unavailable	=	7.2	SU	04/18/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.3	SU	04/19/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.3	SU	04/20/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.2	SU	04/21/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.2	SU	04/22/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.1	SU	04/23/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.4	SU	04/24/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/25/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/26/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/27/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/28/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/29/2013	None	None	None	None
EFF-001	pH	Data Unavailable	=	7.6	SU	04/30/2013	None	None	None	None
EFF-002	1,1,1-Trichloroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.091	None	.5	CTR 41 - Volatile Organics
EFF-002	1,1,2,2-Tetrachloroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.086	None	.5	CTR 37 - Volatile Organics
EFF-002	1,1,2-Trichloro-1,2,2-Trifluoroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.4	None	.5	None
EFF-002	1,1,2-Trichloroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.13	None	.5	CTR 42 - Volatile Organics
EFF-002	1,1-Dichloroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.072	None	.5	CTR 28 - Volatile Organics
EFF-002	1,1-Dichloroethylene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.14	None	.5	CTR 30 - Volatile Organics
EFF-002	1,2,4-Trichlorobenzene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.59	None	5	CTR 101 - Base / Neutral Extractables
EFF-002	1,2-Dibromo-3-Chloropropane	EDB, DBCP & 123TCP In Water by Microextraction & Gas Chromo.	ND		ug/L	04/30/2013	.004	None	.01	None
EFF-002	1,2-Dibromoethane	EDB, DBCP & 123TCP In Water by Microextraction & Gas Chromo.	ND		ug/L	04/30/2013	.005	None	.02	None
EFF-002	1,2-Dichlorobenzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.099	None	.5	CTR 75 - Base / Neutral Extractables
EFF-002	1,2-Dichloroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.17	None	.5	CTR 29 - Volatile Organics
EFF-002	1,2-Dichloropropane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.12	None	.5	CTR 31 - Volatile Organics
EFF-002	1,2-Diphenylhydrazine		ND		ug/L	04/10/2013	.33	None	1	

		Extractable Priority Pollutants								CTR 85 - Base / Neutral Extractables
EFF-002	1,3-Dichlorobenzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.069	None	.5	CTR 76 - Base / Neutral Extractables
EFF-002	1,3-Dichloropropylenes, Sum	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.132	None	.5	CTR 32 - Volatile Organics
EFF-002	1,4-Dichlorobenzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.11	None	.5	CTR 77 - Base / Neutral Extractables
EFF-002	2,3,7,8-TCDD (Dioxin)	Tetra-through Octa-Chlorinated Dioxins and Furans by HRGC/HRMS	ND		pg/L	04/10/2013	.155	None	5	CTR 16 - Miscellaneous
EFF-002	2,4,5-TP (Silvex)	Data Unavailable	ND		ug/L	04/10/2013	.5	None	.5	E515.1
EFF-002	2,4,6-Trichlorophenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.74	None	10	CTR 55 - Acid Extractables
EFF-002	2,4-D	Data Unavailable	ND		ug/L	04/10/2013	.8	None	1	E515.1
EFF-002	2,4-Dichlorophenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.66	None	5	CTR 46 - Acid Extractables
EFF-002	2,4-Dimethylphenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	1.2	None	2	CTR 47 - Acid Extractables
EFF-002	2,4-Dinitrophenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	1.3	None	5	CTR 49 - Acid Extractables
EFF-002	2,4-Dinitrotoluene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.68	None	5	CTR 82 - Base / Neutral Extractables
EFF-002	2,6-Dinitrotoluene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.54	None	5	CTR 83 - Base / Neutral Extractables
EFF-002	2-Chloroethylvinyl Ether	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.93	None	1	CTR 25 - Volatile Organics
EFF-002	2-Chloronaphthalene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.57	None	10	CTR 71 - Base / Neutral Extractables
EFF-002	2-Chlorophenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.66	None	5	CTR 45 - Acid Extractables
EFF-002	2-Nitrophenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.9	None	10	CTR 50 - Acid Extractables
EFF-002	3,3-Dichlorobenzidine	Extractable Priority Pollutants	ND		ug/L	04/10/2013	2	None	5	CTR 78 - Base / Neutral Extractables
EFF-002	4,4-DDD	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.02	None	.02	CTR 110 - Pesticides & PCBs
EFF-002	4,4-DDE	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.004	None	.02	CTR 109 - Pesticides & PCBs
EFF-002	4,4-DDT	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.003	None	.01	CTR 108 - Pesticides & PCBs
EFF-002	4,6-Dinitro-2-methylphenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.75	None	5	CTR 48 - Acid Extractables
EFF-002	4-Bromophenyl Phenyl Ether	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.43	None	5	CTR 69 - Base / Neutral Extractables
EFF-002	4-Chloro-3-methylphenol	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.58	None	1	CTR 52 - Acid Extractables
EFF-002	4-Chlorophenyl Phenyl Ether	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.93	None	5	CTR 72 - Base / Neutral Extractables

EFF-002	4-Nitrophenol	Data Unavailable	ND		ug/L	04/10/2013	.7	None	1	CTR 51 - Acid Extractables E515.1
EFF-002	Acenaphthene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.57	None	1	CTR 56 - Base / Neutral Extractables
EFF-002	Acenaphthylene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.48	None	10	CTR 57 - Base / Neutral Extractables
EFF-002	Acrolein	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.62	None	2	CTR 17 - Volatile Organics
EFF-002	Acrylonitrile	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.19	None	2	CTR 18 - Volatile Organics
EFF-002	Acute Toxicity	Data Unavailable	=	100	% survival	04/03/2013	None	None	None	Rainbow Trout
EFF-002	Alachlor	Nitrogen- & Phosphorus-Containing Pest. in Water by GC	ND		ug/L	04/10/2013	.5	None	.5	None
EFF-002	Aldrin	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.002	None	.005	CTR 102 - Pesticides & PCBs
EFF-002	Aluminum, Total	Inductively Coupled Plasma Emission	ND		ug/L	04/10/2013	20	None	50	None
EFF-002	Ammonia, Total (as N)	Data Unavailable	<	0.2	mg/L	04/03/2013	None	None	None	None
EFF-002	Ammonia, Total (as N)	Data Unavailable	=	0.26	mg/L	04/10/2013	None	None	None	None
EFF-002	Ammonia, Total (as N)	Data Unavailable	=	0.25	mg/L	04/17/2013	None	None	None	None
EFF-002	Ammonia, Total (as N)	Data Unavailable	=	0.28	mg/L	04/23/2013	None	None	None	None
EFF-002	Ammonia, Unionized (as N)	Data Unavailable	<	0.2	mg/L	04/03/2013	None	None	None	None
EFF-002	Ammonia, Unionized (as N)	Data Unavailable	<	0.2	mg/L	04/10/2013	None	None	None	None
EFF-002	Ammonia, Unionized (as N)	Data Unavailable	<	0.2	mg/L	04/17/2013	None	None	None	None
EFF-002	Ammonia, Unionized (as N)	Data Unavailable	<	0.2	mg/L	04/23/2013	None	None	None	None
EFF-002	Anthracene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.39	None	10	CTR 58 - Base / Neutral Extractables
EFF-002	Antimony, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	0.31	ug/L	04/10/2013	.02	None	.5	CTR 01 - Metals
EFF-002	Arsenic, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	0.44	ug/L	04/10/2013	.07	None	.5	CTR 02 - Metals
EFF-002	Asbestos	Determination of Asbestos Structures (>10um) in Drinking Water	ND		Fibers/L	04/10/2013	.2	None	.2	CTR 15 - Units are MFL
EFF-002	Atrazine	Nitrogen- & Phosphorus-Containing Pest. in Water by GC	ND		ug/L	04/10/2013	.3	None	.5	None
EFF-002	Barium, Total	Inductively Coupled Plasma Emission	=	47	ug/L	04/10/2013	.5	None	100	None
EFF-002	Bentazon	Data Unavailable	ND		ug/L	04/10/2013	.4	None	.4	E515.1
EFF-002	Benzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.1	None	.3	CTR 19 - Volatile Organics
EFF-002	Benzidine	Extractable Priority Pollutants	ND		ug/L	04/10/2013	3.4	None	5	CTR 59 - Base / Neutral Extractables
EFF-002	Benzo(a)anthracene		ND		ug/L	04/10/2013	.39	None	5	

		Extractable Priority Pollutants								CTR 60 - Base / Neutral Extractables
EFF-002	Benzo(a)pyrene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.5	None	10	CTR 61 - Base / Neutral Extractables
EFF-002	Benzo(b)fluoranthene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.64	None	10	CTR 62 - Base / Neutral Extractables
EFF-002	Benzo(ghi)perylene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.93	None	5	CTR 63 - Base / Neutral Extractables
EFF-002	Benzo(k)fluoranthene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.34	None	10	CTR 64 - Base / Neutral Extractables
EFF-002	Beryllium, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	ND		ug/L	04/10/2013	.02	None	.1	CTR 03 - Metals
EFF-002	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/03/2013	None	None	None	None
EFF-002	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/10/2013	None	None	None	None
EFF-002	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/17/2013	None	None	None	None
EFF-002	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/24/2013	None	None	None	None
EFF-002	Bis (2-Chloroethoxy) Methane	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.81	None	5	CTR 65 - Base / Neutral Extractables
EFF-002	Bis (2-Chloroethyl) Ether	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.14	None	1	CTR 66 - Base / Neutral Extractables
EFF-002	Bis (2-Chloroisopropyl) Ether	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.41	None	2	CTR 67 - Base / Neutral Extractables
EFF-002	Bis (2-Ethylhexyl) Phthalate	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.83	None	5	CTR 68 - Base / Neutral Extractables
EFF-002	Bromoform	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.093	None	.5	CTR 20 - Volatile Organics
EFF-002	Bromomethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.077	None	.5	CTR 34 - Volatile Organics
EFF-002	Butylbenzyl Phthalate	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.64	None	10	CTR 70 - Base / Neutral Extractables
EFF-002	Cadmium, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	ND		ug/L	04/10/2013	.02	None	.1	CTR 04 - Metals
EFF-002	Carbofuran	Data Unavailable	ND		ug/L	04/10/2013	2	None	5	E531.1
EFF-002	Carbon Tetrachloride	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.11	None	.5	CTR 21 - Volatile Organics
EFF-002	Chlordane	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.04	None	.05	CTR 107 - Pesticides & PCBs
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/01/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/02/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/03/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/04/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/05/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/06/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/07/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/08/2013	None	None	None	None

EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/09/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/10/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/11/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/12/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/13/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/14/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/15/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/16/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/17/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/18/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/19/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/20/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/21/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/22/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/23/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/24/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/25/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/26/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/27/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/28/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/29/2013	None	None	None	None
EFF-002	Chlorine, Total Residual	Data Unavailable	<	0.1	mg/L	04/30/2013	None	None	None	None
EFF-002	Chlorobenzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.083	None	.5	None
EFF-002	Chlorobenzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.083	None	.5	CTR 22 - Volatile Organics
EFF-002	Chloroethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.13	None	.5	CTR 24 - Volatile Organics
EFF-002	Chloroform	Data Unavailable	ND		ug/L	04/03/2013	.11	None	.5	None
EFF-002	Chloroform	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.11	None	.5	CTR 26 - Volatile Organics
EFF-002	Chloromethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.097	None	.5	CTR 35 - Volatile Organics
EFF-002	Chromium (III)	Inductively Coupled Plasma/Mass Spectroscopy	=	0.25	ug/L	04/10/2013	.08	None	.5	CTR 05a - Metals
EFF-002	Chromium (VI)	Data Unavailable	ND		ug/L	04/10/2013	5	None	10	CTR 05b - Metals SM3500-Cr B]
EFF-002	Chrysene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.76	None	10	CTR 73 - Base / Neutral Extractables
EFF-002	Copper, Total	Data Unavailable	=	11	ug/L	04/03/2013	1	None	2	None

EFF-002	Copper, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	9.8	ug/L	04/10/2013	.04	None	.5	CTR 06 - Metals
EFF-002	Cyanide, Total (as CN)	Data Unavailable	=	2	ug/L	04/10/2013	2	None	3	CTR 14 - Misc [10-204-00-1X]
EFF-002	Dalapon	Data Unavailable	ND		ug/L	04/10/2013	6	None	6	E515.1
EFF-002	Di-n-butyl Phthalate	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.91	None	10	CTR 81 - Base / Neutral Extractables
EFF-002	Di-n-octyl Phthalate	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.65	None	10	CTR 84 - Base / Neutral Extractables
EFF-002	Dibenzo(a,h)anthracene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.83	None	10	CTR 74 - Base / Neutral Extractables
EFF-002	Dibromochloromethane	Data Unavailable	ND		ug/L	04/03/2013	.08	None	.5	None
EFF-002	Dibromochloromethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.075	None	.5	CTR 23 - Volatile Organics
EFF-002	Dichlorobromomethane	Data Unavailable	ND		ug/L	04/03/2013	.1	None	.5	None
EFF-002	Dichlorobromomethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.095	None	.5	CTR 27 - Volatile Organics
EFF-002	Dieldrin	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.005	None	.01	CTR 111 - Pesticides & PCBs
EFF-002	Diethyl Phthalate	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.86	None	2	CTR 79 - Base / Neutral Extractables
EFF-002	Diethyl Phthalate	Data Unavailable	ND		ug/L	04/10/2013	2.3	None	3	E506
EFF-002	Dilution Rate	Data Unavailable	=	0.13	ppth	04/01/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.09	ppth	04/02/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.09	ppth	04/03/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.06	ppth	04/04/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.06	ppth	04/05/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.04	ppth	04/06/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.06	ppth	04/07/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.07	ppth	04/08/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.11	ppth	04/09/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.14	ppth	04/10/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.12	ppth	04/11/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.1	ppth	04/12/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.14	ppth	04/13/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.13	ppth	04/14/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.12	ppth	04/15/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.1	ppth	04/16/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.03	ppth	04/17/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.03	ppth	04/18/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.03	ppth	04/19/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.07	ppth	04/20/2013	None	None	None	% of Stream

EFF-002	Dilution Rate	Data Unavailable	=	0.06	ppth	04/21/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.1	ppth	04/22/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.15	ppth	04/23/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.18	ppth	04/24/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.15	ppth	04/25/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.14	ppth	04/26/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.1	ppth	04/27/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.07	ppth	04/28/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.07	ppth	04/29/2013	None	None	None	% of Stream
EFF-002	Dilution Rate	Data Unavailable	=	0.08	ppth	04/30/2013	None	None	None	% of Stream
EFF-002	Dimethyl Phthalate	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.68	None	2	CTR 80 - Base / Neutral Extractables
EFF-002	Dinoseb	Data Unavailable	ND		ug/L	04/10/2013	.8	None	1	E515.1
EFF-002	Diquat	Diquat and Paraquat by LSE and HPLC	ND		ug/L	04/10/2013	2	None	2	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.1	mg/L	04/01/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.1	mg/L	04/02/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8	mg/L	04/03/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.9	mg/L	04/04/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.2	mg/L	04/05/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.2	mg/L	04/06/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.4	mg/L	04/07/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8	mg/L	04/08/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.5	mg/L	04/09/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.6	mg/L	04/10/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.7	mg/L	04/11/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.3	mg/L	04/12/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.8	mg/L	04/13/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.8	mg/L	04/14/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8	mg/L	04/15/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.8	mg/L	04/16/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.7	mg/L	04/17/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.3	mg/L	04/18/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.9	mg/L	04/19/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.7	mg/L	04/20/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.6	mg/L	04/21/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8	mg/L	04/22/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.7	mg/L	04/23/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.3	mg/L	04/24/2013	None	None	None	None
EFF-002	Dissolved Oxygen		=	8.2	mg/L	04/25/2013	None	None	None	None

		Data Unavailable								
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.8	mg/L	04/26/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.9	mg/L	04/27/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	7.5	mg/L	04/28/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.2	mg/L	04/29/2013	None	None	None	None
EFF-002	Dissolved Oxygen	Data Unavailable	=	8.1	mg/L	04/30/2013	None	None	None	None
EFF-002	Endosulfan I	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.004	None	.01	CTR 112 - Pesticides & PCBs
EFF-002	Endosulfan II	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.002	None	.01	CTR 113 - Pesticides & PCBs
EFF-002	Endosulfan Sulfate	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.02	None	.05	CTR 114 - Pesticides & PCBs
EFF-002	Endothal	Endothall in Drinking Water by IEE, AMM, & GC/MS	ND		ug/L	04/10/2013	2	None	45	None
EFF-002	Endrin	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.002	None	.01	CTR 115 - Pesticides & PCBs
EFF-002	Endrin Aldehyde	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.002	None	.01	CTR 116 - Pesticides & PCBs
EFF-002	Ethylbenzene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.08	None	.5	CTR 33 - Volatile Organics
EFF-002	Fluoranthene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.76	None	1	CTR 86 - Base / Neutral Extractables
EFF-002	Fluorene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.81	None	10	CTR 87 - Base / Neutral Extractables
EFF-002	Fluoride, Total	Inorganic Anions by Ion Chromatography	=	220	ug/L	04/10/2013	70	None	100	None
EFF-002	Glyphosate, Total	Glyphosate in Drinking Water by HPCL, PCD, & FD	ND		ug/L	04/10/2013	3	None	10	None
EFF-002	Hardness, Total (as CaCO3)	Data Unavailable	=	216	mg/L	04/03/2013	None	None	None	None
EFF-002	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	210	mg/L	04/10/2013	None	None	5	None
EFF-002	Heptachlor	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.003	None	.01	CTR 117 - Pesticides & PCBs
EFF-002	Heptachlor Epoxide	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.009	None	.01	CTR 118 - Pesticides & PCBs
EFF-002	Hexachlorobenzene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.89	None	1	CTR 88 - Base / Neutral Extractables
EFF-002	Hexachlorobutadiene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.84	None	1	CTR 89 - Base / Neutral Extractables
EFF-002	Hexachlorocyclopentadiene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.45	None	5	CTR 90 - Base / Neutral Extractables
EFF-002	Hexachloroethane	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.58	None	1	CTR 91 - Base / Neutral Extractables
EFF-002	Indeno (1,2,3-cd) Pyrene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.63	None	10	CTR 92 - Base / Neutral Extractables
EFF-002	Isophorone	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.81	None	1	CTR 93 - Base / Neutral Extractables
EFF-002	Lead, Total Recoverable		=	0.049	ug/L	04/10/2013	.02	None	.25	

		Inductively Coupled Plasma/Mass Spectroscopy								CTR 07 - Metals
EFF-002	Mercury, Total Recoverable	Mercury in Water by Oxidation, P&T, and Cold Vapor	=	0.000717	ug/L	04/10/2013	.0002	None	.0005	CTR 08 - Metals
EFF-002	Methyl Tert-butyl Ether (MTBE)	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.4	None	.5	None
EFF-002	Methylene Chloride	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.48	None	.5	CTR 36 - Volatile Organics
EFF-002	Molinate	Nitrogen- & Phosphorus-Containing Pest. in Water by GC	ND		ug/L	04/10/2013	.2	None	.5	None
EFF-002	N-Nitrosodi-n-Propylamine	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.85	None	5	CTR 97 - Base / Neutral Extractables
EFF-002	N-Nitrosodimethylamine	Extractable Priority Pollutants	ND		ug/L	04/10/2013	1.1	None	5	CTR 96 - Base / Neutral Extractables
EFF-002	N-Nitrosodiphenylamine	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.9	None	1	CTR 98 - Base / Neutral Extractables
EFF-002	Naphthalene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.66	None	1	CTR 94 - Base / Neutral Extractables
EFF-002	Nickel, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	8.8	ug/L	04/10/2013	.06	None	.5	CTR 09 - Metals
EFF-002	Nitrate, Total (as N)	Data Unavailable	=	25	mg/L	04/03/2013	None	None	None	Dilution factor of 5
EFF-002	Nitrate, Total (as N)	Data Unavailable	=	23	mg/L	04/10/2013	None	None	None	None
EFF-002	Nitrate, Total (as N)	Data Unavailable	=	25	mg/L	04/17/2013	None	None	None	None
EFF-002	Nitrate, Total (as N)	Data Unavailable	=	25	mg/L	04/23/2013	None	None	None	None
EFF-002	Nitrate, Total (as NO3)	Inorganic Anions by Ion Chromatography	=	22000	ug/L	04/10/2013	1000	None	5000	Dilution factor of 5
EFF-002	Nitrite Plus Nitrate (as N)	Inorganic Anions by Ion Chromatography	=	5100	ug/L	04/10/2013	13	None	400	None
EFF-002	Nitrite, Total (as N)	Inorganic Anions by Ion Chromatography	=	110	ug/L	04/10/2013	10	None	200	None
EFF-002	Nitrobenzene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.74	None	1	CTR 95 - Base / Neutral Extractables
EFF-002	Oxamyl	Data Unavailable	ND		ug/L	04/10/2013	.8	None	20	E531.1
EFF-002	PCB-1016	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.08	None	.5	CTR 119 - Pesticides & PCBs
EFF-002	PCB-1221	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.2	None	.5	CTR 120 - Pesticides & PCBs
EFF-002	PCB-1232	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.1	None	.5	CTR 121 - Pesticides & PCBs
EFF-002	PCB-1242	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.04	None	.5	CTR 122 - Pesticides & PCBs
EFF-002	PCB-1248	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.06	None	.5	CTR 123 - Pesticides & PCBs
EFF-002	PCB-1254	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.04	None	.5	CTR 124 - Pesticides & PCBs
EFF-002	PCB-1260	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.04	None	.5	CTR 125 - Pesticides & PCBs

EFF-002	Pentachlorophenol	Data Unavailable	ND		ug/L	04/10/2013	.2	None	.2	CTR 53 - Acid Extractables E515.1
EFF-002	Perchlorate	Determ. of Perchlorate in Drinking Water using Ion Chromatography	ND		ug/L	04/10/2013	.9	None	4	None
EFF-002	Phenanthrene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.65	None	5	CTR 99 - Base / Neutral Extractables
EFF-002	Phenol, Single Compound	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.46	None	1	CTR 54 - Acid Extractables
EFF-002	Phosphorus, Total (as P)	Data Unavailable	=	3.6	mg/L	04/03/2013	None	None	None	Dilution factor of 20
EFF-002	Phosphorus, Total (as P)	Data Unavailable	=	3.7	mg/L	04/10/2013	None	None	None	None
EFF-002	Phosphorus, Total (as P)	Data Unavailable	=	4.3	mg/L	04/17/2013	None	None	None	None
EFF-002	Phosphorus, Total (as P)	Data Unavailable	=	4.7	mg/L	04/23/2013	None	None	None	None
EFF-002	Picloram	Data Unavailable	ND		ug/L	04/10/2013	.5	None	1	E515.1
EFF-002	Pyrene	Extractable Priority Pollutants	ND		ug/L	04/10/2013	.45	None	10	CTR 100 - Base / Neutral Extractables
EFF-002	Selenium, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	0.3	ug/L	04/10/2013	.07	None	1	CTR 10 - Metals
EFF-002	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/01/2013	None	None	None	None
EFF-002	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/08/2013	None	None	None	None
EFF-002	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/15/2013	None	None	None	None
EFF-002	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/22/2013	None	None	None	None
EFF-002	Settleable Solids	Data Unavailable	<	0.1	ml/L/hr	04/29/2013	None	None	None	None
EFF-002	Silver, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	ND		ug/L	04/10/2013	.02	None	.1	CTR 11 - Metals
EFF-002	Simazine	Nitrogen- & Phosphorus-Containing Pest. in Water by GC	ND		ug/L	04/10/2013	.3	None	.5	None
EFF-002	Styrene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.059	None	.5	None
EFF-002	Temperature	Data Unavailable	=	16.8	Degrees C	04/01/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	16.4	Degrees C	04/02/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	16.6	Degrees C	04/03/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	16.7	Degrees C	04/04/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17	Degrees C	04/05/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17	Degrees C	04/06/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17.3	Degrees C	04/07/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17	Degrees C	04/08/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	16.9	Degrees C	04/09/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	16.6	Degrees C	04/10/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17.2	Degrees C	04/11/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17.4	Degrees C	04/12/2013	None	None	None	None
EFF-002	Temperature		=	17.4	Degrees C	04/13/2013	None	None	None	None

		Data Unavailable								
EFF-002	Temperature	Data Unavailable	=	17.7	Degrees C	04/14/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17.2	Degrees C	04/15/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17	Degrees C	04/16/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	16.9	Degrees C	04/17/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.3	Degrees C	04/18/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	17.8	Degrees C	04/19/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.1	Degrees C	04/20/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	19.2	Degrees C	04/21/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18	Degrees C	04/22/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.2	Degrees C	04/23/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.5	Degrees C	04/24/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.3	Degrees C	04/25/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.4	Degrees C	04/26/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.8	Degrees C	04/27/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	19.3	Degrees C	04/28/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.7	Degrees C	04/29/2013	None	None	None	None
EFF-002	Temperature	Data Unavailable	=	18.9	Degrees C	04/30/2013	None	None	None	None
EFF-002	Tetrachloroethene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.092	None	.5	CTR 38 - Volatile Organics
EFF-002	Tetrachloroethene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.12	None	.5	CTR 43 - Volatile Organics
EFF-002	Thallium, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	ND		ug/L	04/10/2013	.02	None	.1	CTR 12 - Metals
EFF-002	Thiobencarb	Nitrogen- & Phosphorus-Containing Pest. in Water by GC	ND		ug/L	04/10/2013	.2	None	1	None
EFF-002	Toluene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.092	None	.3	CTR 39 - Volatile Organics
EFF-002	Total Suspended Solids (TSS)	Data Unavailable	<	1	mg/L	04/03/2013	None	None	None	None
EFF-002	Total Suspended Solids (TSS)	Data Unavailable	<	1	mg/L	04/10/2013	None	None	None	None
EFF-002	Total Suspended Solids (TSS)	Data Unavailable	<	1	mg/L	04/17/2013	None	None	None	None
EFF-002	Total Suspended Solids (TSS)	Data Unavailable	<	1	mg/L	04/24/2013	None	None	None	None
EFF-002	Toxaphene	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.2	None	.5	None
EFF-002	Trichlorofluoromethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.5	None	.5	None
EFF-002	Vinyl Chloride	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.06	None	.5	CTR 44 - Volatile Organics
EFF-002	Xylenes, Total	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.26	None	.5	None

EFF-002	Zinc, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	41	ug/L	04/10/2013	.5	None	5	CTR 13 - Metals
EFF-002	alpha-BHC	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.004	None	.01	CTR 103 - Pesticides & PCBs
EFF-002	beta-BHC	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.002	None	.005	CTR 104 - Pesticides & PCBs
EFF-002	cis-1,2-Dichloroethene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.11	None	.5	None
EFF-002	delta-BHC	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.002	None	.005	CTR 106 - Pesticides & PCBs
EFF-002	gamma-BHC	Organochlorine Pesticides and PCBs	ND		ug/L	04/10/2013	.004	None	.01	CTR 105 - Pesticides & PCBs
EFF-002	pH	Data Unavailable	=	7.2	SU	04/01/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.4	SU	04/02/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7	SU	04/03/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.1	SU	04/04/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/05/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/06/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/07/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/08/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/09/2013	None	None	None	None
EFF-002	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.2	SU	04/10/2013	None	None	1	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/10/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7	SU	04/11/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.1	SU	04/12/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.4	SU	04/13/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/14/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/15/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/16/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.1	SU	04/17/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.4	SU	04/18/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.4	SU	04/19/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.3	SU	04/20/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.4	SU	04/21/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/22/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/23/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/24/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.3	SU	04/25/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/26/2013	None	None	None	None
EFF-002	pH		=	7.3	SU	04/27/2013	None	None	None	None

		Data Unavailable								
EFF-002	pH	Data Unavailable	=	7.3	SU	04/28/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/29/2013	None	None	None	None
EFF-002	pH	Data Unavailable	=	7.2	SU	04/30/2013	None	None	None	None
EFF-002	trans-1,2-Dichloroethene	Volatile Organic Compounds EPA Method 624	ND		ug/L	04/10/2013	.11	None	.5	CTR 40 - Volatile Organics
GW-001	Aluminum, Total	Data Unavailable	=	1.3	mg/L	04/10/2013	.02	None	.05	None
GW-001	Ammonia, Total (as N)	Data Unavailable	<	0.2	mg/L	04/10/2013	None	None	None	None
GW-001	Freeboard	Data Unavailable	=	160	inches	04/01/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-001	Freeboard	Data Unavailable	=	151	inches	04/10/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-001	Freeboard	Data Unavailable	=	152	inches	04/16/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-001	Freeboard	Data Unavailable	=	154	inches	04/26/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-001	Nitrate, Total (as N)	Data Unavailable	=	4.8	mg/L	04/10/2013	None	None	None	None
GW-001	Sodium, Total	Data Unavailable	=	15	mg/L	04/10/2013	.03	None	1	None
GW-001	Total Dissolved Solids (TDS)	Data Unavailable	=	190	mg/L	04/10/2013	None	None	None	None
GW-001	pH	Data Unavailable	=	6.1	SU	04/10/2013	None	None	None	None
GW-002	Aluminum, Total	Data Unavailable	=	0.11	mg/L	04/10/2013	.02	None	.05	None
GW-002	Ammonia, Total (as N)	Data Unavailable	<	0.2	mg/L	04/10/2013	None	None	None	None
GW-002	Freeboard	Data Unavailable	=	127	inches	04/01/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-002	Freeboard	Data Unavailable	=	122	inches	04/10/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-002	Freeboard	Data Unavailable	=	123	inches	04/16/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-002	Freeboard	Data Unavailable	=	126	inches	04/26/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-002	Nitrate, Total (as N)	Data Unavailable	=	1.4	mg/L	04/10/2013	None	None	None	None
GW-002	Sodium, Total	Data Unavailable	=	24	mg/L	04/10/2013	.03	None	1	None
GW-002	Total Dissolved Solids (TDS)	Data Unavailable	=	220	mg/L	04/10/2013	None	None	None	None
GW-002	pH	Data Unavailable	=	6.3	SU	04/10/2013	None	None	None	None
GW-003	Aluminum, Total	Data Unavailable	ND		mg/L	04/10/2013	.02	None	.05	None
GW-003	Ammonia, Total (as N)	Data Unavailable	<	0.2	mg/L	04/10/2013	None	None	None	None
GW-003	Freeboard	Data Unavailable	=	266	inches	04/01/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-003	Freeboard	Data Unavailable	=	261	inches	04/10/2013	None	None	None	Depth to Groundwater

										(not Freeboard)
GW-003	Freeboard	Data Unavailable	=	260	inches	04/16/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-003	Freeboard	Data Unavailable	=	261	inches	04/26/2013	None	None	None	Depth to Groundwater (not Freeboard)
GW-003	Nitrate, Total (as N)	Data Unavailable	<	0.2	mg/L	04/10/2013	None	None	None	None
GW-003	Sodium, Total	Data Unavailable	=	23	mg/L	04/10/2013	.03	None	1	None
GW-003	Total Dissolved Solids (TDS)	Data Unavailable	=	230	mg/L	04/10/2013	None	None	None	None
GW-003	pH	Data Unavailable	=	7.2	SU	04/10/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	107	mg/L	04/03/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	174	mg/L	04/10/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	234	mg/L	04/17/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	45	mg/L	04/24/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.166	MGD	04/01/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.15	MGD	04/02/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.178	MGD	04/03/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.188	MGD	04/04/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.314	MGD	04/05/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.141	MGD	04/06/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.255	MGD	04/07/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.216	MGD	04/08/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.211	MGD	04/09/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.194	MGD	04/10/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.172	MGD	04/11/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.14	MGD	04/12/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.219	MGD	04/13/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.204	MGD	04/14/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.175	MGD	04/15/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.168	MGD	04/16/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.169	MGD	04/17/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.168	MGD	04/18/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.165	MGD	04/19/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.194	MGD	04/20/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.14	MGD	04/21/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.103	MGD	04/22/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.103	MGD	04/23/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.122	MGD	04/24/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.168	MGD	04/25/2013	None	None	None	None
INF-001	Flow		=	0.179	MGD	04/26/2013	None	None	None	None

		Data Unavailable								
INF-001	Flow	Data Unavailable	=	0.209	MGD	04/27/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.211	MGD	04/28/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.164	MGD	04/29/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	0.166	MGD	04/30/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/01/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/02/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	1.15	inches	04/03/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0.28	inches	04/04/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0.07	inches	04/05/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0.08	inches	04/06/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/07/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/08/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/09/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/10/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/11/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/12/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/13/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/14/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/15/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/16/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/17/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/18/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/19/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/20/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/21/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/22/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/23/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/24/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/25/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/26/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/27/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/28/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/29/2013	None	None	None	None
INF-001	Rainfall	Data Unavailable	=	0	inches	04/30/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	190	mg/L	04/03/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	238	mg/L	04/10/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	228	mg/L	04/17/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)		=	40	mg/L	04/24/2013	None	None	None	None

		Data Unavailable								
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/01/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/02/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/03/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	1.6	gallons/month	04/04/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/05/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/06/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.7	gallons/month	04/07/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/08/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/09/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/10/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/11/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/12/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.6	gallons/month	04/13/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/14/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/15/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/16/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.6	gallons/month	04/17/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/18/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.8	gallons/month	04/19/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.9	gallons/month	04/20/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	1.3	gallons/month	04/21/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/22/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/23/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.5	gallons/month	04/24/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/25/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/26/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.6	gallons/month	04/27/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.6	gallons/month	04/28/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/29/2013	None	None	None	Should be GPM/FT2
INT-001	Surface Loading Rate	Data Unavailable	=	0.4	gallons/month	04/30/2013	None	None	None	Should be GPM/FT2
LND-001	Aluminum, Total	Data Unavailable	ND		mg/L	04/03/2013	.02	None	.05	Same as REC-001
LND-001	Ammonia, Total (as N)	Data Unavailable	<	0.2	mg/L	04/03/2013	None	None	None	Same as REC-001
LND-001	Chloride	Data Unavailable	=	44	mg/L	04/03/2013	None	None	None	Same as REC-001-Dilution Factor 5
LND-001	Flow	Data Unavailable	=	0	MGD	04/01/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/01/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/02/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow		=	0	MGD	04/02/2013	None	None	None	

		Data Unavailable								Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/03/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/03/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/04/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/04/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/05/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/05/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/06/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/06/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/07/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/07/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/08/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/08/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/09/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/09/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/10/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/10/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/11/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/11/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/12/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/12/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/13/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/13/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/14/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/14/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/15/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/15/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/16/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/16/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/17/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/17/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/18/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/18/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/19/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/19/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/20/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/20/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/21/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow		=	0	MGD	04/21/2013	None	None	None	

		Data Unavailable								Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/22/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/22/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/23/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/23/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/24/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/24/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/25/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/25/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/26/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/26/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/27/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/27/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/28/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/28/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/29/2013	None	None	None	Burch Lower Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/29/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/30/2013	None	None	None	Burch Upper Irrigation
LND-001	Flow	Data Unavailable	=	0	MGD	04/30/2013	None	None	None	Burch Lower Irrigation
LND-001	Nitrate, Total (as N)	Data Unavailable	=	26	mg/L	04/03/2013	None	None	None	Same as REC-001-Dilution Factor 5
LND-001	Sodium, Total	Data Unavailable	=	41	mg/L	04/03/2013	.03	None	1	Same as REC-001
LND-001	Total Dissolved Solids (TDS)	Data Unavailable	=	410	mg/L	04/03/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/01/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/02/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.5	SU	04/03/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/04/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/05/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/06/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/07/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/08/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/09/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/10/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/11/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/12/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/13/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/14/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.5	SU	04/15/2013	None	None	None	Same as REC-001
LND-001	pH		=	7.4	SU	04/16/2013	None	None	None	

		Data Unavailable								Same as REC-001
LND-001	pH	Data Unavailable	=	7.5	SU	04/17/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/18/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.5	SU	04/19/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.6	SU	04/20/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.6	SU	04/21/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.2	SU	04/22/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/23/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/24/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.5	SU	04/25/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/26/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	8	SU	04/27/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.3	SU	04/28/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.4	SU	04/29/2013	None	None	None	Same as REC-001
LND-001	pH	Data Unavailable	=	7.5	SU	04/30/2013	None	None	None	Same as REC-001
REC-001	Flow	Data Unavailable	=	0	MGD	04/01/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/02/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/03/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/04/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/05/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/06/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/07/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/08/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0	MGD	04/09/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.042	MGD	04/10/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.039	MGD	04/11/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.055	MGD	04/12/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.042	MGD	04/13/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.099	MGD	04/14/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.061	MGD	04/15/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.067	MGD	04/16/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.067	MGD	04/17/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.071	MGD	04/18/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.079	MGD	04/19/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.076	MGD	04/20/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.076	MGD	04/21/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.063	MGD	04/22/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.009	MGD	04/23/2013	None	None	None	None
REC-001	Flow		=	0.146	MGD	04/24/2013	None	None	None	None

		Data Unavailable								
REC-001	Flow	Data Unavailable	=	0.085	MGD	04/25/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.101	MGD	04/26/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.085	MGD	04/27/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.094	MGD	04/28/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.074	MGD	04/29/2013	None	None	None	None
REC-001	Flow	Data Unavailable	=	0.106	MGD	04/30/2013	None	None	None	None
REC-001	Nitrate, Total (as N)	Data Unavailable	=	26	mg/L	04/03/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/01/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/02/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.5	SU	04/03/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/04/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/05/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/06/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/07/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/08/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/09/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/10/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/11/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/12/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/13/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/14/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.5	SU	04/15/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/16/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.5	SU	04/17/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/18/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.5	SU	04/19/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.6	SU	04/20/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.6	SU	04/21/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.2	SU	04/22/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/23/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/24/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.5	SU	04/25/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/26/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	8	SU	04/27/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.3	SU	04/28/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.4	SU	04/29/2013	None	None	None	Same as LND-001
REC-001	pH	Data Unavailable	=	7.5	SU	04/30/2013	None	None	None	Same as LND-001
RSW-001	Ammonia, Total (as N)		<	0.2	mg/L	04/03/2013	None	None	None	

		Data Unavailable								Russian River Upstream
RSW-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Dissolved Oxygen	Data Unavailable	=	10.5	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Electrical Conductivity @ 25 Deg. C	Data Unavailable	=	251	umhos/cm	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Hardness, Total (as CaCO3)	Data Unavailable	=	140	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Nitrate, Total (as N)	Data Unavailable	<	0.2	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Phosphorus, Total (as P)	Data Unavailable	=	4	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Temperature	Data Unavailable	=	16.1	Degrees C	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Temperature	Data Unavailable	=	17.2	Degrees C	04/12/2013	None	None	None	Russian River Upstream
RSW-001	Temperature	Data Unavailable	=	16	Degrees C	04/16/2013	None	None	None	Russian River Upstream
RSW-001	Temperature	Data Unavailable	=	18.6	Degrees C	04/23/2013	None	None	None	Russian River Upstream
RSW-001	Total Dissolved Solids (TDS)	Data Unavailable	=	140	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Total Suspended Solids (TSS)	Data Unavailable	=	3.5	mg/L	04/03/2013	None	None	None	Russian River Upstream
RSW-001	Turbidity	Data Unavailable	=	3.7	NTU	04/03/2013	None	None	None	Russian River Upstream
RSW-001	pH	Data Unavailable	=	7.2	SU	04/03/2013	None	None	None	Russian River Upstream
RWS-002	Ammonia, Total (as N)	Data Unavailable	<	0.2	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	<	5	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Dissolved Oxygen	Data Unavailable	=	10.7	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Electrical Conductivity @ 25 Deg. C	Data Unavailable	=	254	umhos/cm	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Hardness, Total (as CaCO3)	Data Unavailable	=	136	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Nitrate, Total (as N)	Data Unavailable	<	0.2	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Phosphorus, Total (as P)	Data Unavailable	<	1	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Temperature	Data Unavailable	=	15.8	Degrees C	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Temperature	Data Unavailable	=	16.8	Degrees C	04/12/2013	None	None	None	Russian River Downstream
RWS-002	Temperature	Data Unavailable	=	15.6	Degrees C	04/16/2013	None	None	None	Russian River Downstream
RWS-002	Temperature	Data Unavailable	=	18.3	Degrees C	04/23/2013	None	None	None	Russian River Downstream
RWS-002	Total Dissolved Solids (TDS)	Data Unavailable	=	140	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Total Suspended Solids (TSS)	Data Unavailable	=	3.6	mg/L	04/03/2013	None	None	None	Russian River Downstream
RWS-002	Turbidity	Data Unavailable	=	3.5	NTU	04/03/2013	None	None	None	Russian River Downstream
RWS-002	pH	Data Unavailable	=	7.3	SU	04/03/2013	None	None	None	Russian River Downstream

Total Analytical Data Points: 760

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Data Summary-Calculated

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	Comments
EFF-001	BOD5 @ 20 Deg. C, Percent Removal	30-Day Average	=	96	%	04/30/2013	None
EFF-001	Flow	Daily Maximum	=	0.349	MGD	04/01/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.325	MGD	04/02/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.328	MGD	04/03/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.397	MGD	04/04/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.39	MGD	04/05/2013	

							Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.386	MGD	04/06/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.409	MGD	04/07/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.332	MGD	04/08/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.311	MGD	04/09/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.346	MGD	04/10/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.359	MGD	04/11/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.332	MGD	04/12/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.335	MGD	04/13/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.331	MGD	04/14/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.289	MGD	04/15/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.271	MGD	04/16/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.325	MGD	04/17/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.275	MGD	04/18/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.396	MGD	04/19/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.402	MGD	04/20/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.493	MGD	04/21/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.426	MGD	04/22/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.401	MGD	04/23/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.373	MGD	04/24/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.311	MGD	04/25/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.267	MGD	04/26/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.304	MGD	04/27/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.303	MGD	04/28/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.303	MGD	04/29/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Flow	Daily Maximum	=	0.536	MGD	04/30/2013	Filter Effluent Flow to Contact Chamber
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/01/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/02/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/03/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/04/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/05/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/06/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/07/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/08/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/09/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/10/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/11/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/12/2013	None
EFF-001	Total Coliform	7-Day Median	<	2		04/13/2013	None

					MPN/100 mL		
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/14/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/15/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/16/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/17/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/18/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/19/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/20/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/21/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/22/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/23/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/24/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/25/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/26/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/27/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/28/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/29/2013	None
EFF-001	Total Coliform	7-Day Median	<	2	MPN/100 mL	04/30/2013	None
EFF-001	Total Suspended Solids (TSS), Percent Removal	30-Day Average	=	99	%	04/30/2013	None
EFF-002	Chlorine, Total Residual	Average Monthly (AMEL)	<	0.1	mg/L	04/30/2013	None
EFF-002	Dichlorobromomethane	Average Monthly (AMEL)	<	0.1	ug/L	04/30/2013	None
EFF-002	Flow	Daily Average (Mean)	=	623	MGD	04/01/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	577	MGD	04/02/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	553	MGD	04/03/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	714	MGD	04/04/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	923	MGD	04/05/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	871	MGD	04/06/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	757	MGD	04/07/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	694	MGD	04/08/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	667	MGD	04/09/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	626	MGD	04/10/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	587	MGD	04/11/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	558	MGD	04/12/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	509	MGD	04/13/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	485	MGD	04/14/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	523	MGD	04/15/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	514	MGD	04/16/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	486	MGD	04/17/2013	Discharge to Russian River
EFF-002	Flow		=	460	MGD	04/18/2013	Discharge to Russian River

		Daily Average (Mean)					
EFF-002	Flow	Daily Average (Mean)	=	444	MGD	04/19/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	441	MGD	04/20/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	434	MGD	04/21/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	421	MGD	04/22/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	411	MGD	04/23/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	403	MGD	04/24/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	393	MGD	04/25/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	391	MGD	04/26/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	389	MGD	04/27/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	384	MGD	04/28/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	375	MGD	04/29/2013	Discharge to Russian River
EFF-002	Flow	Daily Average (Mean)	=	365	MGD	04/30/2013	Discharge to Russian River
INF-001	Flow	Daily Maximum	=	2.81	MGD	04/01/2013	None
INF-001	Flow	Daily Maximum	=	2.74	MGD	04/02/2013	None
INF-001	Flow	Daily Maximum	=	2.69	MGD	04/03/2013	None
INF-001	Flow	Daily Maximum	=	2.61	MGD	04/04/2013	None
INF-001	Flow	Daily Maximum	=	2.55	MGD	04/05/2013	None
INF-001	Flow	Daily Maximum	=	2.52	MGD	04/06/2013	None
INF-001	Flow	Daily Maximum	=	2.74	MGD	04/07/2013	None
INF-001	Flow	Daily Maximum	=	2.52	MGD	04/08/2013	None
INF-001	Flow	Daily Maximum	=	2.66	MGD	04/09/2013	None
INF-001	Flow	Daily Maximum	=	2.61	MGD	04/10/2013	None
INF-001	Flow	Daily Maximum	=	2.55	MGD	04/11/2013	None
INF-001	Flow	Daily Maximum	=	2.58	MGD	04/12/2013	None
INF-001	Flow	Daily Maximum	=	2.62	MGD	04/13/2013	None
INF-001	Flow	Daily Maximum	=	2.52	MGD	04/14/2013	None
INF-001	Flow	Daily Maximum	=	2.4	MGD	04/15/2013	None
INF-001	Flow	Daily Maximum	=	2.32	MGD	04/16/2013	None
INF-001	Flow	Daily Maximum	=	2.77	MGD	04/17/2013	None
INF-001	Flow	Daily Maximum	=	2.68	MGD	04/18/2013	None
INF-001	Flow	Daily Maximum	=	2.55	MGD	04/19/2013	None
INF-001	Flow	Daily Maximum	=	2.65	MGD	04/20/2013	None
INF-001	Flow	Daily Maximum	=	2.6	MGD	04/21/2013	None
INF-001	Flow	Daily Maximum	=	2.88	MGD	04/22/2013	None
INF-001	Flow	Daily Maximum	=	2.74	MGD	04/23/2013	None
INF-001	Flow	Daily Maximum	=	2.75	MGD	04/24/2013	None
INF-001	Flow	Daily Maximum	=	2.64	MGD	04/25/2013	None
INF-001	Flow	Daily Maximum	=	2.64	MGD	04/26/2013	None
INF-001	Flow	Daily Maximum	=	2.56	MGD	04/27/2013	None
INF-001	Flow	Daily Maximum	=	2.65	MGD	04/28/2013	None
INF-001	Flow	Daily Maximum	=	2.59	MGD	04/29/2013	None
INF-001	Flow	Daily Maximum	=	2.59	MGD	04/30/2013	None

Total Calculated Data Points: 124

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Violations

Violation ID	Violation Date	Violation Type	Description(+)	Corrective Action	Created By	Last Modified By
948745	04/03/2013	Order Conditions	Low UV dose below the required 100,000MJ/cm2 occurred on the following dates: A	Increased the filter backwash cycles to stop the flow surges.	Discharger	Discharger
948746	04/30/2013	Deficient Monitoring	Visual Observation of Upstream & Downstream Russian River was not recorded on pl	Operators were counseled on permit required observations and reminded of frequency.	Discharger	Discharger

Total Violations: 2

⊟

Attachments

File Name	Description	Size
13D0266-UP-DOWN.pdf	None	178 KB
13D0268-RR7.pdf	None	166 KB
13D0271-RR6.pdf	None	210 KB
13D0274-RR6.pdf	None	182 KB
13D0276-RR7.pdf	None	171 KB
13D0648CTR All OL.pdf	None	889 KB
13D0670-Final.pdf	None	622 KB
13D0673-GW.pdf	None	171 KB
13D0676-GW.pdf	None	174 KB
13D0678-RR6.pdf	None	175 KB
13D0967-RR6.pdf	None	391 KB
13D1180-RR6.pdf	None	173 KB
13E0094-Title 22 EPA 504.pdf	None	163 KB
RR Apr Pond Attachment to PET Tool.xlsm	None	27 KB
RR CTR Apr 2013.pdf	None	137 KB
RRTP CT Calculations Apr 2013.pdf	None	17 KB
RRTP Events Apr 2013.pdf	None	21 KB
RRTP Lab Bench Apr 2013.pdf	None	121 KB
RRTP NTU Apr 2013.pdf	None	35 KB
RRTP Observations Apr 2013.pdf	None	172 KB
RRTP RR6 Bioassay Apr 2013.pdf	None	40 KB
RRTP SSO Apr 2013.pdf	None	9 KB

Total Attachments: 22

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Cover Letter

File Name
RRTP Cover Apr 2013.pdf

Total No. of Cover Letter Files: 1 **Cover Leter Text: No**

The current report was generated with data as of: 03/04/2014

Total Maximum Daily Loads for Metals and Selenium
San Gabriel River and Impaired Tributaries

U.S. Environmental Protection Agency
Region 9

California Regional Water Quality Control Board
Los Angeles Region

LIST OF ACRONYMS

µg/L	Micrograms per liter
ACF	Acute Conversion Factor
AGR	Agricultural Supply
BAT	Best Available Technology
BMP	Best Management Practice
CCC	Criteria Continuous Concentration
CCF	Chronic Conversion Factor
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
COMM	Commercial and Sport Fishing
CMC	Criteria Maximum Concentration
CTR	California Toxics Rule
CWA	Clean Water Act
EMC	Event Mean Concentration
EST	Estuarine Habitat
FHWA	Federal Highway Administration
GIS	Geographic Information System
GWR	Ground Water Recharge
IND	Industrial Service Supply
JWPCP	Joint Water Pollution Control Plant
LAs	Load Allocations
LACSD	Los Angeles County Sanitation Districts
LADWP	Los Angeles Department of Water and Power
LACDPW	Los Angeles County Department of Public Works
LARWQCB	Los Angeles Regional Water Quality Control Board
LSPC	Loading Simulation Program in C++
MAR	Marine Habitat
MCLs	Maximum Contaminant Levels
MGD	Million Gallons Per Day
MIGR	Migration of Aquatic Organisms
MS4	Municipal Separate Storm Sewer System
MUN	Municipal Supply
NAV	Navigation
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Wastewater Treatment Works
PROC	Industrial Process Supply
RECI	Water Contact Recreation
RECII	Non-contact Water Recreation
SARWQCB	Santa Ana Regional Water Quality Control Board
SCAG	Southern California Association of Governments
SCCWRP	Southern California Coastal Water Research Project
SHELL	Shellfish Harvesting
SIP	State Implementation Plan

SPWN	Spawning, Reproduction, and/or Early Development
SWRCB	State Water Resources Control Board
TMDL	Total Maximum Daily Loads
USACE	United States Army Corpos of Engineers
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds
WDRs	Waste Discharge Requirements
WER	Water Effect Ratio
WET	Wetland Habitat
WLA	Waste Load Allocation
WRP	Water Reclamation Plant

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1. INTRODUCTION

Segments of the San Gabriel River and its tributaries exceed water quality objectives for copper, lead, selenium, and zinc. These segments (i.e., reaches) of the San Gabriel River are included on the California 303(d) list of impaired waterbodies (LARWQCB, 1998 and 2002). The Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed to restore the impaired waterbodies to their full beneficial uses. Table 1 summarizes the stream reaches in the San Gabriel River Watershed included on the California 303(d) list for metals.

Table 1. Waterbodies in the San Gabriel River watershed listed as impaired for metals (LARWQCB, 2002)

Impaired Reach	Copper	Lead	Selenium	Zinc
San Gabriel River Reach 2	X	X		X
Coyote Creek	X	X	X	X

This document provides the background information used by the U.S. Environmental Protection Agency (EPA) and the California Regional Water Quality Control Board, Los Angeles Region (Los Angeles Regional Board) in the development of TMDLs for metals to the San Gabriel River Watershed.

1.1 Regulatory Background

Section 303(d) of the Clean Water Act (CWA) requires that each State "shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality standard applicable to such waters." The CWA also requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and establish TMDLs for such waters.

The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the CWA, as well as in EPA guidance (U.S. EPA, 2000a). A TMDL is defined as the "sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) such that the capacity of the waterbody to assimilate pollutant loadings (the Loading Capacity) is not exceeded. A TMDL is also required to account for seasonal variations and include a margin of safety to address uncertainty in the analysis.

States must develop water quality management plans to implement the TMDL (40 CFR 130.6). EPA has oversight authority for the 303(d) program and is required to review and either approve or disapprove the TMDLs submitted by states. In California, the State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards are responsible for preparing lists of impaired waterbodies under the 303(d) program and for preparing TMDLs, both subject to EPA approval. If EPA disapproves a TMDL submitted by a state, EPA is required to establish a TMDL for that waterbody. The regional boards also hold regulatory authority for many of the instruments used to implement the TMDLs such as the National

Pollutant Discharge Elimination System (NPDES) permits and state-specified Waste Discharge Requirements (WDRs).

The Los Angeles Regional Board identified over 700 waterbody-pollutant combinations in the Los Angeles Region where TMDLs would be required (LARWCQB, 1996, 1998). These are referred to as “listed” or “303(d) listed” waterbodies or waterbody segments. A schedule for development of TMDLs in the Los Angeles Region was established in a consent decree approved on March 22, 1999 (Heal the Bay Inc., *et al.* v. Browner C 98-4825 SBA).

For the purpose of scheduling TMDL development, the decree combined the over 700 waterbody pollutant combinations into 92 TMDL analytical units. Analytical unit 39 consists of impairments of lead in San Jose Creek Reach 2, arsenic in the San Gabriel River Estuary, and silver in Coyote Creek. Upon review of Analytical unit 39, it appears that the lead impairment was wrongly assigned to San Jose Creek Reach 2. This was likely a typo in the consent decree as the lead impairment should have been assigned to San Gabriel River Reach 2 in order to be consistent with the 1998 303(d) list. The 1998 303(d) list also included impairments for abnormal fish histology in San Gabriel River Reach 1, the Estuary, and Coyote Creek. This TMDL does not address these listings.

The 303(d) list was updated in 2002. There were delistings for arsenic for the San Gabriel River Estuary and silver for Coyote Creek. There were new listings for San Gabriel River Reach 2 (copper and zinc) and for Coyote Creek (copper, lead, selenium and zinc). The additional 2002 listings are not required to be addressed by the consent decree but are required to be addressed by the CWA. This TMDL addresses the 2002 metals listings in the San Gabriel River and Coyote Creek (Figure 1) as well additional impairments found in the Estuary and San Jose Creek Reach 1 based on more recent data.

1.2 Environmental Setting

The San Gabriel River receives drainage from a 682 square mile area of eastern Los Angeles County and has a main channel length of approximately 58 miles. Its headwaters originate in the San Gabriel Mountains with the East, West, and North Forks. The river flows through a heavily developed commercial and industrial area before emptying into the Pacific Ocean in Long Beach. The main tributaries of the river are Walnut Creek, San Jose Creek, and Coyote Creek (LARWQCB, 2000). A map of the watershed is presented in Figure 1 and the predominant land uses are shown in Figure 2.

Reach 5. The San Gabriel River Main Stem. The upper watershed consists of extensive areas of undisturbed riparian and woodland habitats in its upper reaches, much of which were set aside as wilderness areas by the U.S. Congress in 1968 as Public law 90-318, designating the San Gabriel Wilderness, within and as apart of the Angeles National Forest. Other areas in the upper watershed are subject to heavy recreational use. The upper watershed also contains a series of reservoirs with flood control dams (Cogswell, San Gabriel, and Morris Dams). Below Morris Dam, the river flows out of the San Gabriel Canyon and into the San Gabriel Valley.

About four miles downstream from the mouth of the San Gabriel Canyon is the Santa Fe Dam and Reservoir flood control project. Los Angeles County Department of Public Works (LACDPW) operates and maintains the Santa Fe Reservoir Spreading Grounds through an easement with the United States Army Corps of Engineers (USACE). The spreading grounds recharge water to the Main San Gabriel Basin underlying the San Gabriel Valley and are bounded by the San Gabriel Mountains on the north, the Puente Hills on the south, the San Jose Hills to the east, and the San Rafael Hills to the west. Flow from the upper part of the watershed often does not get past the Santa Fe Dam and its spreading grounds.

The Rio Hondo branches from the San Gabriel River just below Santa Fe Dam and flows westward to Whittier Narrows Reservoir. Flows from the San Gabriel River and Rio Hondo merge at this reservoir during larger flood events. From Whittier Narrows Reservoir, the Rio Hondo flows southwestward towards the Los Angeles River.

Reaches 3 and 4. The area between Santa Fe and Whittier Narrows Dam. The San Gabriel River between Santa Fe Dam and the Whittier Narrows Basin is soft-bottomed with riprap sides. This area is used for infiltration and is primarily dry during most of the year. Reach 4 of the San Gabriel River runs from the Santa Fe Dam to Ramona Boulevard. Reach 3 of the San Gabriel River runs from Ramona Boulevard to the Whittier Narrows Dam.

Walnut Creek is a tributary to San Gabriel River Reach 3. Puddingstone Reservoir is located on upper Walnut Creek and is operated for flood control, water conservation, and recreation. Immediately below Puddingstone Reservoir, the creek is soft-bottomed. The rest of the creek is concrete lined until its confluence with the San Gabriel River. Walnut Creek receives inputs from Big Dalton Wash.

San Jose Creek enters San Gabriel River Reach 3 below Walnut Creek. The upper portion of San Jose Creek (Reach 2) extends from White Avenue to Temple Avenue. San Jose Creek Reach 1 extends from Temple Avenue to the confluence with the San Gabriel River. Tributaries to San Jose Creek Reach 1 include the South Fork, Diamond Bar Creek, and Puente Creek. The Pomona Water Reclamation Plant (WRP) discharges to the South Fork. San Jose Creek Reach 1 is concrete lined in its upper portion and soft bottomed just before it joins the San Gabriel River. The San Jose Creek WRP discharges to the soft-bottomed portion of the reach.

Waters entering the mainstem from San Jose and Walnut Creeks may be diverted through Whittier Narrows area to the Los Angeles River. Those waters remaining in the San Gabriel River will often recharge at the downstream spreading grounds.

Whittier Narrows Dam. The Whittier Narrows are a natural gap in the hills along the southern boundary of the San Gabriel Valley. The Whittier Narrows Dam is a flood control and water conservation project constructed and operated by the USACE. The Rio Hondo and San Gabriel Rivers flow through Narrows and are impounded by the Dam. The purpose of the project is to collect upstream runoff and releases from the Santa Fe Dam for flood control and water conservation. If the inflow to the reservoir exceeds the groundwater recharge capacity of the spreading grounds or the storage capacity of the water conservation or flood control pools, water is released into the San Gabriel River.

Reach 2. Below Whittier Narrows Dam. The Montebello Forebay is a recharge facility located immediately downstream of Whittier Narrows Dam and allows infiltration into the Central Basin aquifer. It runs from just below the Narrows to Firestone Boulevard (essentially all of Reach 2). Groundwater is recharged either by percolation through the unlined bottom of the river or by the diversion of water to the San Gabriel Coastal Basin Spreading Grounds by way of rubber dams. Water that is not captured in these spreading facilities flows to the ocean.

Reach 1 and Estuary. The Lower Watershed. The lower part of the river flows through a concrete-lined channel in a heavily urbanized portion of the county. Reach 1 extends from Firestone Boulevard to the Estuary, just above the confluence with Coyote Creek.

Coyote Creek is a concrete-lined channel that flows along the Los Angeles/Orange County border. The upper portion of Coyote Creek is located in Orange County and is under the jurisdiction of the Santa Ana Regional Water Quality Control Board (Santa Ana Regional Board). The Coyote Creek subwatershed is largely urbanized, but there are areas of open space in the upper watershed, which are mostly used for oil production. (SARWQCB, 2004). Coyote Creek joins the San Gabriel River above the tidal prism in Long Beach south of Willow Street.

The Estuary is approximately 3.4 miles long with a soft bottom and concrete and riprap sides. The Estuary receives flow from San Gabriel Reach 1 and Coyote Creek, tidal exchange, and cooling water discharged from two power plants.

1.3 Elements of a TMDL

There are seven elements of a TMDL. Sections 2 through 8 of this document are organized such that each section describes one of the elements, with the analysis and findings of this TMDL for that element. The elements are:

- **Section 2: Problem Identification.** This section reviews the metals data used to add the waterbody to the 303(d) list, and summarizes existing conditions using that evidence along with any new information acquired since the listing. This element identifies those reaches that fail to support all designated beneficial uses; the beneficial uses that are not supported for each reach; the water quality objectives designed to protect those beneficial uses; and, in summary, the evidence supporting the decision to list each reach, such as the number and severity of exceedances observed.
- **Section 3: Numeric Targets.** For this TMDL, the numeric targets are based upon the water quality objectives described in the California Toxics Rule (CTR).
- **Section 4: Source Assessment.** This section estimates metals loadings from point sources and non-point sources to the San Gabriel River and listed tributaries.
- **Section 5: Linkage Analysis.** This analysis shows how the sources of metals compounds into the waterbody are linked to the observed conditions in the impaired waterbody. The linkage analysis addresses the critical conditions of stream flow, loading, and water quality parameters.

- **Section 6: TMDLs and Pollutant Allocations.** This section identifies the total allowable loads that can be discharged without causing water quality exceedances. Each pollutant source is allocated a quantitative load of metals that it can discharge without exceeding numeric targets. Allocations are designed such that the waterbody will not exceed numeric targets for any of the compounds or related effects. Allocations are based on critical conditions, so that the allocated pollutant loads may be expected to achieve water quality standards at all times.
- **Section 7: Implementation.** This section describes the plans, regulatory tools, or other mechanisms by which the waste load allocations and load allocations are to be achieved. This section contains a cost analysis.
- **Section 8: Monitoring.** This TMDL includes a requirement for monitoring the waterbody to ensure that the water quality standards are attained. It also describes special studies to address uncertainties in assumptions made in the development of this TMDL and the process by which new information may be used to refine the TMDL. While the TMDL identifies the goals for a monitoring program, the Executive Officer will issue subsequent orders to identify the specific requirements and the specific entities that will develop and implement a monitoring program and submit technical reports.

2. PROBLEM IDENTIFICATION

This section presents a review of the data used by the Los Angeles Regional Board to list the San Gabriel River for metals. Where available, additional pertinent data were used to assess the condition of the watershed.

2.1 Water Quality Standards

California water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the regional boards in their Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are designed to be protective of the beneficial uses specified in the Basin Plan.

2.1.1 Beneficial Uses

The Basin Plan for the Los Angeles Regional Board (LARWQCB, 1994) defines 22 beneficial uses for the San Gabriel River (Table 2-1). These uses are recognized as existing (E), potential (P) or intermittent (I) uses. Metals loading to the San Gabriel River watershed may result in impairments of beneficial uses associated with aquatic life (WILD, WARM, COLD, RARE, EST, MAR, MIGR, SPWN, and WET) and water supply (MUN, IND, AGR, GWR, and PROC).

Table 2-1. Beneficial uses in the San Gabriel River watershed. (LARWQCB, 1994)

Reach	MUN	GWR	REC1	REC2	WILD	WARM	COLD	RARE	WET	IND	AGR	PROC	IND	SHELL	NAV/ COMM	EST/ MAR	MIGR/ SPWN
San Gabriel River Reach 5 (Mainstem)	E	E	E	E	E	E	E			E	E	E					
San Gabriel River Reach 4 (Santa Fe Dam to Ramona)	E	E	E	E	E	E	E			E	E	E					
San Gabriel River Reach 3 (Ramona to Whittier Narrows)	P^{1}	I	I^{2}	I	E	I											
Walnut Creek	P^{1}	I	I^{2}	I	E	I			I								
San Jose Creek Reach 2 (Temple Street to I-10 at White Ave)	P^{1}	I	P^{2}	I	E	I											
San Jose Creek Reach 1 (Confluence to Temple Street)	P^{1}	I	P^{2}	I	E	I											
San Gabriel River Reach 2 (Whittier Narrows to Firestone)	P^{1}	I	E^{2}	E	E	I		E		P		P					
San Gabriel River Reach 1 (Firestone to Estuary)	P^{1}		E^{2}	E	P	P											
Coyote Creek	P^{1}		P^{2}	I	P	P		E		P		P					
Estuary			E	E	E			E		E			E	P	E	E	E

1. Use may be reviewed by SWRCB
2. Access restricted by LACDPW

The Basin Plan for the Santa Ana Regional Board (SARWQCB, 1995) defines five beneficial uses for upper Coyote Creek (Table 2-2). These uses are recognized as present or potential uses.

Table 2-2. Beneficial uses in upper Coyote Creek. (SARWQCB, 1995)

Reach	MUN	AGR	IND	GWR	REC1	REC2	COMM	WARM	COLD	BIOL	WILD	RARE
Coyote Creek (within Santa Ana Regional Boundary)	x				x	x		x			x	

2.1.2. Water Quality Objectives

Narrative water quality objectives are specified by the 1994 Los Angeles Regional Board Basin Plan. The following narrative objectives are most pertinent to the metals TMDL:

Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use.

All waters shall be maintained free of toxic substances in concentrations that are toxic to or that produce detrimental physiological responses in human, plant, animal, or aquatic life.

Toxic substances shall not be present at levels that will bioaccumulate in aquatic life resources to levels which are harmful to aquatic life or human health.

The Los Angeles Regional Board's narrative toxicity objective reflects and implements national policy set by Congress. The Clean Water Act states that, "it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." (33 U.S.C. 1251(a)(3)). In 2000, EPA established numeric criteria for certain toxic pollutants, including the metals subject to these TMDLs, in the California Toxics Rule (CTR) (U.S. EPA 2000b). The federal water quality criteria established by the CTR serve as the numeric water quality objectives for the Los Angeles Region. The CTR criteria apply at all times during wet and dry weather to inland surface waters. (See, 40 CFR 131.38(a), (c)(1), and (d)(1).) There is no exception for wet-weather conditions. Aquatic life is present in wet weather conditions and the CTR is legally necessary to protect these uses. In high-volume, wet-weather conditions, if the concentration of a toxic pollutant in a water body exceeds the CTR criterion, the water body is toxic.

The TMDLs for metals in the San Gabriel River are based on the CTR criteria for the protection of aquatic life. The CTR aquatic life criteria for copper (Cu), lead (Pb), selenium (Se), and zinc (Zn) are presented in Table 2-3. The aquatic life-based criteria will ensure that both the aquatic life and water supply beneficial uses for the San Gabriel River are protected. The CTR human health criterion for copper is less stringent than the aquatic life criteria. There are no CTR human health criteria for lead, selenium, or zinc, to compare with aquatic life criteria. However, the CTR aquatic life criteria are at least or more protective than the primary or secondary drinking water limits set forth in Title 22 of the California Code of Regulations.

The CTR establishes short-term (acute) and long-term (chronic) aquatic life criteria for metals in both freshwater and saltwater. The acute criterion, defined in the CTR as the Criteria Maximum Concentration (CMC), equals the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (one hour) without deleterious effects. The chronic criterion, defined in the CTR as the Criteria Continuous Concentration (CCC), equals the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. The criteria for copper, lead and zinc in freshwater and saltwater and the criterion for selenium in saltwater are based on the dissolved fraction of metals in water. The criterion for selenium in freshwater is based on the total recoverable fraction.

Freshwater criteria apply to waters in which the salinity is equal to or less than 1 part per thousand (ppt) 95 percent or more of the time. Saltwater criteria apply to waters in which salinity is equal to or greater than 10 ppt 95 percent or more of the time. For waters in which the salinity is between 1 and 10 ppt, the more stringent of the two criteria apply.

Table 2-3. Water quality objectives established in the California Toxic Rule (CTR). Values in table are based on a hardness value of 100 mg/l as $CaCO_3$. (U.S. EPA, 2000b)

Metal	Freshwater Chronic (µg/l)	Freshwater Acute (µg/l)	Saltwater Chronic (µg/l)	Saltwater Acute (µg/l)
Copper	9*	13*	3.1	4.8
Lead	2.5*	65*	8.1	210
Selenium	5**	Reserved	71	290
Zinc	120*	120*	81	90

*Freshwater criteria for copper, lead, and zinc are hardness dependent.
**Freshwater criterion for selenim is for total recoverable metals

The CTR allows for the adjustment of freshwater and saltwater criteria with a water-effect ratio (WER) to account for site-specific chemical conditions. A WER represents the ratio of metals that are measured to metals that are biologically available and toxic to aquatic life. A WER is a measure of the toxicity of a material in site water divided by the toxicity of the same material in laboratory dilution water. The adjusted criteria are equal to the values in Table 2-3 multiplied by a WER. No site-specific WER has been developed for the San Gabriel River; therefore, a WER default value of 1.0 is assumed.

The freshwater criteria for copper, lead, and zinc are expressed as a function of hardness because hardness and/or water quality characteristics that are usually correlated with hardness can impact the toxicity of these metals. Hardness is used as a surrogate for a number of water quality characteristics, which affect the toxicity of these metals. Increasing hardness generally has the effect of decreasing the toxicity of metals. The CTR lists criteria based on a hardness value of 100 mg/L as $CaCO_3$ (Table 2-2) and provides hardness dependent equations to calculate the criteria using site-specific hardness data (up to 400 mg/L as $CaCO_3$), as follows:

$$\mathbf{CMC = WER * ACF * EXP[(m_a)(\ln(hardness)+b_a]} \qquad \textbf{Equation (1)}$$
$$\mathbf{CCC = WER * CCF * EXP[(m_c)(\ln(hardness)+b_c]} \qquad \textbf{Equation (2)}$$

Where:

CMC = Criteria Maximum Concentration
CCC = Criteria Continuous Concentration
WER = Water Effects Ratio (assumed to be 1)
ACF = Acute conversion factor (to convert from total recoverable to dissolved metals)
CCF = Chronic conversion factor (to convert from total recoverable to dissolved metals)
m_A = slope factor for acute criteria
m_C = slope factor for chronic criteria
b_A = y intercept for acute criteria
b_C = y intercept for chronic criteria

The coefficients needed for the calculation of freshwater objectives are provided in the CTR (Table 2-4). The conversion factors for lead are hardness-dependent. The following equations can be used to calculate the lead conversion factors based on site-specific hardness data:

$$\textbf{Lead ACF} = \mathbf{1.46203 - [(\ln\{hardness\})(0.145712)]} \qquad \textbf{Equation (3)}$$
$$\textbf{Lead CCF} = \mathbf{1.46203 - [(\ln\{hardness\})(0.145712)]} \qquad \textbf{Equation (4)}$$

Table 2-4. Coefficients used in formulas for calculating freshwater CTR standards. (U.S. EPA, 2000b)

Metal	Freshwater ACF	Saltwater ACF	m_A	B_A	Freshwater CCF	Saltwater CCF	m_C	b_C
Copper	0.960	0.83	0.9422	-1.700	0.960	0.83	0.8545	-1.702
Lead	0.791*	0.951	1.2730	-1.460	0.791*	0.951	1.2730	-4.705
Selenium	n/a	0.998	n/a	n/a	n/a	0.998	n/a	n/a
Zinc	0.978	0.946	0.8473	0.884	0.986	0.946	0.8473	0.884

* The Freshwater ACF and CCF for lead are hardness dependent. Conversion factors in this table are based on a hardness value of 100 mg/L as $CaCO_3$.

2.1.3. Antidegradation

State Board Resolution 68-16, “Statement of Policy with Respect to Maintaining High Quality Water” in California, known as the "Antidegradation Policy," protects surface and ground waters from degradation. Any actions that can adversely affect water quality in all surface and ground waters must be consistent with the maximum benefit to the people of the state, must not unreasonably affect present and anticipated beneficial use of such water, and must not result in water quality less than that prescribed in water quality plans and policies. Furthermore, any actions that can adversely affect surface waters are also subject to the federal Antidegradation Policy (40 CFR 131.12). The proposed TMDL will not degrade water quality, and will in fact improve water quality as it is designed to achieve compliance with existing, numeric water quality standards.

2.2 Water Quality Data Summary

This section summarizes water quality data pertaining to metals for the San Gabriel River and its tributaries. The 303(d) listings are based on storm water data. This section assesses the storm water data that were used in the listings, more recent storm water data, and additional dry-weather data. Data were evaluated based on the “Water Quality Control Policy for Developing California’s Clean Water Act Section 303(d) List” (SWRCB, 2004). Sources of metals and conditions in the river vary dramatically between wet and dry weather (see Section 4). It is therefore essential to conduct the data assessment separately for wet and dry weather.

2.2.1. Dry-weather Data Summary

There are two sources of data that were evaluated to assess dry-weather water quality. The first source is the ambient monitoring data collected by the Los Angeles County Sanitation Districts (LACSD) for the five WRPs located in the San Gabriel River. Locations of the receiving water monitoring stations for the five plants are listed in Table 2-5.

Table 2-5. Location of LACSD ambient monitoring stations.

Reach	Station	Description
San Jose Creek		
1	R-A-P	Below Pomona WRP discharge, at San Jose Street, downstream of Old Brea Road
1	R-C	Below the intersection of the north and south forks of San Jose Creek
1	R-D	End of concrete-lined portion of San Jose Creek -200 yards downstream of 3rd Ave
1	C-1	Above the San Jose Creek WRP discharge point 002
1	C-2	Below the San Jose Creek WRP discharge point 002
San Gabriel River		
Reach	**Station**	**Description**
3	R-10	Above the confluence with San Jose Creek
3	R-11	Upstream of the Whittier Narrows WRP discharge points 001 and 002
3	R-A-WN	Downstream of the Whittier Narrows WRP discharge point 001, approximately 150 feet upstream of Whittier Narrows Dam
1	R-2	Below the San Jose Creek WRP discharge point 001, near Firestone Blvd
1	R-3-1	Upstream of the Los Coyotes WRP
1	R-4	Downstream of the Los Coyotes WRP, at Artesia Boulevard
1	R-9W	At the end of the western low flow channel, near Atherton Street
Estuary	R-A-2	Downstream of the confluence of the eastern and western low flow channels
Estuary	R-6	At Seventh Street
Estuary	R-7	At Westminster Avenue
Estuary	R-8	At Marina Avenue
Coyote Creek		
Reach	**Station**	**Description**
	R-A-1	Upstream of the discharge from Long Beach WRP
	R-A	Downstream of the discharge from Long Beach WRP
	R-9E	At the end of the eastern low flow channel, near Atherton Street

Evaluation of LACSD Data

Data from LACSD samples were compared to chronic CTR criteria. LACSD analyzes for concentrations of total recoverable metals; therefore, CTR criteria were converted to total recoverable metals using default chronic conversion factors (Table 2-3). Data collected from freshwater stations were compared to freshwater CTR criteria, which were adjusted for site-specific hardness values. Where possible, data were compared to criteria that had been adjusted for actual hardness values measured for each sample. Metals data from samples without reported hardness values were compared to CTR criteria based on median hardness values for those sampling stations. Samples from the Estuary were compared to saltwater criteria, which are independent of hardness. These monitoring data provide water quality information for the San Gabriel River Reaches 1 and 3, San Jose Creek, Coyote Creek, and the Estuary (Table 2-6).

Table 2-6. Summary dry-weather ambient data assessment (LACSD data 1995 through 2005). Values in table are the number of samples exceeding chronic CTR criteria over the number of metals samples. Non detects treated as zero.

Reach	Median Hardness	Copper	Lead	Zinc	Selenium[1]
San Jose Creek Reach 1					
R-A-P (below Pomona WRP)	202	1/12	2/12	1/12	0/12
R-C (below Pomona WRP)	373	0/19	0/19	0/19	0/12
R-D (End of concrete-lined portion of Creek)	534[2]	1/19	1/19	0/19	5/12
C-1 (above SJWRP 002)	515[2]	0/33	0/33	0/32	4/30
C-2 (below SJWRP 002)	296	0/12	0/12	0/5	2/12
Total		2/95	3/95	1/82	11/78
San Gabriel Reach 3					
R-10 (above confluence with San Jose Creek)	131	0/3	0/3	0/3	0/3
R-11 (above WNWRP)	250	0/49	0/49	0/48	0/38
R-A-WN (below WNWRP)	212	0/24	0/24	0/24	0/10
Total		0/76	0/76	0/75	0/51
Coyote Creek					
RA1 (above LBWRP)	417	0/49	0/49	0/49	0/29
RA (below LBWRP)	249	0/42	0/42	0/42	0/14
R-9E	278	2/20	1/20	1/20	0/12
Total		2/111	1/111	1/111	0/55
San Gabriel Reach 1					
R-2 (below SJWRP 001)	204	0/12	0/12	0/5	0/12
R-3-1	196	1/20	0/20	0/20	0/21
R-4 (below LCWRP)	217	0/11	0/11	0/11	0/12
R-9W	211	0/19	0/19	0/19	0/12
Total		1/62	0/62	0/55	0/57
Estuary[1]					
R-A-2		2/19	0/19	2/19	0/12
R-6		1/11	0/11	0/11	0/12
R-7		1/11	0/11	0/11	0/12
R-8		1/20	2/19	0/19	0/12
Total		5/61	2/60	2/60	0/48

1) Criteria are independent of hardness.

2) Maximum allowable hardness value to adjust criteria is 400 mg/L as $CaCO_3$.

Dry-Weather Results for San Jose Creek Reach 1

There were occasional exceedances of chronic copper, lead, and selenium criteria in San Jose Creek Reach 1. Two out of 95 samples exceeded the adjusted chronic copper criterion. This does not indicate an impairment in San Jose Creek.

Three out of 95 samples exceeded the adjusted chronic lead criterion. Fourteen of the 95 samples had detection limits greater than adjusted CTR criterion, so it is possible that samples with non-detectable values exceeded the criterion. However, these samples were taken prior to 2001. Since LACSD lowered their detection limits, only three out of 81 samples exceeded the criterion. It is therefore reasonable to treat the older samples as below the criterion. Three exceedances do not indicate an impairment in San Jose Creek.

There were 11 out of 78 samples exceeding the chronic selenium criterion. Detection limits were not an issue for the selenium assessment. This exceedance percentage indicates an impairment. A dry-weather TMDL is required for selenium in San Jose Creek Reach 1.

Being a natural element, selenium can be found throughout the environment. Selenium is present in local marine sedimentary rocks. (Orange County, 2006) Sources of selenium include irrigation of soils that are naturally high in selenium, activities that mobilize groundwater to the surface (e.g., dewatering activities), petroleum refinery effluents, and runoff or discharges from certain mining activities (U.S. EPA, 2006).

Dry-Weather Results for San Gabriel River Reach 3

There were no exceedances of chronic copper, lead, zinc or selenium criteria in San Gabriel River Reach 3. Four of the older lead samples had detection limits greater than adjusted CTR criterion, so it is possible that samples with non-detectable values exceeded the criterion. However, no samples have exceeded the criterion since LACSD lowered their detection limits in 2001. There is no evidence of impairments for any metals. No dry-weather TMDLs are required for this reach.

Dry-Weather Results for San Gabriel River Reach 1

There were few to no exceedances of chronic copper, lead, zinc, and selenium criteria in San Gabriel River Reach 1. One out of 62 samples exceeded the copper criterion. This exceedance percentage does not indicate an impairment. There were no exceedances of lead criteria in the 62 samples. Eight of these samples had detection limits above CTR criterion, so it is possible that samples with non-detectable values of metals exceeded the criterion. These samples were taken prior to 2002. Since LACSD lowered their detection limits, no samples exceeded the criterion. It is therefore reasonable to treat the older samples as below the criterion. With zero exceedances, there is no evidence of impairment in this reach and no dry-weather TMDLs are required.

Dry-Weather Results for Coyote Creek

There were few to no exceedances of chronic copper, lead, zinc, or selenium criteria in Coyote Creek. Two out of 111 samples exceeded the copper criterion, which does not indicate an impairment. One out of 111 samples exceeded the chronic zinc criterion, which does not indicate an impairment. One out of 111 samples exceeded the chronic lead criterion. Twenty of these samples had detection limits above CTR criterion, so it is possible that samples with non-detectable values of metals exceeded the criterion. Twenty of these samples were taken prior to 2002. Since LACSD lowered their detection limits, one out of 91 samples exceeded the criterion. It is therefore reasonable to treat the older 20 samples as below the criterion. With one exceedance, there is no evidence of impairment in this reach. No dry-weather TMDLs are required for this reach.

Dry-Weather Results for the Estuary

There are occasional exceedances of copper, lead, and zinc in samples from the Estuary. Two out of the 60 samples exceeded the chronic lead criterion for saltwater. Twenty-two of these samples had detection limits (or estimated values) greater than the CTR criterion. These samples were taken prior to 2003. Since LACSD lowered their detection limits, one out of 40 samples exceeded the criterion. It is therefore reasonable to treat the older 20 samples as below the criterion. Two exceedances do not indicate an impairment for lead.

Two out of 60 samples exceeded the chronic zinc criterion for saltwater. Seven of the 60 samples had detection limits greater than CTR criterion. These samples were taken prior to 2003. Since LACSD lowered their detection limits, two out of 40 samples exceeded the criterion. It is therefore reasonable to treat the older 20 samples as below the criterion. Two exceedances do not indicate an impairment for zinc.

Five out of 61 samples exceeded the chronic copper criterion for saltwater. Fifty-four of these samples had detection limits greater than CTR criterion. In 2003, the detection limits were lowered from 80 µg/L to 8 µg/L, which is still greater than the adjusted CTR saltwater criterion (3.7µg/L). Since LACSD lowered their detection limits to 8 µg/L, five out of 40 samples exceed the criterion. Unlike other reaches, it cannot be assumed that nondetectable values in the older data were less than CTR criterion. More weight is therefore given to the more recent data. Furthermore, when copper was detected in the samples, the criterion was exceeded by three to eight times, which demonstrates that the magnitude of exceedances is significant. Five out of 40 exceedances indicates an impairment for copper in the Estuary. Based on the weight evidence, a dry-weather TMDL is required for copper in the Estuary.

Sources of copper include automobile break pads, copper antifouling paint, building materials, industrial use, pesticides, soil erosion, copper in municipal supply water, and deposition of air emissions from fuel combustion and industrial facilities. (TDC Environmental, 2004).

Evaluation of Los Angeles County Department of Public Works (LACDPW) Dry-Weather Data

The second source of dry-weather water quality data is the Los Angeles County Department of Public Works (LACDPW) storm water mass emission stations at Coyote Creek (S13) and San Gabriel River Reach 2 (S14). LACDPW collects composite samples during storm events and dry weather for hardness, dissolved metals, and total recoverable metals. Dissolved metals data collected during dry weather were compared to hardness adjusted chronic CTR criteria to assess dry-weather impairments (Table 2-7).

Table 2-7. Summary of chronic metals criteria exceedances in LACDPW dry-weather data for San Gabriel River Reach 2 (Station S14) and Coyote Creek (Station S13) from October 1997 to June 2005.

San Gabriel Reach 2	Number of Samples	Exceedances of Chronic Criteria
Copper (dissolved)	10	0
Lead (dissolved)	10	0
Selenium (total recoverable)	10	0
Zinc (dissolved)	10	0
Coyote Creek	**Number of Samples**	**Exceedances of Chronic Criteria**
Copper (dissolved)	8	0
Lead (dissolved)	8	0
Selenium (total recoverable)	8	1
Zinc (dissolved)	8	0

Based on the LACDPW dry-weather data, there are a no exceedances of chronic copper, lead, or zinc criteria in San Gabriel River Reach 2 or Coyote Creek. There is one exceedance of the selenium criterion in Coyote Creek. There are no impairments for any of these metals and no dry-weather TMDLs are required for these reaches.

2.2.2 Wet-weather Data Summary

To assess wet-weather water quality, LACDPW storm water data were evaluated. As stated previously, LACDPW collects composite samples during storm events for hardness, dissolved metals, and total recoverable metals. Dissolved metals data from storm events were compared to hardness adjusted dissolved chronic and acute CTR criteria to assess wet-weather impairments (Table 2-8).

Table 2-8. Summary of acute and chronic criteria exceedances in LACDPW storm water data for San Gabriel River Reach 2 (Station S14) and Coyote Creek (Station S13) from November 1997 to January 2005.

San Gabriel Reach 2	Number of Samples	Exceedances of Acute Criteria	Exceedances of Chronic Criteria
Copper (dissolved)	58	2	4
Lead (dissolved)	58	0	5
Selenium (total recoverable)	58	-	1
Zinc (dissolved)	58	3	3
Coyote Creek	**Number of Samples**	**Exceedances of Acute Criteria**	**Exceedances of Chronic Criteria**
Copper (dissolved)	62	9	19
Lead (dissolved)	62	0	7
Selenium (total recoverable)	62	-	4
Zinc (dissolved)	62	6	6

Detection limits for all metals were below the CTR acute and chronic criteria. Therefore, if metals were not detected in a sample, CTR criteria were not exceeded.

Wet-Weather Results for San Gabriel River Reach 2

There were five out of 58 samples that exceeded the chronic lead criterion, which indicates an impairment. There were four out of 58 exceedances of the chronic copper criterion and three out of 58 exceedances of the chronic zinc criterion. This does not indicate impairments for these metals. A wet-weather TMDL is required for lead in San Gabriel River Reach 2.

Wet-Weather Results for Coyote Creek

In Coyote Creek, there were 19 out of 62 samples exceeding the chronic copper criterion, seven out of 62 samples exceeding the chronic lead criterion, and six out of 62 samples exceeding the chronic zinc criterion. This indicates impairments for these metals. There were four out of 62 exceedances of the chronic selenium criteria. This does not indicate an impairment. Wet-weather TMDLs are required for copper, lead, and zinc in Coyote Creek.

2.2.3. Conclusions

The available data provide an overall picture of water quality during both dry and wet weather. The data review confirms the existence of impairments for some of the metals identified in the 1998 and 2002 303(d) lists. The more recent data indicates additional dry-weather impairments not included on the 303(d) list. Based on the conclusions drawn from the data review, TMDLs are developed for the pollutant-water body combinations shown in Table 2-9.

Table 2-9. TMDLs required to address wet- and dry-weather impairments.

Dry-weather TMDLs	Copper	Lead	Zinc	Selenium
San Jose Creek Reach 1				X
Estuary	x			
Wet-weather TMDLs	**Copper**	**Lead**	**Zinc**	**Selenium**
San Gabriel River Reach 2		x		
Coyote Creek	x	x	x	

Dry-weather TMDLs will be developed for copper in the Estuary and selenium in San Jose Creek Reach 1. Allocations will be developed for upstream reaches and tributaries to meet TMDLs in downstream reaches. Discharges to upstream reaches can cause or contribute to exceedances of water quality standards and contribute to impairments downstream. Dry-weather allocations will be assigned to San Gabriel River Reach 1 and Coyote Creek and its tributaries to meet the copper TMDL in the Estuary. Dry-weather allocations will be assigned to San Jose Creek Reach 2 to meet the selenium TMDL in San Jose Creek Reach 1. No dry-weather allocations are required for San Gabriel River Reaches 2, 3, 4, 5, San Jose Creek, or Walnut Creek because they do not drain to the Estuary during dry weather.

Wet-weather TMDLs will be developed for lead in San Gabriel River Reach 2 and for copper, lead, and zinc in Coyote Creek. Allocations will be developed for all upstream reaches and tributaries in the watershed because they drain to impaired reaches during wet weather. Discharges to these upstream reaches can cause or contribute to exceedances of water quality standards in San Gabriel River Reach 2 and Coyote Creek and thus contribute to impairments.

There are no available data to assess water quality in Reaches 4, or 5 of the San Gabriel River or Walnut Creek. There are no wet-weather data for Reach 1 and it is not possible to assess wet-weather water quality at the bottom of the watershed. Additional data representing wet-weather conditions in Reach 1 and the Estuary are needed. No TMDLs or waste load allocations will be developed for Reach 1 or the Estuary during wet-weather, but wet-weather monitoring will be required as part of the implementation of this TMDL.

3. NUMERIC TARGETS

Numeric targets for the TMDL are based on CTR criteria. As stated in section 2.1.2, CTR criteria are expressed as dissolved metals because dissolved metals more closely approximate the bioavailable fraction of metals in the water column. However, sources of metals loading to the watershed include metals associated with particulate matter. Once discharged to the river, particulate metals could dissolve, causing the criteria to be exceeded. The TMDL targets, and resulting waste load allocations, are expressed in terms of total recoverable metals to address the potential for dissolution of particulate metals in the receiving water. Attainment of numeric targets expressed as total recoverable metals will ensure attainment of the dissolved CTR criteria.

Separate numeric targets are developed for dry and wet weather because hardness values and the fractionation between total recoverable and dissolved metals vary between dry and wet weather. As in other TMDLs (e.g., the Los Angeles River Metals TMDL), the distinction between wet and dry weather is operationally defined as the 90th percentile flow in the river. Because separate wet-weather TMDLs are required for San Gabriel Reach 2 and Coyote Creek, the distinction between wet- and dry-weather is separately defined for these two reaches.

To determine the distinction between wet and dry weather, historical flows were obtained from flow gauge stations located in the watershed (Figure 3). LACDPW flow gauge station F262C-R is located in San Gabriel River Reach 2. Very little flow is measured at this gauge because much of Reach 2 is used for groundwater recharge; the median flow is 0.0 cubic feet per second (cfs) and the 90th percentile flow is 1.0 cfs based on flow records from 1990 to 2005. There is a United States Geological Survey (USGS) gauge station located at the bottom of Reach 3 just above Whittier Narrows Dam (station 1108500). The flow gauge above the dam is the best indicator of wet-weather conditions (i.e., sufficient runoff is generated to cause a response in the river flow and to wash off pollutants from the watershed land surface). Gauges below the dam would record a delayed response in flows due to the impact of the dam. In the meantime, storm water runoff would be making its way to the river. Therefore, the flow gauge above the dam is the best indicator of when wet-weather conditions are sufficient to result in storm water runoff. Furthermore, when flows reach the 90th percentile at USGS station 11085000, the upper and lower portions of the watershed are most likely connected. Flows of this magnitude will likely exceed the dam’s capacity. Defining wet weather in this way addresses wet-weather impairments in Reach 2 by ensuring that upper reaches do not contribute to downstream impairments. The delineation between wet and dry weather in Reach 2 therefore occurs when the maximum daily flow at USGS station 11085000 is 260 cfs. This is the 90th percentile flow based on flow records from 1990 to 2005 (Figure 4). Wet-weather targets apply when the maximum daily flow is equal to or greater than 260 cfs.

In Coyote Creek, the delineation between wet and dry weather occurs when the maximum daily flow at LACDPW flow gauge station F354-R, located at the bottom of the creek is 156 cfs. This is the 90th percentile flow based on flow records from 1990 to 2005 (Figure 5) and is representative of wet-weather conditions. Wet-weather targets apply when the maximum daily flow in the creek is equal to or greater than 156 cfs.

3.1 Dry-Weather Targets

Dry-weather numeric targets are developed for copper in the Estuary and selenium in San Jose Creek Reach 1 (Table 3-1). Numeric targets are based on chronic CTR criteria because these are the most protective criteria and the most applicable during dry-weather conditions. Targets for the Estuary are based on CTR saltwater criteria because the salinity in the Estuary is greater than 10 parts per thousand 95% or more of the time. Targets for San Jose Creek Reach 1 are based on CTR freshwater criteria. Dry-weather targets are independent of hardness. A CTR default conversion factor is applied as a translator to convert the copper target from dissolved to total recoverable metals.

Table 3-1. Dry-weather numeric targets expressed as µg/L total recoverable metals.

	Copper			Selenium		
Reach	Chronic Saltwater Criteria (µg/L dissolved)	CCF	Numeric Target (µg/L total)	Chronic Freshwater Criteria (µg/L total)	CCF	Numeric Target (µg/L total)
San Jose Creek Reach 1	--	--	--	5	--	5
San Gabriel River Estuary	3.1	0.83	3.7	--	--	--

Based on monitoring conducted for previous TMDLs, the default conversion factor overestimates the fraction of copper in the dissolved form. Although there is insufficient dry-weather data in the San Gabriel River watershed to demonstrate this assertion, it was demonstrated in the Los Angeles River watershed, using City of Los Angeles Watershed Monitoring Program data, which had similar watershed characteristics and sources of flow and pollutant loading. The use of the default conversion factors is applied to the margin of safety.

3.2 Wet Weather Targets

CTR acute criteria are the basis for the wet-weather targets because they are protective of aquatic life during the generally short-term and episodic storm conditions that exist in the San Gabriel River watershed. Median hardness values from LACDPW storm water data (Table 3-2) were used to calculate reach specific targets for lead in San Gabriel River Reach 2 and copper, lead and zinc in Coyote Creek. Selenium targets are independent of hardness.

Table 3-2. Wet-weather hardness values (mg/L as $CaCO_3$) from LACDPW storm water data (1997-2005).

Reach	Number of samples	10th percentile hardness	50th percentile hardness	90th percentile hardness
San Gabriel Reach 2	58	99	175	282
Coyote Creek	61	51	105	210

The data collected by LACDPW were also used in a regression analysis to evaluate the relationship between dissolved and total recoverable metals in storm water (Table 3-3). The slope of the regression reflects the ratio of the dissolved to total recoverable concentration; the r-squared value reflects the strength of the relationship.

Table 3-3. Relationship between dissolved and total recoverable metals in storm water data in San Gabriel River Reach 2 and Coyote Creek (1997-2004) and CTR default conversion factors.

Metal	LACDPW Storm water data in SGR Reach 2			ACF	LACDPW Storm water data in Coyote Creek			ACF
	N	Slope	R^2		N	Slope	R^2	
Copper	58	0.28	0.42	0.960	62	0.51	0.64	0.960
Lead	58	0.36	0.48	0.709*	62	0.49	0.75	0.784*
Zinc	58	0.34	0.29	0.978	62	0.62	0.60	0.978

*ACF for cadmium and lead are hardness dependent and were calculated based on the hardness in SGR Reach 2 (175 mg/L as Ca CO_3) and Coyote Creek (105 mg/L as Ca CO_3).

These regressions suggest that the CTR default conversion factors overestimate the dissolved portion of metals in storm water. However, the r-squared values suggest a weak linear relationship between the dissolved and total recoverable values. The slope of the regression is therefore not used to convert the dissolved criteria to a total recoverable metals target. The CTR default conversion factors are used instead. The resulting wet-weather numeric targets are presented in Table 3-4.

Table 3-4. Wet-weather numeric targets expressed as µg/L total recoverable metals.

		Copper		Lead		Zinc	
Reach	Median Hardness (mg/L as $CaCO_3$)	ACF	Numeric Target (µg/L)	ACF	Numeric Target (µg/L)	ACF	Numeric Target (µg/L)
San Gabriel Reach 2	175	--	**--**	0.709	**166**	--	--
Coyote Creek	105	0.96	**15**	0.784	**87**	0.987	**125**

*ACF for lead is based on median hardness values.

Evaluation of the storm water data compared to the default conversion factor showed that the default conversion factor overestimates the fraction of metal in the dissolved form. Figures 6 through 9 show that when measured values of dissolved metals were plotted against measured values of total metals, most of the measured values fell below the line CTR-based trend lines of $y = 0.96x$ for copper, $y = 0.79x$ for lead, and $y = 0.978x$ for zinc. Data from literature confirm this and suggest that there is an even smaller portion of dissolved metals in wet weather. Young et al. 1980 estimated that only 10% of the cadmium, copper, lead, and zinc in storm water samples were dissolved. McPherson et al. 2004 found similar results in storm water from nearby Ballona Creek. In that study, only 17% of the cadmium, 37% of the copper, and 14% of the lead were dissolved. The use of the default conversion factors is applied to the margin of safety.

4. SOURCE ASSESSMENT

This section identifies the potential sources of metals in the San Gabriel River watershed. In the context of TMDLs, pollutant sources are either point sources or nonpoint sources. Point sources include discharges for which there are defined outfalls such as wastewater treatment plants, industrial discharges, and storm drain outlets. These discharges are regulated through National Pollutant Discharge Elimination System (NPDES) permits. Nonpoint sources, by definition, include pollutants that reach waters from a number of diffuse land uses and source activities that are not regulated through NPDES permits.

4.1 Point Sources

The NPDES permits in the San Gabriel River Watershed include municipal separate storm sewer system (MS4) permits, the Caltrans storm water permit, general construction storm water permits, general industrial storm water permits, major NPDES permits (including publicly owned treatment works), minor NPDES permits, and general NPDES permits. The permits under the jurisdiction of the Los Angeles Regional Board are presented in Table 4-1.

Table 4-1. Summary of Los Angeles Regional Board issued NPDES permits in San Gabriel River watershed. (SOURCE: LARWQCB, 2006).

Type of Discharge	Estuary	Reach 1	Coyote Creek	Reach 2	San Jose Creek	Reach 3 and Above	Total Permits
Municipal Storm Water	*	*	*	*	*	*	3
Caltrans Storm Water	*	*	*	*	*	*	1
Industrial Storm Water	-	45	203	8	177	166	599
Construction Storm Water	2	20	36	18	136	132	344
Publicly Owned Treatment Works	--	1	1	--	2	1	5
Major NDPES Discharges	2	--	--	--	--	--	2
Minor NPDES Discharges	--	--	5	1	3	2	11
General NPDES Discharges	5	7	22	4	11	7	56
Construction Dewatering	1	2	4	--	8	1	16
Petroleum Fuel Cleanup Sites	--	--	4	1	--	--	5
VOC Cleanup Sites	--	1	2	--	--	1	4
Hydrostatic Test Water	2	--	1	--	1	--	4
Non-Process Wastewater	--	--	3	--	--	--	3
Potable Water	2	4	8	3	2	5	24

*Municipal and Caltrans permits discharge to all reaches.

The upper portion of Coyote Creek and a portion of the watershed draining to the Estuary are located in Orange County and are under the jurisdiction of the Santa Ana Regional Board. The permits under the jurisdiction of the Santa Ana Regional Board are presented in Table 4-2.

Table 4-2. Summary of Santa Ana Regional Board issued NPDES permits in the Coyote Creek and Estuary subwatersheds (SOURCE: SARWQCB, 2006).

Type of Discharge	No. of Permits
Municipal Storm Water	2
Caltrans Storm Water	1
Industrial Storm Water	207
Construction Storm Water	184
Publicly Owned Treatment Works	0
Major NDPES Discharges	0
Minor NPDES Discharges	2
General NPDES Discharges	
De Minimus Discharges	2
Petroleum and Solvents Cleanup Sites	3

4.1.1. Storm water Permits

Storm water runoff in the San Gabriel River Watershed is regulated through the Los Angeles County MS4 permit, the Long Beach MS4 permit, the Orange County MS4 permit, the statewide storm water permit issued to Caltrans, the statewide Construction Activities Storm Water General Permit and the statewide Industrial Activities Storm Water General Permit.

MS4 Storm Water Permits

In 1990, EPA developed rules establishing Phase I of the NPDES storm water program, designed to prevent pollutants from being washed by storm water runoff into the MS4 (or from being discharged directly into the MS4) and then discharged into local waterbodies. Phase I of the program required operators of medium and large MS4s (those generally serving populations of 100,000 or more) to implement a storm water management program as a means to control polluted discharges. Individual sources of metals within the watershed, which are collected by MS4s and discharged to the river, include automobile break pads, vehicle wear, building materials, pesticides, erosion of paint and deposition of air emissions from fuel combustion and industrial facilities.

The Los Angeles County MS4 permit was renewed in December 2001 as Order No. R4-01-182 and is on a five-year renewal cycle. There are 85 co-permittees covered by this permit, including 84 incorporated cities and the County of Los Angeles. The City of Long Beach MS4 permit was renewed on June 30, 1999 as Order No. R4-99-060 and is on a five-year renewal cycle. It solely covers the City of Long Beach. The Orange County MS4 permit was renewed on January 18, 2002 as Order No. R8-2002-0010. Co-permittees covered by this permit include 25 incorporated cities and Orange County.

Caltrans Storm Water Permit

Caltrans is regulated by a statewide storm water discharge permit that covers all municipal storm water activities and construction activities (State Board Order No. 99-06-DWQ). The Caltrans storm water permit authorizes storm water discharges from Caltrans properties such as the state highway system, park and ride facilities, and maintenance yards. The storm water discharges from most of these Caltrans properties and facilities eventually end up in either a city or county storm drain which are then discharged to the river.

General Storm Water Permits

In 1990, EPA issued regulations for controlling pollutants in storm water discharges from industrial sites (40 CFR Parts 122, 123, and 124) equal to or greater than five acres. The regulations require discharges of storm water associated with industrial activity to obtain an NPDES permit and to implement Best Available Technology Economically Achievable (BAT) to reduce or prevent nonconventional and toxic pollutants associated with industrial activity, including metals, in storm water discharges and authorized non-storm discharges. In 1999, EPA expanded the program to include storm water discharges from construction sites that resulted in land disturbances equal to or greater than one acre (40 CFR Parts 122, 123, and 124).

On April 17, 1997, State Board issued a statewide general NPDES permit for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities Permit (Order No. 97-03-DWQ, NPDES Permit Nos. CAS000001). As of the writing of this TMDL, there are approximately 804 dischargers enrolled under the general industrial storm water permit in this watershed (596 under the jurisdiction of the Los Angeles Board and 208 under the jurisdiction of the Santa Ana Regional Board). The potential for metals loading via runoff from these sites is high, especially at metal plating, transit, and recycling facilities. Stenstrom et al. (2005) found that although the data collected by the industrial monitoring program were highly variable, the mean values for copper, lead and zinc were 1010, 2960, and 4960 µg/L, respectively, greatly exceeding applicable CTR values. However, during dry weather, the potential contribution of metals loading from industrial sites is low, because non-storm water discharges are prohibited or controlled by the permit.

On August 19, 1999, State Board issued a statewide general NPDES permit for Discharges of Storm Water Runoff Associated with Construction Activities (Order No. 99-08-DQW, NPDES Permit Nos. CAS000002). As of the writing of this TMDL, there are 537 dischargers enrolled under the general construction storm water permit in the watershed (350 under the jurisdiction of the Los Angeles Board and 187 under the jurisdiction of the Santa Ana Regional Board). Sources of metals from construction sites include sediment containing metals, construction materials, and equipment used on construction sites. Raskin et al. (2004) found that building materials and construction waste exposed to storm water can leach metals and contribute metals to waterways. However, during dry weather, the potential contribution of metals loading is low because non-storm water discharges are prohibited or controlled by the permit.

4.1.2. Publicly Owned Treatment Works (POTWs)

The LACSD Joint Outfall System is an integrated network of facilities that includes seven treatment plants, five of which are associated with the San Gabriel River Watershed. These five treatment plants (Whittier Narrows, Pomona, Long Beach, Los Coyotes, and San Jose Creek) are connected to the Joint Water Pollution Control Plant (JWPCP) which discharges off of the Palos Verdes Peninsula. This system allows for the diversion of desired flows into or around each "upstream" plant.

- The most upstream plant is the Pomona WRP (Order No. 95-078). It has a design capacity of 15 million gallons per day (MGD) and discharges tertiary-treated municipal and industrial wastewater to the South Fork of San Jose Creek. During dry weather, virtually all of the treated effluent is reclaimed for landscape and crop irrigation, as well as for industrial processes.

- The San Jose Creek WRP (95-079) has a design capacity of 100 MGD. It discharges an average of 80 MGD of tertiary-treated municipal and industrial wastewater via three discharge points. Discharge No. 001 to San Gabriel River Reach 1 is the primary discharge outfall for both east and west plants, which is eight miles south of the plant near Firestone Blvd. The river is concrete-lined from the discharge point to the Estuary, about nine miles downstream. A turnout located approximately midway down the pipe is used to divert reclaimed water to spreading grounds. Discharge No. 002 to San Jose Creek is used for groundwater recharge at Rio Hondo and the San Gabriel Coastal Spreading Grounds. San Jose Creek is unlined from the discharge point to the San Gabriel River. Discharge No. 003 delivers treated effluent to the unlined portion of the San Gabriel River Reach 3 as well as the Rio Hondo and San Gabriel Coastal Spreading Grounds.

- The Whittier Narrows WRP (Order No. 95-082) has a design capacity of 15 MGD. There is one discharge point to the San Gabriel River. Discharge No. 001 discharges to the river about 700 feet upstream from the Whittier Narrows Dam. The tertiary-treated municipal and industrial wastewater generally flows down the river to the San Gabriel River Spreading Grounds.

- The Los Coyotes WRP (Order No. 95-077) has a design capacity of 37.5 MGD. Tertiary-treated municipal and industrial wastewater is discharged into the San Gabriel River Reach 1, 1,230 feet upstream of the Artesia freeway. About 12% of the total treated effluent is reclaimed for irrigation.

- The Long Beach WRP (Order No. 95-076) has a design capacity of 25 MGD. Tertiary-treated municipal and industrial wastewater is discharged to Coyote Creek at a point 2,200 feet upstream from the confluence with the San Gabriel River, above the Estuary. A portion of the treated effluent is reclaimed for irrigation.

4.1.3 Major Individual NPDES Permits

Major discharges are POTWs with yearly average flows over 0.5 MGD, industrial sources with yearly average flows over 0.1 MGD, and those with lesser flows but with acute or potential adverse environmental impacts. In addition to the POTWs, there are two major discharges in the watershed, the Haynes generating station, operated by the City of Los Angeles Department of Water and Power (LADWP) and the generating station operated by AES Alamitos, L.L.C. Both plants draw in water from the nearby Los Cerritos Watershed Management Area and discharge into the tidal prism just north of Second St. (Westminster Ave.). The Alamitos plant draws in water from Los Cerritos Channel and is permitted to discharge up to 1,283 MGD. The Haynes plant draws in water from Alamitos Bay and is permitted to discharge up to 1,014 MGD. The Alamitos and Haynes stations have limits for copper, lead, selenium, and zinc, but they are based on California Ocean Plan objectives. The Ocean Plan objectives are less stringent than the CTR saltwater criteria so there is the potential for the facilities to discharge metals in exceedance of the numeric targets. A memorandum sent from the State Board to the Los Angeles Regional Board (SWRCB 2002) redefined the two power plants as falling under the jurisdiction of the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP) and the CTR. These permits are scheduled for renewal in 2006.

4.1.4 Minor Individual NPDES Permits

Minor discharges are all other discharges that are not categorized as a Major. Many of these permits are for episodic discharges rather than continuous flows. Minor permits cover miscellaneous wastes such as ground water dewatering, swimming pool wastes, and ground water seepage. Some of these permits contain effluent limits for metals. However, some of these permits were issued prior to the adoption of CTR and there is the potential for these facilities to discharge metals in exceedance of the numeric targets in this TMDL. There are 11 minor NPDES permits in the San Gabriel River watershed.

4.1.5 General NPDES Permits

Pursuant to 40 CFR parts 122 and 123, the State Board and the Regional Boards have the authority to issue general NPDES permits to regulate a category of point sources if the sources: involve the same or substantially similar types of operations; discharge the same type of waste; required the same type of effluent limitations; and require similar monitoring. The Los Angeles Regional Board has issued general NPDES permits in the San Gabriel River watershed for the following categories of discharges: construction dewatering, non-process wastewater; petroleum fuel cleanup sites; VOC cleanup sites; potable water; and hydrostatic test water.

There are 16 discharges enrolled under Los Angeles Regional Board Order Nos. R4-2003-0111, 97-043, and 97-045 for construction dewatering. There are three discharges enrolled under Los Angeles Regional Board Order Nos. R4-2004-0058 and 98-055 for non-process wastewater. These permits include CTR-based effluent limitations for metals.

There are five dischargers enrolled under Los Angeles Regional Board Order No. R4-2002-0125 for treated groundwater and other wastewaters from petroleum fuel-contaminated sites. There are four dischargers enrolled under Los Angeles Regional Board Order No. R4-2002-0107 for treated groundwater from VOC-contaminated sites. To enroll under these permits, dischargers must demonstrate that treated groundwater does not exceed the CTR-based water quality criteria for metals. Once enrolled under the permit, dischargers must continue to demonstrate compliance with CTR-based effluent limitations for lead.

There are 24 dischargers enrolled under Los Angeles Regional Board Order No. R4-2003-0108 for groundwater from potable water supply wells. There are four dischargers enrolled under Los Angeles Regional Board Order Nos. R4-2004-0109 and 97-047 for low threat hydrostatic test water. Discharges enrolled under these permits must meet maximum contaminant levels (MCLs) adopted by the California Department of Health Services. In general, the MCLs for metals are greater than the numeric targets.

The Santa Ana Regional Board has issued general NPDES permits in the Coyote Creek subwatershed for de minimus discharges and for petroleum and solvent cleanup sites. There are two discharges enrolled under Santa Ana Regional Board Order No.03-061 for de minimus threats to water quality. The order states that discharges enrolled under the general permit are not expected to cause toxicity; therefore no toxicity limits are included in the general permit. There are three discharges enrolled under Santa Ana Regional Board Order No. 02-007 for discharges of extracted and treated groundwater from petroleum and solvent cleanup sites. The Order includes CTR-based effluent limitations for lead for freshwater and saltwater discharges from those sites polluted with leaded gasoline.

4.2 Non-point Sources

Atmospheric deposition is a potential nonpoint source of metals to the watershed. Sabin et al. estimated the mass of dry-atmospheric deposition for the Los Angeles River watershed (Sabin et al., 2004). For the purpose of this source assessment, the numbers for the Los Angeles River watershed were extrapolated to the San Gabriel River watershed based on the relative area of each watershed and the relative amount of surface water in each watershed (Table 4-2). Direct atmospheric deposition is the amount of metals deposited directly onto the surface of the river. These numbers are generally small because the actual surface area of the river system is small. Indirect deposition is the amount of metals deposited onto the entire watershed. Metals deposited on the land surface of the watershed may be washed off during rain events and delivered to the river system. The amount of deposited metals available for transport to the river (i.e., not infiltrated) is unknown. In a separate study, Sabin et al. found that for a small impervious catchment, atmospheric deposition could potentially account for 57-100% of the metals in storm runoff generated in the study area (Sabin et al., 2005). This study assumes that all the metals deposited on the catchment were available for removal. However, in large, varied watersheds, such as the Los Angeles River and San Gabriel River watersheds, not all metals deposited on the land surface may be available for removal by runoff. Estimates of metals deposited on land (Table 4-3) are much higher than estimates of storm water loading to the river system (Table 4-9). The loading of metals associated with indirect atmospheric deposition are accounted for in the estimates of the storm water loading. Once metals are deposited on land under the jurisdiction of a storm water permittee, they are within a permittee's control.

Table 4-3. Estimates of dry weather direct and indirect deposition (derived from Sabin et al., 2004).

	Area (square miles)	% Water	Copper (kg/year)	Lead (kg/year)	Zinc (kg/year)
Los Angeles River Watershed	834	0.21%			
Indirect Deposition			16,000	12,000	80,000
Direct Deposition			3	2	10
San Gabriel River Watershed	682	0.36%			
Indirect Deposition			13,084	9,813	65,419
Direct Deposition			4.1	2.8	13.8

Natural background loading of metals is another potential source. This is an unlikely source during dry weather. Natural or open spaces are primarily located in the upper portion of the watershed in the Angeles National Forest (Figure 2). The flow from these areas is relatively small during dry weather and much of it is captured behind dams. The levels of metals concentrations in flow from these areas are also likely to be low. Stein and Yoon (2005) found that metals concentrations from natural areas in Southern California, including two sites in the upper San Gabriel watershed, were below CTR criteria and below concentrations found at developed sites. The mean concentrations for the natural areas were 0.465 µg/L copper, 0.052 µg/L lead, 0.618 µg/L selenium, and 0.471 µg/L zinc during dry weather.

During wet-weather, flow from the upper portion of the watershed can potentially reach the lower portion of the watershed. Stein and Yoon (2005) also found that metals concentrations from natural areas in wet-weather were below CTR criteria and below concentrations found at developed sites. During wet weather, the mean concentrations for the natural areas were 5.27 µg/L copper, 1.42 µg/L lead, 0.77 µg/L selenium, and 21.5 µg/L zinc. Natural sources will be assigned load allocations to address any potential loading during dry and wet weather.

4.3 Quantification of Sources

The San Gabriel River has two distinct flow conditions. During wet-weather periods, flow in the river is generated by storm water runoff in the watershed, which can quickly reach thousands of cubic feet per second. During dry weather, flows are significantly lower and less variable. The major sources of flow are point source discharges, urban runoff, and groundwater baseflow.

4.3.1. Dry-Weather Loading

The total metals loads from the San Jose, Pomona, Whittier Narrows, Los Coyotes, and Long Beach WRPs were estimated using monthly flow and effluent concentration data provided as part of the annual self monitoring reports (Table 4-4). On an annual basis, these POTWs contribute approximately 1,918 kg/year of copper, 1,541 kg/year of lead, 201 kg/year of selenium and 11,929 kg/year of zinc to the San Gabriel River. Much of the water from the Pomona, Whittier Narrows, and San Jose Creek WRPs is recharged; thus, while these values reflect metals loading to the system, some of the metals loading are lost to recharge.

Table 4-4. Total annual metals loading from POTWs (kg/yr). Data are from LACSD.

Facility	Reach	1997	1998	1999	2000	2001	2002	2003	2004	Ave
Copper										
Pomona	SJC	36	30	31	44	42	26	22	32	33
San Jose Creek 001e and 002	SGR 1 SJC	703	736	711	784	695	656	655	651	699
San Jose Creek 001w and 003	SGR 1 SGR 3	399	403	398	410	326	189	282	359	346
Whittier Narrows*	SGR 3	119	139	141	104	109	110	106	85	114
Los Coyotes	SGR 1	450	483	462	437	410	310	328	330	401
Long Beach	CC	181	236	197	218	218	136	158	161	188
Total WRP										**1781**
Lead										
Pomona	SJC	40	30	63	44	42	5	5	12	30
San Jose Creek 001e and 002	SGR 1 SJC	703	515	711	784	417	131	131	130	440
San Jose Creek 001w and 003	SGR 1 SGR 3	359	282	398	410	195	38	56	72	226
Whittier Narrows*	SGR 3	131	97	141	104	87	22	32	21	79
Los Coyotes	SGR 1	900	967	923	437	455	116	82	83	495
Long Beach	CC	362	472	296	218	194	34	40	40	207
Total WRP										**1477**
Selenium										
Pomona	SJC	4	3	3	4	4	3	3	4	3
San Jose Creek 001e and 002	SGR 1 SJC	77	74	71	78	70	66	66	65	71
San Jose Creek 001w and 003	SGR 1 SGR 3	60	40	40	41	33	19	28	36	37
Whittier Narrows*	SGR 3	12	14	14	10	11	11	11	11	12
Los Coyotes	SGR 1	45	48	46	44	46	39	41	41	44
Long Beach	CC	18	24	20	22	24	17	20	20	21
Total WRP										**188**
Zinc										
Pomona	SJC	253	182	315	264	210	157	247	373	250
San Jose Creek 001e and 002	SGR 1 SJC	4217	3678	3556	3919	3477	3278	5241	4554	3990
San Jose Creek 001w and 003	SGR 1 SGR 3	3587	2417	2788	2869	1955	1324	2822	2869	2579
Whittier Narrows*	SGR 3	535	1039	988	832	761	767	1064	844	854
Los Coyotes	SGR 1	3601	3866	2769	3062	2732	2713	4506	3300	3319
Long Beach	CC	1321	1062	1379	1306	1211	1020	1960	1471	1341
Total WRP										**10,992**

*The majority of Whittier Narrows flow is discharged to the Rio Hondo, which is part of the Los Angeles River watershed.

The amount of metals loading from POTWs is well defined. The amount of metals loading from storm drains and dry weather runoff is not well defined. In order to evaluate all dry-weather sources of metals in the San Gabriel River watershed, the Southern California Coastal Research Project (SCCWRP) conducted two monitoring events in September 2002 and September 2003 (Ackerman et al., 2004a). The monitoring consisted of synoptic sampling of flow and metals concentrations from WRPs, storm drains and open channels. The first monitoring event was conducted on September 29 and 30, 2002, and the second was conducted on September 14 through 16, 2003. The data collected represent snapshots of the flow distribution and water quality conditions throughout the watershed. During the sampling events, all observed sources of flow to the San Gabriel River system were from storm drains, tributaries, and the Los Coyotes, Long Beach, San Jose, and Pomona WRPs (Table 4-5).

Table 4-5. Measured flow inputs (cfs) to the San Gabriel River (Ackerman et al, 2004a).

	Coyote Creek	San Gabriel	San Jose Creek	Walnut Creek	Total
2002					
Storm drains	10.6	3.1	14.3	1.2	29.2
Tributaries	8.30	-	1.0	6.0	15.3
WRPs	0.04	97.5	58.3	-	155.8
Total	19.0	100.5	73.7	7.23	200.3
2003					
Storm drains	11.9	1.6	13.5	1.7	28.7
Tributaries	7.44	-	6.66	3.9	18.0
WRPs	18.7	104.4	87.3	-	210.4
Total	38.0	106.0	107.4	5.64	257.1

Overall, WRPs contribute about 80% of the flow in the river system during dry-weather. Walnut Creek receives no WRP flow. The Whittier Narrows WRP did not contribute to flow in the San Gabriel River during the two dry-weather sampling events.

The measured concentrations of metals varied between storm drains, open channels, and WRPs (Table 4-6). The concentrations of all metals were greater in storm drains than in WRP discharges. The concentrations of all metals except zinc were greater in open channels than in WRP discharges. This indicates that dry-weather runoff or nuisance flow and/or discharges from other NPDES permitted sources are a significant source of metals in the San Gabriel watershed.

Table 4-6. Mean observed metals concentrations by source (Ackerman et al., 2004a).

	Detection Limit (µg/L)	Storm Drains (µg/L)	Open Channels (µg/L)	WRPs (µg/L)
2002				
Copper	8	15	7.0	nd
Lead	2	2.6	3.0	nd
Nickel	20	7.4	nd	nd
Zinc	10	134	28	45
2003				
Copper	8	8.0	3.0	nd
Lead	2	1.6	1.9	nd
Nickel	20	0.7	nd	nd
Zinc	10	99	57	72

nd = non-detectable value

The reported values for copper, lead, and nickel are sometimes less than the detection limit because non-detectable concentrations were treated as zero. Loads were calculated by multiplying the measured flows and concentrations at each sample location. Table 4-7 provides the summary results in terms of total mass emissions of each metal and the relative contribution from each major source.

Table 4-7. Metals loading by source. Samples with non-detectable values treated as zero (Ackerman et al., 2004a).

	Storm Drains	Large Tributaries	WRPs
2002			
Copper	38%	62%	0%
Lead	29%	71%	0%
Nickel	100%	0%	0%
Zinc	14%	8%	78%
2003			
Copper	100%	0%	0%
Lead	25%	75%	0%
Nickel	100%	0%	0%
Zinc	11%	7%	82%

The SCCWRP study assumed all non-detectable values were zero, when the actual concentration of metals may be nearly as high as the detection level. For WRPs, which contribute the dominant source of flow in the river, minor changes in concentrations can have a major effect on loading estimates. If non-detectable values were treated as ½ the detection limit, for example, the WRPs would appear as the dominant source of loading.

Table 4-8 provides the SCCWRP study results in terms of total mass emissions of each metal and the relative emissions to the four streams in the San Gabriel River system. According to the SCCWRP study, Walnut Creek contributes a large percentage of copper and lead loading. This indicates that additional monitoring is needed for Walnut Creek. There was not enough data to assess potential metals impairments in Walnut Creek (Section 2.2.1).

Table 4-8. Metals loading by reach/tributary Samples with non-detectable values treated as zero (Ackerman et al., 2004a).

	Coyote Creek (%)	San Gabriel River (%)	San Jose Creek (%)	Walnut Creek (%)
2002				
Copper	22%	12%	20%	46%
Lead	55%	14%	8%	24%
Nickel	9%	50%	36%	0%
Zinc	8%	53%	36%	3%
2003				
Copper	49%	2%	29%	20%
Lead	11%	1%	39%	50%
Nickel	0%	0%	100%	0%
Zinc	16%	43%	38%	3%

4.3.2. Dry-Weather Loading to the Estuary

Sources of flow to the Estuary include upstream inputs to Reach 1 and Coyote Creek, the two generating stations, and tidal exchange with the ocean. Upstream sources were evaluated in section 4.3.1. The total metals loads from the Los Alamitos and Haynes generating stations were estimated using effluent monitoring from the two plants (Table 4-9). Both plants sample for monthly flow and semi-annual metals concentrations. Annual average flows were calculated from the monthly average maximum flows, then multiplied by the average effluent concentration to estimate annual loading. On an annual basis, the generating stations contribute approximately 20,000 kg/year of copper, 2,700 kg/year of lead, and 56,000 kg/year of zinc to the Estuary.

Table 4-9. Metals loading to the San Gabriel River Estuary (kg/year total recoverable metals) from the Los Alamitos and Haynes generating stations.

Haynes Station	2000	2001	2002	2003	2004	Average
Flow (MGD)	729	779	848	761*	689	761
Copper (kg/year)	ND	26,583	23,621	10,419	16,752	15,475
Lead (kg/year)	5,238	1,864	ND	1,016	832	1,790
Zinc (kg/year)	16,620	16,334	18,370	21,815	72,489	29,126

Alamitos Station	2000	2001	2002	2003	2004	Average
Flow (MGD)	914	981	735	680	953	853
Copper (kg/year)	6,690	4,200	3,800	3,701	3,972	4,473
Lead (kg/year)	ND	986	841	1,626	1,152	921
Zinc (kg/year)	42,204	23,111	14,359	37,076	15,729	26,496

Total - Both Plants	2000	2001	2002	2003	2004	Average
Copper (kg/year)	6,690	30,784	27,422	14,120	20,725	19,948
Lead (kg/year)	5,238	2,850	841	2,642	1,984	2,711
Zinc (kg/year)	58,824	39,445	32,729	58,891	88,218	55,621

*Flow unavailable for 2003. Average flow used.

Metals loading from the power plants is approximately ten times greater than the metals loading from POTWs that discharge to Coyote Creek and Reach 1 (Table 4-4).

4.3.4. Wet-Weather Loading

Wet-weather sources of metals are generally associated with the accumulation and wash-off of metals on the land surface during rain events. Metals washed off the land surface are delivered to the river through creeks and storm water collection systems. Wet-weather loading varies depending on the amount of rainfall and size of storms in a given year.

Wet-weather pollutant loading is estimated from the storm water monitoring data collected at the mass emission stations in Coyote Creek and San Gabriel River Reach 2 (LACDPW, 2000-2005). The total runoff volume for a storm season is multiplied by the average metals concentrations for that season (Table 4-10).

Table 4-10. Wet-weather storm water metals loading to the San Gabriel River watershed (kg total recoverable metals). Data are from LACDPW.

San Gabriel River Reach 2	97/98	98/99	99/00	00/01	01/02	02/03	03/04	Average
No. storms sampled for metals	9	13	10	9	6	4	3	--
Total runoff volume (acre-ft)	32,800	12,700	3,777	8,404	3,258	9,684	25,694	--
Average copper concentration (µg/L)	24.5	7.3	7.4	8.6	12.8	27	12.7	--
Copper loading (kg)	990	115	34	89	51	323	403	286
Average lead concentration (µg/L)	15	--	--	2.8	1.9	13.5	1.8	--
Lead loading (kg)	607	--	--	29	8	161	57	172
Average selenium concentration (µg/L)	--	--	--	2.5	1.8	2.7	2.2	--
Selenium loading (kg)	--	--	--	26	7	32	69	33
Average zinc concentration (µg/L)	166	50.1		39.2	29.9	128	52.5	--
Zinc loading (kg)	6,708	785	--	406	120	1,528	1,664	1,868

Coyote Creek	97/98	98/99	99/00	00/01	01/02	02/03	03/04	Average
No. storms sampled for metals	10	14	12	10	5	4	3	--
Total runoff volume (acre-ft)	60,500	11,500	22,937	14,616	3,672	26,608	43,689	--
Average copper concentration (µg/L)	43.2	14.2	10.3	9.2	16.9	17.6	32.4	--
Copper loading (kg)	3,224	201	291	166	77	578	1,746	898
Average lead concentration (µg/L)	29	--	--	2.5	2.3	4.6	15.8	--
Lead loading (kg)	2,166	--	--	45	10	150	850	644
Average selenium concentration (µg/L)	--	4.8	--	2.5	2.5	2.4	3.6	--
Selenium loading (kg)	--	68	--	45	11	78	195	80
Average zinc concentration (µg/L)	344	66.7	36.3	35.9	44.9	78.1	148	--
Zinc loading (kg)	25,656	946	1,027	647	203	2,563	7,965	5,573

Average annual metals loading from WRPs (Table 4-4) can be compared to average wet-weather storm water loading (Table 4-10) to provide an indication of the relative contributions from these sources. This comparison can only be made in Coyote Creek because it is the only reach that receives direct POTW discharge (Long Beach WRP) and has a LACDPW storm water mass emission station. On an annual basis, storm water contributes about 83% of the copper loading, 76% of the lead loading, 80% of the zinc loading, and 79% of the selenium loading in Coyote Creek. Wet-weather storm water runoff is thus the dominant source of annual metals loading, which agrees with previous studies in the Los Angeles River and Ballona Creek watersheds (Stein et al., 2003).

5. LINKAGE ANALYSIS

Information on sources of pollutants provides one part of the TMDL equation. To determine the effects of these sources on water quality, it is necessary to determine the assimilative capacity of the receiving water. Variations between wet and dry weather can strongly affect the delivery of metals to the San Gabriel River and the assimilative capacity of the river to accommodate this loading so that water quality standards are met. Therefore, two distinct approaches for the linkage analysis were taken for wet and dry weather. Hydrodynamic and water quality models were used to assess the effects of metals loadings in the San Gabriel River on water quality under both dry- and wet- weather conditions. To estimate the assimilative capacity of the Estuary, a linkage is made based on the volume of water in the Estuary and the influence of tidal exchange.

5.1 Development of the Dry-Weather Model

The dry-weather model was developed to assess in-stream concentrations and sources of copper, lead, and zinc in low-flow conditions. It is included as Appendix I (Tetratech, 2005a). The modeling system consisted of a hydrodynamic model linked with a separate water quality model of the river system. For simulation of hydrodynamics, the one-dimensional (1-D) version of the Environmental Fluid Dynamics Code (EFDC) was used. Stream channel geometry, topographic data, meteorological data, and sources of flow and metals loading were input into the model. Model setup of the river system included the following reaches:

- San Gabriel River
- Coyote Creek
- San Jose Creek
- Walnut Creek

During low-flow conditions, these reaches are rarely linked due to various controls and features in the watershed that impede or divert flows. Therefore, these river reaches were modeled independently for the dry-weather simulation periods.

Data from the two synoptic monitoring events conducted by SCCWRP in September 2002 and September 2003 were used to support the model development. The data were used as model input as well as for comparison to model results. Flow and water quality measurements taken from the storm drains and WRPs were used as inputs to the hydrodynamic and water quality model simulations. The resulting simulated in-stream water quality results were compared with the measured in-stream water quality at corresponding locations from the SCCWRP study.

5.2 Dry-Weather Model Results

Model predictions of in-stream water quality were compared to observed in-stream water quality data, with no calibration of modeling parameters to improve the comparison. Based on the comparison, the model was considered successful if the magnitudes and trends of the simulated and observed water quality were similar.

The model results were noticeably impacted by input data with non-detectable values of metals. For the purposes of modeling, inflow data with non-detected metals were assigned values equal to half the detection limit. A sensitivity analysis was then performed in which the data were assigned a value of zero. Overall, assigning values of zero to non-detectable metals in inflow data resulted in lower simulated concentrations of metals in the river.

Overall, the magnitude of simulated in-stream concentrations was similar to the magnitude of observed in-stream concentrations. However, the simulated concentrations do not always compare consistently with the observed in-stream concentrations. This may be due to observed in-stream concentrations that were below detection limits or due to the influence of other factors and sources that are not accounted for in the model.

5.3 Development of the Wet-Weather Model

The wet-weather modeling report is included as Appendix II (Tetratech, 2005b). Metals loading can be associated with sediment loading because of the sorptive properties of metals. To assess the link between sources of metals and the impairment of waters during wet weather, a modeling system was developed to simulate land-use-based sources of sediment and associated metals loads and the hydrologic and hydraulic processes that affect their delivery to the San Gabriel River system. EPA's Loading Simulation Program in C++ (LSPC) was selected to simulate the hydrologic water quality conditions in the San Gabriel River watershed.

The San Gabriel River watershed was divided into 139 sub-watersheds for appropriate hydrologic connectivity and representation (Figure 10). Meteorological data, soils data, stream reach characteristics, hydrologic data, and land use coverage were input into the model. The model was used to simulate total suspended solids and then to simulate metals associated with total suspended solids using potency factors equal to the ratio of metals to total suspended solids. These potency factors were successfully applied in Ballona Creek (Ackerman et al., 2004b) and the Los Angeles River (Tetra Tech, Inc, 2004) and are considered regionally calibrated.

5.4 Wet Weather Model Results

Hydrology is the first model component that was calibrated and validated because an estimation of wet-weather metals loading relies heavily on flow prediction. January 1990 through December 2002 was selected as the hydrology simulation period. Twelve LACDPW and USGS flow gauging stations were used for calibration and/or validation of the model (Figure 3). To account for the extensive hydrological alterations in the watershed, the model was first calibrated for minimally controlled subwatersheds, then calibrated for more controlled subwatersheds, so that observed flow variability could be attributed to man-made alterations. Calibration was assessed through graphical comparison, regression analysis, and relative error in volume of model results and observed data. The model accurately predicted average monthly flow patterns and predicted total and seasonal volumes within an acceptable range of error for the relatively unaltered subwatersheds. The model over-predicted flow in certain cases and under-predicted flow in the more controlled subwatersheds due to hydraulic controls, localized rainfall events, and unaccounted flow discharges from dams.

After calibration, a validation of hydrologic parameters was made through a comparison of model output to observed flows and volumes at selected gages. As was the case for calibration, validation results were assessed through graphical comparison, regression analysis, and relative error in volume of model results and observed data. Overall, the model accurately predicted storm peaks in minimally controlled river segments. For the more-controlled river segments, model results were less accurate due to the lack of data on hydraulic controls in these sub watersheds. In addition, because runoff and resulting flow are highly dependent on rainfall, occasional storms were over-predicted or under-predicted depending on the distance between meteorological and flow gauge stations.

The water quality model was calibrated by comparing model output with pollutographs (plots of concentration vs. time) for total suspended solids, copper, lead, and zinc observed at the LACDPW mass emission stations in San Gabriel River Reach 2 (S14) and Coyote Creek (S13). To assess the predictive capability of the model, the output was graphically compared to observed data. (Attachment C to Appendix II) Pollutographs indicated that the model generally captured the range of observed values for a storm event, but did not always predict the shape of the pollutograph. Misrepresentation of flows in the hydrology model affected predictions of pollutographs and resulting event mean concentrations (EMCs) in the water quality model. To provide additional assessment, observed EMCs were compared to EMCs calculated using hourly model output.

Once calibrated, the water quality model was validated by comparing predicted EMCs with historically observed EMCs at the two LACDPW mass emission stations. During certain periods, observed values of zinc, lead and copper appeared to stay constant because they were reported as non-detects. Non-detects were replaced with one-half the detection limit for comparison with modeled data. Overall, the magnitude of predicted concentrations was similar to the magnitude of observed concentrations. Deviations from the observed data may be caused by localized storms that resulted in higher or lower metals loading, which is determined by the associated modeled flow. This flow is dependent on the proximity of the storm to the meteorological station and model subwatersheds. The model is adequate for predicting EMCs but not refined enough for predicting changes in concentration that occur over the course of the storm.

5.5 Linkage Analysis for the Estuary

The data assessment only indicates the need for water column TMDLs (section 2.2). There is no evidence of sediment impairment in the Estuary. Therefore, if discharges to the Estuary are limited by concentration-based waste load allocations, water quality numeric targets for the Estuary will be attained.

The assimilative capacity of the Estuary is a function of the volume of the Estuary and the tidal prism, which is the volume of water exchanged between an Estuary and the open sea during one tidal period. The head of the Estuary was considered at the 405 freeway, 4900 ft upstream of 7th Street. The tidal range was considered to vary linearly from zero at this location to a maximum of 3.4 ft at the mouth. The tide at the mouth was assumed the same as the Los Patos station ID 427 (Tides & Currents, 2005). Based on the LACDPW Estuary profile plan in Figure 11, the Estuary was divided into two reaches. The first reach is from the mouth, considered at Ocean Avenue Bridge, to 7th Street. The second reach is between 7th Street and the 405 freeway. The characteristics of the reaches estimated from Figure 11 are presented in Table 5-1.

Table 5-1. San Gabriel River Estuary geometry.

Reach	Length (ft) L	Bottom width (ft) B	Average water depth (ft) H	Levee slope S
1	13000	300	15	3:1
2	4900	300	10	2:1

Based on the data in Table 5-1, the volume of the Estuary is calculated as V = H*L*(B+S*H), giving the volume of each reach as:

$V_1 = 6.73 \times 10^7$ ft^3
$V_2 = 1.57 \times 10^7$ ft^3

With a total average volume of:

$V = 8.3 \times 10^7$ ft^3

Based on the assumption that the tidal range varies linearly from a maximum at the mouth of 3.4 feet to no tide at the 405 freeway, and considering the relative length of each reach, the average tidal ranges (i.e., tidal range at the center of each reach) are:

$R_1 = 2.17$ ft
$R_2 = 0.47$ ft

With the information in Table 5-1, the water surface area for each reach, A = L*(B+2*H*S), is:

$A_1 = 5.07 \times 10^6$ ft^2
$A_2 = 1.67 \times 10^6$ ft^2

The tidal prism, P, calculated as P = A*R (equation (II-6-12) in USACE's Coastal Engineering Manual), at each reach was estimated as:

$P_1 = 1.1 \times 10^7$ ft^3
$P_2 = 0.78 \times 10^6$ ft^3

Giving a total tidal prism for the Estuary of:

$P = 1.18 \times 10^7$ ft^3

The volume at high tide, $V_{HT} = V + P/2$, is therefore:

$V_{HT} = 8.89 \times 10^7$ ft^3, or 665 million gallons

And the volume at low tide, $V_{LT} = V - P/2$, is therefore:

$V_{LT} = 7.71 \times 10^7$ ft^3, or 576 million gallons.

Given the flow from the power plants (1614 MGD from Table 4-9) and the volume of water in Estuary at low tide, it can be assumed that the power plant flow displaces all ocean water in the Estuary at the critical condition and that ocean water provides no excess assimilative capacity.

SCCRWP is currently leading a study to develop and implement a watershed monitoring and modeling program for the Estuary. They have collected and are currently compiling hydrology, water quality, and sediment data that will be used in development of the Estuary model. The data include water quality and sediment samples from two longitudinal surveys and three months of continuous flow, temperature, elevation, salinity, and velocity measurements at the mouth of the Estuary. The model will account for upstream inputs, tidal exchange, and mixing and will help to better characterize the relative sources and fate and transport of metals loading to the Estuary. It is expected to be completed in December 2006. Results of the model will be used to re-evaulate the TMDL and waste load allocations, if necessary, when the TMDL is reconsidered.

5.6 Summary of Linkage Analysis

The dry- and wet-weather models provide an understanding of the relationship between metals loading and targets. The dry-weather model is able to predict the overall magnitude of in-stream concentrations but not able to consistently predict the instantaneous concentrations at any given time. The wet-weather model was able to predict flow and magnitudes of concentrations in the minimally controlled river segments but less able in the more-controlled river segments. Because they could not predict concentrations on short time scales, neither the dry- or wet-models were used to develop loading capacity, but they provide an understanding of the relationship between metals loading and targets. While not used to develop loading capacity, the models should prove useful in evaluating management scenarios to help achieve load reductions in TMDL implementation. For the Estuary, the linkage analysis demonstrates that power plant flow comprises the majority of the volume of water in the Estuary and that and the ocean water provides no excess assimilative capacity.

6. TOTAL MAXIMUM DAILY LOADS

This section explains the development of the loading capacities (i.e., TMDLs) and allocations for metals in the San Gabriel River watershed. EPA regulations require that a TMDL include waste load allocations (WLAs), which identify the portion of the loading capacity allocated to existing and future point sources (40 CFR 130.2(h)) and load allocations (LAs), which identify the portion of the loading capacity allocated to nonpoint sources (40 CFR 130.2(g)). As discussed in previous sections, the flows, sources, and the relative magnitude of inputs vary between dry-weather and wet-weather conditions. TMDLs are therefore developed to address dry- and wet-weather conditions separately.

6.1 Dry-Weather Selenium Allocations for San Jose Creek

The dry-weather loading capacity for San Jose Creek Reach 1 was calculated by multiplying the numeric target for selenium by the median flow (Table 6-1). The median flow for San Jose Creek Reach 1, obtained from long-term flow data at LACDPW flow gauge F312B-R, is 19 cfs. This gauge is located above San Jose Creek WRP outfall No. 002 and represents the non-WRP flow in the reach. The Pomona WRP is located above F312B-R, but during dry weather, nearly all Pomona flow is reused and does not enter San Jose Creek.

Dry-weather allocations are assigned to sources in San Jose Creek Reach 1 and Reach 2 to meet the selenium TMDL in San Jose Creek Reach 1. Allocations are assigned to both point and nonpoint sources.

A load allocation of zero is assigned for direct atmospheric deposition of selenium. No studies on atmospheric deposition of selenium have been conducted, but an allocation must be assigned to this potential source. It is believed that much of the selenium results from natural soils in the watershed. This assumption is somewhat corroborated by the fact that many of the impairments in San Jose Creek occur after the channel becomes soft-bottomed. Special studies will allow further assessment of sources of selenium in San Jose Creek. In the interim, all potential sources of selenium are assigned allocations.

The load allocation for open space is calculated by multiplying the percentage of open space in the San Jose Creek subwatershed by the loading capacity. “Open space” refers to opens space that discharges directly to the river and not through the storm drain system. Once drainage from open space is collected by the storm drain system it becomes a point source and is included with the storm water allocation. Open space comprises 1.8% of the San Jose Creek subwatershed [1].

Concentration-based waste load allocations equal to the dry-weather selenium target for San Jose Creek Reach 1 (Table 3-1) are assigned to POTWs and other non-storm water point sources. This

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[1] As determined through GIS mapping using County storm drain layers.

allows these discharges to expand to their design capacity while meeting concentration-based numeric targets. Because there are no sediment impairments in the watershed, it is not necessary to restrict total metals loading. Furthermore, many of the non-storm water point sources have intermittent flow and calculation of mass-based waste load allocations is not possible. By providing concentration-based limits, we ensure that the loads from these sources are associated with an increased assimilative capacity so that numeric targets will be attained.

A grouped mass-based waste load allocation is developed for storm water permittees (MS4s, Caltrans, General Industrial, and General Construction) by subtracting the load allocations from the total loading capacity according to the following equation:

$$\mathbf{WLA}_{\text{Storm Water}} = \mathbf{TMDL} - \mathbf{LA}_{\text{Direct Air Deposition}} - \mathbf{LA}_{\text{Open Space}} \qquad \textbf{Equation (5)}$$

The resulting allocations for all sources in San Jose Creek Reach 1 and Reach 2 are presented in Table 6-1.

Table 6-1 Selenium allocations for San Jose Creek Reach 1 and Reach 2 (total recoverable metals).

Flow (cfs)	Loading Capacity (kg/day)	Non-Storm Water Point Sources (µg/L)	Direct Air Deposition (kg/day)	Open Space (kg/day)	Grouped Storm Water (kg/day)
19	0.232	5	0	0.0042	0.228

For accounting purposes, it is assumed that Caltrans and the general storm water permittees discharge entirely to the MS4 system. This assumption has been supported though review of the permits. A zero waste load allocation is assigned to all industrial and construction stormwater permits during dry weather. NPDES Permit Nos. CAS000001 and CAS000002 already prohibit non-storm water discharges with few exceptions as discussed in Section 4.1.1. The dry-weather storm water allocation is shared by the MS4 permittees and Caltrans. It is not possible to divide this allocation because there is not enough data on the relative reach-specific extent of MS4 and Caltrans areas.

6.2 Dry-Weather Copper Allocations for San Gabriel River Estuary

Dry-weather allocations are assigned to sources in the Estuary, San Gabriel River Reach 1 and Coyote Creek to meet the copper TMDL in the Estuary. Allocations are assigned to both point and nonpoint sources. Allocations are assigned to sources that discharge directly to the Estuary and sources that discharge to upstream reaches (Table 6-2).

Table 6-2. Direct and indirect sources discharging to the San Gabriel River Estuary

Upstream Sources (San Gabriel River Reach 1 and Coyote Creek)	Direct Sources (Estuary)
WRPs	Power Plants
Non-Storm Water Point Sources	Non-Storm Water Point Sources
Storm Water	Storm Water
Direct Air	Direct Air

As discussed in section 5.5, given the flow from the power plants and the volume of water in Estuary at low tide, it can be assumed that at the critical condition during the tidal cycle, the power plant flow displaces all ocean water in the Estuary. The concentration of copper in the Estuary is therefore a function of upstream and direct sources, with ocean water providing no assimilative capacity. Concentration-based allocations are assigned to upstream and direct sources according to the following equation:

$$C_{est} = \frac{C_{upstream} * Q_{upstream} + C_{direct} * Q_{direct}}{Q_{est}} \qquad \textbf{Equation (6)}$$

Where:

C_{est} = Copper numeric target for the Estuary = 3.7 µg/L
$C_{upstream}$ = Concentration of copper in upstream sources
$Q_{upstream}$ = Upstream flow
C_{direct} = Concentration of copper in direct sources
Q_{direct} = Direct source flow
Q_{est} = Combined direct and upstream flow

The upstream indirect dischargers' relative contribution of flow is small compared to the power plants, which discharge directly to the Estuary. Upstream flow is approximately 157 cfs or 101 MGD[2]. The combined power plant design flow is 2297 MGD. As shown in section 4.4.3, due to their differences in flow, the metals loading from the power plants is approximately ten times greater than the metals loading from the WRPs. Reductions in the power plant copper discharge concentrations will result in the most benefit to water quality in the Estuary. Therefore, staff proposes a copper concentration-based waste load allocation to the power plants of 3.1 ug/L to provide excess assimilative capacity for the indirect, upstream discharges. Special studies will be required to further assess the effect of upstream discharges on water quality and the aquatic life beneficial uses in the Estuary.

6.2.1 Dry-weather Copper Allocations for San Gabriel River Reach 1 and Coyote Creek

Non-storm water point sources that discharge to Reach 1 and Coyote Creek receive copper allocations based on freshwater criteria and upstream median dry-weather hardness values[3] to ensure that these sources do not contribute to copper exceedances in the Estuary while

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[2] Equal to the combined median flow at LACDPW gauge F42B-R (114 cfs), located at the bottom of Reach 1 (below the San Jose Creek and Los Coyotes Outfalls), median flow at LACDPW flow gauge F354-R (19 cfs), located near the bottom of Coyote Creek (above the Long Beach WRP outfall), and median Long Beach WRP flow (24 cfs).

[3] Median dry-weather hardness at receiving water station R-4, below San Jose Creek and Los Coyotes WRP outfalls in Reach 1 is 217 mg/L as $CaCO_3$. Median dry-weather hardness at receiving water station R-A, below Long Beach WRP outfall in Coyote Creek is 249 mg/L as $CaCO_3$.

considering their relative contribution of flow. This results in concentration-based copper allocations equal to 18 µg/L for Reach 1 sources and 20 µg/L for Coyote Creek sources.

Storm water permittees that discharge to Reach 1 are assigned the same concentration-based copper allocations as the non-storm water discharges (18µg/L) because flow in Reach 1 is comprised almost entirely of WRP flow and any non-WRP urban runoff is insignificant[4].

The copper waste load allocations for storm water sources that drain to Coyote Creek are equal to the concentration-based allocations assigned to the non-storm water discharges (20 µg/L) multiplied by the median non-WRP flow, minus the contribution from open space and direct atmospheric deposition. The median non-WRP Coyote Creek flow is equal to 19 cfs, measured at LACDPW Station F354-R, located above the Long Beach WRP outfall.

As shown in Table 4-3, dry-weather direct atmospheric deposition rates for copper were extrapolated to the San Gabriel River watershed based on previous studies in the Los Angeles River watershed (Sabin et al., 2004). To calculate reach-specific direct deposition, direct deposition for the entire watershed (4.1 kg/year or 0.0113 kg/day) is multiplied by the relative area of water in the Reach 1 and Coyote Creek subwatersheds as compared to the area of water in the entire watershed[5]. Indirect deposition of metals is accounted for in the allocations to storm water. Once metals are deposited on land under the jurisdiction of a storm water permittee, they are within a permittee's control. There is no open space in the Reach 1, or Coyote Creek subwatersheds that is not served by storm drains [6]. Open space therefore receives a load allocation equal to zero. Copper allocations for all sources in Reach 1 and Coyote Creek are shown in Table 6-3.

Table 6-3 Dry-weather copper waste load and load allocations for Reach 1, and Coyote Creek (total recoverable metals).

Reach	Non-WRP Flow (cfs)	Non-storm water WLA (µg/L)	Upstream Allowable Load (kg/day)	Combined Storm water WLA (kg/day)	% Area of Water in Watershed	Direct Air Deposition WLA (kg/day)	Open Space WLA (kg/day)
San Gabriel Reach 1	--	18*	--	--	2.4%	2.7×10^{-4}	0
Coyote Creek	19	20	0.943	0.941	17%	2.0×10^{-3}	0

*Also applies to storm water sources in San Gabriel River Reach 1.

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[4] Reach 1 flows were obtained from long-term flow records (1990-2005) at LACDPW station F42B-R, located just above Spring Street and below the Los Coyotes and San Jose Creek outfalls. The median flow at this gauge is 114 cfs. Since the gauge is below the WRP outfalls, the average annual WRP flow (obtained from San Jose Creek and Los Coyotes 2000-2005 annual reports) is subtracted from the median gauge flow to obtain the non-WRP flow. The total average annual flow from the WRPs is 115 cfs, which is greater than the flow measured at station F42B-R. The difference between the WRP flow and the measured flow is within the error of the flow gauge.

[5] There are 1555 acres of water in the entire watershed, 37.4 acres of water in the Reach 1 subwatershed (2.4%), and 269 acres in the Coyote Creek subwatershed (17%).

[6] As determined through GIS mapping using County storm drain layers.

As was done for San Jose Creek, a zero waste load allocation is assigned to all industrial and construction stormwater permits during dry weather. The dry-weather storm water allocation is shared by the MS4 and Caltrans permittees.

6.2.2 Dry-weather Allocations for Direct Sources in San Gabriel River Estuary

Based on Equation 6, given the allocations assigned to upstream sources and a combined power plant design flow of 2297 MGD, the power plants must receive a concentration-based waste load allocation for copper equal to 3.1 µg/L in order to meet the numeric target of 3.7 µg/L for the Estuary.

The other direct discharges to the Estuary, including storm water and non-storm water point sources, are assigned concentration-based waste load allocations equal to the Estuary copper numeric target of 3.7 µg/L. Their relative flow of these sources is unknown, so it is not possible to assign them mass-based waste load allocations.

Atmospheric deposition can be calculated from previous studies and scaled to the Estuary subwatershed based on the relative area of water in the Estuary as compared to the area of water in the entire watershed (6.8 %), resulting in an allocation of 7.75×10^{-4} kg/day. Because this is a mass-based allocation, while other sources receive concentration-based allocations, it is not possible to subtract this load allocation from other sources in order to meet the target in the Estuary. However, this load allocation is insignificant compared to loading from other sources. For example, if the power plants were assigned a mass-based allocation based on their design flow (3560 cfs), the allocation would be 27 kg/day. The load allocation for direct air is essentially zero.

There is no open space in the Estuary subwatershed that is not served by storm drains [7]. Open space therefore receives a load allocation equal to zero. Dry-weather allocations for all sources in the San Gabriel River Estuary are presented in Table 6-4.

Table 6-4 Dry-weather copper waste load and load allocations for the Estuary (total recoverable metals).

Reach	Power Plants (µg/L)	Non-storm water WLA (µg/L)	Direct Air (kg/day)	Open Space WLA (kg/day)	Combined Storm water WLA (µg/L)
Estuary	3.1	3.7	7.75×10^{-4}	0	3.7

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[7] As determined through GIS mapping using County storm drain layers.

6.3 Wet-Weather Loading Capacity

During wet weather, the allowable load is a function of the volume of water in the river. Given the variability in wet-weather flows, the concept of a single critical flow is not justified. Instead, a load-duration curve approach is used to establish the wet-weather loading capacity. A load-duration curve is developed by multiplying the wet-weather flows by the in-stream numeric target. The result is a curve that identifies the allowable load for a given flow. Table 6-5 presents the equations used to calculate the load duration curves. The wet-weather TMDLs for metals are defined by these load-duration curves.

Separate wet-weather TMDLs are developed for San Gabriel Reach 2 and Coyote Creek. In San Gabriel River Reach 2, wet-weather TMDLs apply when the maximum daily flow in the river is equal to or greater than 260 cfs as measured at USGS station 11085000, located at the bottom of Reach 3 just above the Whittier Narrows Dam (see Section 3, Numeric Targets). In Coyote Creek, wet-weather TMDLs apply when the maximum daily flow in the creek is equal to or greater than 156 cfs as measured at LACDPW flow gauge station F354-R, located at the bottom of the creek, just above the Long Beach WRP.

Table 6-5. Wet-weather loading capacities (TMDLs) for metals (total recoverable metals).

Reach	Copper (kg/day)	Lead (kg/day)	Zinc (kg/day)
San Gabriel Reach 2	--	Daily storm volume x 166 µg/L	--
Coyote Creek	Daily storm volume x 15 µg/L	Daily storm volume x 87 µg/L	Daily storm volume x 125 µg/L

The daily storm volume is equal to the total daily flow either in San Gabriel River Reach 2 or Coyote Creek.

6.4 Wet-Weather Allocations.

Wet-weather allocations are assigned to all upstream reaches and tributaries of San Gabriel River Reach 2 and Coyote Creek because they potentially drain to these impaired reaches during wet weather. Allocations are assigned to both point and nonpoint sources. Concentration-based waste load allocations are developed for the POTWs and other non-storm water point sources. Mass-based load allocations are developed for open space and direct atmospheric deposition. A grouped mass-based waste load allocation is developed for storm water permittees (MS4s, Caltrans, General Industrial, and General Construction) by subtracting the load allocations from the total loading capacity.

6.4.1. Wet-weather waste load allocations for POTWs and other NPDES permits.

Similar to the approach for dry-weather, concentration-based WLAs (Table 6-6) are established for the POTWs and other non-storm water permits to ensure that these sources do not contribute to exceedances of wet-weather numeric targets.

Table 6-6. Wet-weather WLAs for POTWs and other non-storm water permits (total recoverable metals).

Reaches	Copper (µg/L)	Lead (µg/L)	Zinc (µg/L)
San Gabriel Reach 2 and upstream reaches and tributaries	--	166	--
Coyote Creek and tributaries	15	87	125

6.4.2. Wet-weather load allocations

An estimate of direct atmospheric deposition is developed based on the percent area of surface water in the watershed. Approximately 0.4% of the watershed area draining to San Gabriel River Reach 2 is comprised of water and approximately 0.2% of the watershed area draining to Coyote Creek is comprised of water. The load allocation for atmospheric deposition is calculated by multiplying these percentages by total loading capacities. The loadings associated with indirect deposition are included in the wet-weather storm water waste load allocations. Once metals are deposited on land under the jurisdiction of a storm water permittee, they are within a permittee's control. As was done for dry-weather, open space load allocations are calculated by multiplying the percent area of open space in the watershed not served by storm drains by the total loading capacity. Open space comprises 0% of the Coyote Creek subwatershed and approximately 47% of the San Gabriel River watershed that drains to Reach 2 [8]. Load allocations for direct air deposition and open space are presented in Table 6-7.

Table 6-7. Wet-weather open space load allocations (total recoverable metals).

Metal	Loading Capacity	% Open Space	Open Space (kg/day)	% Water	Direct Air Deposition (kg/day)
San Gabriel Reach 2 and upstream reaches and tributaries					
Lead	Daily storm volume x 166 µg/L	48%	Daily storm volume x 79 µg/L	0.4%	Daily storm volume x 0.6 µg/L
Coyote Creek and tributaries					
Copper	Daily storm volume x 15 µg/L	0	0	0.2%	Daily storm volume x 0.03 µg/L
Lead	Daily storm volume x 87 µg/L	0	0	0.2%	Daily storm volume x 0.2 µg/L
Zinc	Daily storm volume x 125 µg/L	0	0	0.2%	Daily storm volume x 0.3 µg/L

The daily storm volume is equal to the total daily flow either in San Gabriel River Reach 2 or Coyote Creek.

6.4.3. Wet-weather waste load allocations for storm water permittees

Wet-weather waste load allocations for storm water permittees (Table 6-8) are calculated by subtracting the load allocations for open space and direct air deposition from the total loading capacity (Equation 5).

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[8] As determined by Regional Board staff through GIS mapping using County storm drain layers.

Table 6-8. Wet-weather waste load allocations for storm water (total recoverable metals).

Reach	Copper (kg/day)	Lead (kg/day)	Zinc (kg/day)
San Gabriel Reach 2 and upstream reaches and tributaries		Daily storm volume x 86.4 µg/L	
Coyote Creek and tributaries	Daily storm volume x 14.9 µg/L	Daily storm volume x 86.8 µg/L	Daily storm volume x 124.7 µg/L

The daily storm volume is equal to the total daily flow either in San Gabriel River Reach 2 or Coyote Creek

A flow of 260 cfs (daily storm volume = $6.4x10^8$ liters) for San Gabriel Reach 2 and a flow of 156 cfs (daily storm volume = $3.8x10^8$ liters) for Coyote Creek results in the waste load allocations presented in Table 6-9.

Table 6-9. Wet-weather allocations based on example daily flows (total recoverable metals).

Metal	Flow (cfs)	Daily Storm Volume (liters)	Loading Capacity (kg/day)	Open Space (kg/day)	Direct Air Deposition (kg/day)	Storm water permittees (kg/day)
San Gabriel Reach 2 and upstream reaches and tributaries						
Lead	260	$6.4x10^8$ liters	105.5	50.2	0.41	54.9
Coyote Creek and tributaries						
Copper	156	$3.8x10^8$ liters	5.72	0	0.012	5.71
Lead	156	$3.8x10^8$ liters	33.2	0	0.07	33.1
Zinc	156	$3.8x10^8$ liters	47.7	0	0.10	47.6

Allocations for NPDES-regulated municipal storm water discharges from multiple point sources can be expressed as a single categorical waste load allocation when data and information are insufficient to assign each source or outfall an individual allocation. The storm water allocations may be fairly rudimentary because of data limitations and variability in the system. The combined storm water waste load allocation is further allocated to the general industrial, general construction, MS4 and Caltrans permits based on their percent area of the developed portion of the watershed (Table 6-10). The developed portion of the watershed includes all land uses except open space and water. The total area covered by facilities enrolled under the general construction and industrial storm water permits was obtained from the State Board database. This was subtracted from the total developed area to obtain a rough estimate of the area covered by the MS4 and Caltrans permittees. The areas associated with each permit type were then divided by the total developed area to obtain the percentages in Table 6-10. The MS4 permittees and Caltrans share a waste load allocation because there is not enough data on the relative reach-specific extent of MS4 and Caltrans areas.

Table 6-10. Wet-weather waste load allocations for storm water apportioned to permit type based on percent area of developed portion of watershed (total recoverable metals).

Metal	% Area Construction	General Construction WLA (kg/day)	% Area Industrial	General Industrial WLA (kg/day)	% Area MS4 and Caltrans	MS4 and Caltrans WLA (kg/day)
San Gabriel Reach 2 and upstream reaches and tributaries						
Lead	1.4%	Daily storm volume x 1.24 μg/L	4.2%	Daily storm volume x 3.6 μg/L	94.4%	Daily storm volume x 82 μg/L
Coyote Creek						
Copper	5%	Daily storm volume x 0.7 μg/L	3.5%	Daily storm volume x 0.5 μg/L	91.5%	Daily storm volume x 13.7 μg/L
Lead	5%	Daily storm volume x 4.3 μg/L	3.5%	Daily storm volume x 3.0 μg/L	91.5%	Daily storm volume x 79.5 μg/L
Zinc	5%	Daily storm volume x 6.2 μg/L	3.5%	Daily storm volume x 4.3 μg/L	91.5%	Daily storm volume x 114.2 μg/L

The daily storm volume is equal to the total daily flow either in San Gabriel River Reach 2 or Coyote Creek

For the MS4 and Caltrans permits, the daily storm volume is measured at TMDL effectiveness monitoring locations. The final TMDL effectiveness monitoring locations are the LACDPW storm water mass emission stations at Coyote Creek (S13) and San Gabriel River Reach 2 (S14). A flow of 260 cfs (daily storm volume = 6.4×10^8 liters) for San Gabriel Reach 2 and a flow of 156 cfs (daily storm volume = 3.8×10^8 liters) for Coyote Creek results in the waste load allocations presented in Table 6-11.

Table 6-11. Wet-weather waste load allocations for storm water permits based on example daily flows (total recoverable metals).

Metal	Flow (cfs)	Daily Storm Volume (liters)	General Construction (kg/day)	General Industrial (kg/day)	MS4 and Caltrans (kg/day)
San Gabriel Reach 2 and upstream reaches and tributaries					
Lead	260	6.4×10^8 liters	0.8	2.3	51.8
Coyote Creek and tributaries					
Copper	156	3.8×10^8 liters	0.285	0.198	5.23
Lead	156	3.8×10^8 liters	1.7	1.15	30.3
Zinc	156	3.8×10^8 liters	2.4	1.7	43.5

Each storm water permittee under the general industrial and construction storm water permits will receive an individual waste load allocations per acre based on the total acreage of general permits in the developed portion of the watershed. This results in the same per acre allocation for the industrial and construction storm water permittees (Table 6-12).

Table 6-12. Wet-weather waste load allocations for enrollees under general construction or industrial storm water permits (total recoverable metals).

Metal	General Construction Permit Area (acres)	Individual General Construction WLA (g/day/acre)	General Industrial Permit Area (acres)	Individual General Industrial WLA (g/day/acre)
San Gabriel Reach 2 and upstream reaches and tributaries				
Lead	2213	Daily storm volume x 0.56 µg/L	6412	Daily storm volume x 0.56 µg/L
Coyote Creek and tributaries				
Copper	6176	Daily storm volume x 0.12 µg/L	4295	Daily storm volume x 0.12 µg/L
Lead	6176	Daily storm volume x 0.70 µg/L	4295	Daily storm volume x 0.70µg/L
Zinc	6176	Daily storm volume x 1.01 µg/L	4295	Daily storm volume x 1.01 µg/L

The daily storm volume is equal to the total daily flow either in San Gabriel River Reach 2 or Coyote Creek

For the general industrial and construction storm water permits, the daily storm volume is measured at USGS station 11085000 for discharges to Reach 2 and above and at LACDPW flow gauge station F354-R for discharges to Coyote Creek. For example, a flow of 260 cfs (daily storm volume = 6.4×10^8 liters) for San Gabriel Reach 2 and a flow of 156 cfs (daily storm volume = 3.8×10^8 liters) for Coyote Creek would result in the waste load allocations presented in Table 6-13.

Table 6-13. Wet-weather waste load allocations for individual general construction or industrial storm water permittees (g/day/acre) based on example daily flows (total recoverable metals).

Metal	Flow (cfs)	Daily Storm Volume (liters)	General Construction (g/day/acre)	General Industrial (g/day/acre)
San Gabriel Reach 2 and upstream reaches and tributaries				
Lead	260	6.4×10^8 liters	0.36	0.36
Coyote Creek and tributaries				
Copper	156	3.8×10^8 liters	0.046	0.046
Lead	156	3.8×10^8 liters	0.27	0.27
Zinc	156	3.8×10^8 liters	0.39	0.39

6.5 Margin of Safety

TMDLs must include a margin of safety to account for any lack of knowledge concerning the relationships between pollutant loads and their effect on water quality. There is little uncertainty in the development of these TMDLs because the models were not used to develop waste load allocations. The TMDLs are simply equal to the numeric targets multiplied by the median flow in dry weather and the numeric targets multiplied by actual flow in wet-weather. The primary sources of uncertainty are related to assumptions made in developing numeric targets. The use of default conversion factors is an implicitly conservative assumption, which is applied to the margin of safety. The conversion factors are defined as the fraction of dissolved metals divided by the total metals concentration. For the dry-weather copper target, it has been shown in previous TMDLs that the default conversion factor overestimates the fraction of copper in the dissolved form. For the wet-weather copper, lead, and zinc targets, evaluation of the storm water data compared to the default conversion factor showed that the default conversion factor overestimates the fraction of metal in the dissolved form. When the CTR criteria expressed as dissolved metals are divided by conversion factors to convert to total recoverable metals, the resulting dry- and wet-weather targets are underestimated. This underestimation is applied to the margin of safety.

7. IMPLEMENTATION

This section describes the implementation procedures that could be used to provide reasonable assurances that water quality standards will be met. Further, the reasonably foreseeable means of compliance with the TMDL are discussed.

7.1 Regulatory Mechanisms for Implementation

7.1.1 Nonpoint Sources

Nonpoint sources will be regulated through the authority contained in sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy, and the Conditional Waiver for Discharges from Irrigated Lands, adopted by the Los Angeles Regional Water Quality Control Board on November 3, 2005.

7.1.2 POTWs and Other Non-storm Water NPDES Permits

The concentration-based WLAs established for the POTWs and other point sources in this TMDL will be implemented through NPDES permit limits. Permit limits will meet the water quality targets established in this TMDL and maintain water quality standards in the San Gabriel River. Permit writers may translate waste load allocations into effluent limits by applying the SIP procedures or other applicable engineering practices authorized under federal regulations. It is expected that these limits will take into account the variability in the effluent data and the frequency of monitoring. Wet-weather WLAs will not be used to determine monthly permit limits, but will only be used in the determination of a daily limit. For permits subject to both dry- and wet-weather WLAs, it is expected that permit writers would write a monthly limit based on the dry-weather WLA and two separate daily maximums based on the dry- and wet-weather WLAs. Compliance schedules may be established in individual NPDES permits, at Regional Board discretion, allowing up to 5 years within a permit cycle to achieve compliance. Compliance schedules may not be established in general NPDES permits. A discharger enrolled under a general permit that could not immediately comply with effluent limitations specified to implement waste load allocations would be required to apply for an individual permit in order to demonstrate the need for a compliance schedule. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to 9 years from the effective date of the TMDL to achieve compliance with final WLAs.

7.1.3 General Industrial Storm Water Permits

Non-storm water flows authorized by NPDES Permit Nos. CAS000001, or any successor permit, are exempt from the dry-weather waste load allocation equal to zero. Instead, these authorized non-storm water flows shall meet the reach-specific concentration-based waste load allocations assigned to the POTWs, power plants, and other non-storm water NPDES permits (Table 6-1 for San Jose Creek and Table 6-3 for San Gabriel Reach 1 and Coyote Creek). The dry-weather waste load allocation equal to zero applies to unauthorized non-storm water flows, which are prohibited by NPDES Permit Nos. CAS000001. It is anticipated that the dry-weather waste load allocations will be implemented in future general permits through the requirement of improved BMPs to eliminate the discharge of non-storm water flows.

The wet-weather mass-based waste load allocations for the general industrial storm water permittees (Table 6-12) will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. Concentration-based permit conditions may be set to achieve the mass-based waste load allocations. These concentration-based conditions would be equal to the concentration-based waste load allocations assigned to the POTWs and other non-storm water NPDES permits (Table 6-6). Compliance with permit conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. If this method of compliance is chosen, permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations.

General industrial storm water permittees are allowed interim wet-weather concentration-based WLAs for copper equal to 63.6 µg/L and lead equal to 480 µg/L as a monthly interim limit and 638 µg/L as a daily interim limit. The interim copper WLA is based on the copper benchmark contained in EPA's Storm Water Multi-sector General Permit for Industrial Activities. The interim lead WLA is based on the 95th percentile of the total lead values for the monthly limit and the 99th percentile for the daily limit obtained from historical runoff data from the Puente Hills Landfill, operated by Los Angeles County Sanitation Districts, and enrolled under the existing general industrial permit. The interim waste load allocations apply to all industry sectors and will apply for a period not to exceed nine years from the effective date of the TMDL. Because EPA benchmarks for zinc are less than the final wet-weather WLAs, no interim limits are assigned for these metals.

In the first four years from the effective date of the TMDL, interim copper and lead wet-weather waste load allocations and final zinc wet-weather waste load allocations will not be interpreted as enforceable permit conditions. The interim waste load allocations will not be included in any permits until the historical and recent storm water data from the Puente Hills landfill and industry wide data are evaluated by the Regional Board and the Regional Board reconsiders the interim waste load allocation as appropriate or in need of a revision to reflect BMP performance under varying storm conditions. The interim waste load allocations will be reconsidered within one year of the effective date of the final 2006 303(d) list. If monitoring demonstrates that interim copper and lead or final zinc waste load allocations are being exceeded, the permittee shall evaluate existing and potential BMPs, including structural BMPs, and implement any necessary BMP improvements. It is anticipated that monitoring results and any necessary BMP improvements would occur as part of an annual reporting process. After four years from the effective date of the TMDL, interim copper and lead and final zinc waste load allocations shall be translated into enforceable permit conditions. Compliance with conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of waste load allocations. In addition, permittees shall begin an iterative BMP process to meet final copper and lead waste load allocations. Permittees shall comply with final copper and lead waste load allocations within 9 years from the effective date of the TMDL, which shall be expressed as water quality based effluent limitations. Effluent limitations may be expressed as permit conditions. Compliance with conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of waste load allocations.

7.1.4 General Construction Storm Water Permits

Waste load allocations for the general construction storm water permits will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (NPDES Permit Nos. CAS000002), or any successor permit, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3.and A.9 of NPDES Permit Nos. CAS000001, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by NPDES Permit Nos. CAS000001.

Within six years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the wet-weather waste load allocations assigned to construction storm water permittees. Similar studies are allowed for compliance with the Los Angeles River Metals TMDL, which became effective on January 11, 2006. The Los Angeles River studies are due by January 11, 2012 and may apply to construction storm water permittees in the San Gabriel River watershed.

Regional Board staff will bring the results of the effectiveness studies, including recommended BMPs, before the Regional Board for consideration within seven years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with wet-weather waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within eight years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within seven years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with wet-weather waste load allocations.

7.1.5 MS4 and Caltrans Storm Water Permits

Grouped dry-weather and wet-weather mass-based waste load allocations have been developed for the MS4 and Caltrans permits (Tables 6-1, 6-3, and 6-10). EPA regulation allows allocations for NPDES-regulated storm water discharges from multiple point sources to be expressed as a single categorical waste load allocation when the data and information are insufficient to assign each source or outfall individual WLAs. The shared allocations apply to the Caltrans permit and all NPDES-regulated municipal storm water discharges in the San Gabriel River watershed, including municipalities enrolled under the Los Angeles County MS4 permit, the City of Long

Beach MS4 permit, and the Orange County MS4 permit. Figure 12 shows the municipalities located in each San Gabriel River subwatershed.

For the dry-weather condition, mass-based waste load allocations (Table 6-4) will be incorporated into MS4 and Caltrans or other NPDES permits. Applicable CTR limits are being met most of the time during dry weather (Table 2-6). Due to the expense of obtaining accurate flow measurements required for calculating loads, concentration-based permit limits may apply during dry weather (concentration-based waste load allocations already apply to storm water discharges to San Gabriel Reach 1 and the Estuary). These concentration-based limits would be equal to the dry-weather waste load allocations assigned to the POTWs and other non-storm water NPDES permits (Table 6-1 for San Jose Creek and Table 6-3 for San Gabriel Reach 1 and Coyote Creek). For the wet-weather condition, mass-based waste load allocations (Table 6-10) will be incorporated into NPDES permits.

Each municipality and permittee will be responsible for the group waste load allocations, and will not necessarily be given a specific allocation for the land uses under their jurisdiction. Therefore, the focus of compliance should be on developed areas where the contribution of metals is highest and areas where activities occur that contribute significant loading of metals (e.g., high-density residential, industrial areas and highways). Flexibility will be allowed in determining how to reduce metals as long as the waste load allocations are achieved. To achieve the necessary reductions to meet the waste load allocations, permittees will need to balance short-term capital investments directed to addressing this and future TMDLs in the San Gabriel River watershed with long-term planning activities for stormwater management in the region as a whole. It should be emphasized that the potential implementation strategies discussed below may contribute to the implementation of future TMDLs for the San Gabriel River watershed.

Figures 13a through 13d present the estimated load reductions needed to meet the grouped storm water waste load allocations. In these figures, allowable loads are plotted against storm volume to assist permittees in the design of BMPs to achieve the necessary load reductions. As described in section 5.2, The LSPC model was used to simulate storm volumes and associated loads over a 12-year period. From the model output and identified storms, metals loads were ranked by the amount of rainfall that occurred over the storm period. Loading capacities for each storm were then calculated by multiplying the storm volume by the appropriate numeric water quality target. For these figures, the loading capacity is a green line, the model-predicted historical loads below the loading capacity are shaded with blue and the model-predicted historical loads above the loading capacity are shaded with red. It is apparent from the figures that the model-predicted historical loads of lead will generally fall below the loading capacity, while reductions in the model-predicted historical loads of copper and zinc would be necessary to meet the loading capacity.

7.2 Potential Implementation Strategies for MS4 and Caltrans Storm Water Permits

The implementation strategy selected will need to address the different sources of metals loading during dry and wet weather. During dry weather, metals loading are predominately in the dissolved phase. During wet weather, the metals loading are predominately bound to sediment, which are transported with storm runoff (McPherson et al. 2004 and Stein et al., 2003).

Municipalities may employ a variety of implementation strategies to meet the required WLAs such as non-structural and structural BMPs, and/or diversion and treatment. Specific projects, which may have a significant environmental impact, would be subject to an environmental review. The lead agency for subsequent projects would be obligated to mitigate any impacts they identify, for example by mitigating potential flooding impacts by designing the BMPs with adequate margins of safety.

The administrative record and the fact sheets for the Los Angeles MS4 permit, the Long Beach MS4 permit, the Orange County MS4 permit, and the Caltrans storm water permit must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocations in the TMDL. Reductions to be achieved by each BMP will need to be documented and sufficient monitoring will need to be put in place to verify that the desired reductions are achieved. The permits should also provide a mechanism to make adjustments to the required BMPs as necessary to ensure their adequate performance. If non-structural BMPs alone adequately implement the waste load allocations then additional controls are not necessary. Alternatively, if the non-structural BMPs selected prove to be inadequate then structural BMPs or additional controls may be imposed.

7.2.1 Non-structural BMPs

The non-structural BMPs are based on the premise that specific land uses or critical sources can be targeted to achieve the TMDL waste load allocations. Non-structural BMPs provide several advantages over structural BMPs. Non-structural BMPs can typically be implemented in a relatively short period of time. The capital investment required to implement non-structural BMPs is generally less than for structural BMPs. However, the labor costs associated with non-structural BMPs may be higher. Therefore, in the long-term, the non-structural BMPs may be more costly. Examples of non-structural controls include more frequent and appropriately timed storm drain catch basin cleanings, improved street cleaning by upgrading to vacuum type sweepers, and educating industries of good housekeeping practices. Since there appear to be few dry-weather exceedances, the permittees are encouraged to initially concentrate on source reduction strategies including detection and elimination of illicit discharges, reduction of dry-weather nuisance flows, and increased inspection of industrial facilities. In addition, improved enforcement of BMPs for construction sites and improved detection and elimination of illicit connections to the storm drain system may result in significant reductions in discharges of metal pollutants to the San Gabriel River. A potential source of copper loading is from brake pads. The use of alternative materials for brake pads would help to reduce the discharge of copper in all watersheds. The Brake Pad Partnership, a multistakeholder effort in the San Francisco Bay, is currently conducting investigations to understand and address as necessary the impacts on surface water quality that may arise from break pad wear debris.

7.2.2 Structural BMPs

The structural BMPs are based on the premise that specific land uses, critical sources, or specific periods of a storm event can be targeted to achieve the TMDL waste load allocations. Structural BMPs may include placement of stormwater treatment devices specifically designed to reduce metals loading, such as infiltration trenches or filters, at critical points in the stormwater conveyance system. During storm events, when flow rates are high, these types of filters may require surge control, such as an underground storage vault or detention basin.

7.2.3 Diversion and Treatment

The diversion and treatment strategy includes the installation of facilities to provide capture and storage of dry and/or wet-weather runoff and diversion of the stored runoff to a wastewater collection system for treatment. A small, dedicated runoff treatment facility or alternative BMPs may be implemented to meet the TMDL requirements.

The volume of flow requiring storage and treatment would have to be estimated in order to size the storage facilities, estimate diversion flow rates, and determine the collection system and treatment capacities needed to accommodate these diverted flows. Wet-weather flows beyond the capacities of these facilities would be bypassed. However, a portion of these larger storm events would still be captured and treated, thereby eliminating the metals loading of small storms and reducing those of larger storms. Overflows from these systems could be routed through structural BMPs designed to remove sediment contaminated with metals for further reduction of metal loads. Additional studies that evaluate the effect of short duration rainfall intensity (i.e., one-year, one-hour rainfall event) on the mobilization and transport of metals are encouraged and would be useful in designing the flow through design capacity of in-line BMPs.

Regional Board staff is currently leading the Wet-Weather Task Force, a multi-stakeholder effort to address wet weather-related basin planning issues. The task force will prepare a list of projects for Board consideration. One project that the group has already decided to pursue is the design storm project. The objectives of the design storm project are to understand how different storm characteristics (e.g. storm size, intensity, duration, length of antecedent dry period) affect flows and water quality and to determine the effect of treating different “design storms” on water quality, technological feasibility, and cost.

7.2.4 Integrated Resources Approach

The Regional Board supports in concept an integrated water resources approach to improving water quality during wet weather. An integrated water resources approach takes a holistic view of regional water resources management by integrating planning for future wastewater, storm water, recycled water, and potable water needs and systems, and focusing on beneficial re-use of storm water at multiple points throughout a watershed to preserve local groundwater resources and reduce the need for imported water where feasible. Much of the upper and middle portions of the watershed implement an integrated approach through the various groundwater recharge facilities. This approach could be extended to include other areas of the watershed and to manage storm water flow. The Greater Los Angeles County Region recently received $1.5 million in Proposition 50 grant funds from the State to develop a Final Integrated Regional Water Management Strategic Plan. The strategic plan would serve as a tool to attract state, federal, and local voter-approved funding to implement integrated water supply and water quality projects.

7.3 Potential Implementation Strategies for Non-storm Water Permits

Based on a review of permits, discharger monitoring reports, and reasonable potential analyses, it is expected that the WRPs and most other minor and general NPDES permits will meet their waste load allocations and will not need to install pollution control equipment to comply with the TMDL. The Haynes and Alamitos power plants are not expected to meet their waste load allocations based on their existing effluent quality. One potential means of compliance would be to replace the copper condensers used in the power generating units, which would eliminate any additional copper added to the intake water during the once-through cooling process. For the Alamitos plant, which draws in once-through cooling water from Los Cerritos Channel, the intake water has an average copper concentration of 2.1 μg/L. Three out of 22 samples of intake water (from 2000-2004) had copper concentrations greater than the waste load allocation of 3 μg/L. For the Haynes plant, which draws in once-through cooling water from Alamitos Bay, the concentration of copper in the intake water averaged 12.2 μg/L, with all samples (from 2001-2005) exceeding the waste load allocation of 3 μg/L. Both plants would likely need to install additional pollution control equipment or consider alternative treatment strategies, such as implementing dry-cooling technologies or relocating their discharge out of the Estuary.

7.4 Implementation Schedule

The implementation schedule for all permits is summarized in Table 7-3. The Los Angeles Regional Board intends to reconsider this TMDL in five years after the effective date of the TMDL to re-evaluate the waste load allocations based on the additional data obtained from special studies.

The implementation schedule for the MS4 and Caltrans storm water permits shall consist of a phased approach. Permittees shall demonstrate TMDL effectiveness in prescribed percentages of the watershed, with dry-weather TMDLs achieved within 10 years and wet-weather TMDLs achieved in 15 years. The dry-weather schedule is more accelerated because the dry-weather exceedances occur infrequently and major structural BMPs are not anticipated. The Regional Board may extend the wet-weather implementation period if an integrated water resources approach is employed and permittees demonstrate the need for an extended schedule.

Table 7-1. Implementation Schedule.

Date	Action
Effective date of TMDL	Regional Board permit writers shall incorporate waste load allocations into NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance, renewal, or re-opener.
Within 1 year of the effective date of the 2006 303(d) list.	The Los Angeles Regional Board shall reconsider this TMDL to develop dry- and wet-weather numeric targets, WLAs and LAs for copper and zinc in San Gabriel River Reach 2 and selenium in Coyote Creek if impairments are maintained in these reaches on the final 2006 303(d) list. The Regional Board shall also revise this TMDL to include dry-weather numeric targets for lead in San Gabriel River Reach 2 and copper, lead, and zinc in Coyote Creek in addition to the wet-weather targets for these pollutant-waterbody combinations already assigned in this TMDL.
4 years after effective date of the TMDL	Responsible jurisdictions and agencies shall provide to the Los Angeles Regional Board results of the special studies.
5 years after effective date of the TMDLs	The Los Angeles Regional Board shall reconsider this TMDL to recalculate numeric targets using alternative hardness values, site specific translators, and/or water effect ratios based on the results of the ambient monitoring program. If necessary, the Regional Board shall add alternative targets based on sediment quality guidelines to protect benthic sediments in the Estuary. The Los Angeles Regional Board shall also reconsider this TMDL to re-evaluate the waste load allocations, load allocations, and the implementation schedule based on the results of special studies.
NON-STORM WATER PROGRAM NPDES PERMITS (INCLUDING POTWS AND POWER PLANTS)	
Upon permit issuance, renewal, or re-opener	The non-storm water program NPDES permits shall achieve waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Compliance schedules may allow up to 5 years in individual NPDES permits to meet permit requirements. Compliance schedules may not be established in general NPDES permits. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to 10 years from the effective date of the TMDL to achieve compliance with final WLAs.
GENERAL INDUSTRIAL STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	The general industrial storm water permitees shall achieve dry-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin to install and test BMPs to meet the interim copper wet-weather WLAs. BMP effectiveness monitoring will be implemented to determine progress in achieving interim copper wet-weather waste load allocations.
4 years after effective date of the TMDLs	The general industrial storm water permittees shall achieve interim copper and lead waste load allocations. Permittees shall begin an iterative BMP process, including BMP effectiveness monitoring to achieve compliance with final copper and lead waste load allocations. Permittees shall achieve final zinc wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.

Date	Action
9 years after the effective date of TMDL	The general industrial storm water NPDES permittees shall achieve final copper and lead wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
GENERAL CONSTRUCTION STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather waste load allocations. Waste load allocations shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
Six years from the effective date of the TMDL	The construction industry will submit the results of wet-weather BMP effectiveness studies to the Los Angeles Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
Seven years from the effective date of the TMDL	The Los Angeles Regional Board will consider results of the wet-weather BMP effectiveness studies and consider approval of BMPs.
Eight years from the effective date of the TMDL	All general construction storm water permittees shall implement Regional Board-approved BMPs.
MS4 AND CALTRANS STORM WATER PERMITS	
12 months after the effective date of the TMDL	In response to an order issued by the Executive Officer, MS4 and Caltrans storm water NPDES permittees shall submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both TMDL effectiveness monitoring and ambient monitoring. Ambient monitoring shall commence within six months of approval of the coordinated monitoring plan by the Executive Officer. The monitoring plan shall be made available for public review and comment prior to Executive Officer approval.
4 years after effective date of TMDL (Draft Report) 4 ½ years after effective date of TMDL (Final Report)	MS4 and Caltrans storm water NPDES permittees shall provide a written report to the Regional Board outlining the drainage areas to be addressed and how these areas will achieve compliance with the waste load allocations. The report shall include implementation methods, an implementation schedule, proposed milestones, and any revisions to the TMDL effectiveness monitoring plan.
MS4 AND CALTRANS STORM WATER PERMITS[9]	
6 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 50% of the total drainage area served by the storm drain system is effectively meeting the dry-weather waste load allocations and 25% of the total drainage area served by the storm drain system is effectively meeting the wet-weather waste load allocations.
8 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 75% of the total drainage area served by the storm drain system is effectively meeting the dry-weather waste load allocations.

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[9] Implementation schedule may be extended, upon Regional Board approval, if an integrated resources approach is employed and permittees demonstrate the need for an extended schedule.

Date	Action
10 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the storm drain system is effectively meeting the dry-weather waste load allocations and 50% of the total drainage area served by the storm drain system is effectively meeting the wet-weather waste load allocations.
15 years after effective date of the TMDL	The MS4 and Caltrans storm water NPDES permittees shall demonstrate that 100% of the total drainage area served by the storm drain system is effectively meeting both the dry-weather and wet-weather waste load allocations and attaining water quality standards for copper, lead, selenium, and zinc.

7.5 Cost Analysis

This section takes into account a reasonable range of economic factors in estimating potential costs associated with this TMDL. The storm water permittees and power plants are the two types of permitted discharges reasonably expected to incur additional costs as a result of this TMDL. This analysis, together with the other sections of this staff report, CEQA checklist, response to comments, Basin Plan amendment and supporting documents, were completed in fulfillment of the applicable provisions of the California Environmental Quality Act (Public Resources Code Section 21159.)[10]

7.4.1 Cost analysis for storm water permittees

This cost analysis focuses on compliance with the grouped waste load allocation by the storm water permittees in the urbanized portion of the watershed assigned waste load allocations (Table 7-2). Most permittees would likely implement a combination of the structural and non-structural BMPs to achieve compliance with their waste load allocations. This analysis estimates the costs of a potential strategy that combines structural and non-structural BMPs through a phased implementation approach. In addition to achieving compliance with this TMDL, such a strategy could be used to achieve compliance with the upcoming San Gabriel River Bacteria and Toxicity TMDLs. Therefore, this cost analysis reflects the potential costs of compliance with multiple TMDLs based on likely implementation scenarios.

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[10] Because this TMDL implements existing water quality objectives (namely, the numeric CTR criteria established by EPA), it does not “establish” water quality objectives and no further analysis of the factors identified in Water Code section 13241 is required. However, the staff notes that its CEQA analysis provides the necessary information to properly “consider” the factors specified in Water Code section 13241. As a result, the section 13241 analysis would at best be redundant.

Table 7-2 Urbanized portion of watershed assigned storm water waste load allocations.

Reach	Open Space and Water (acres)	Developed (acres)	Total (acres)
Estuary	116	2,931	3,047
Reach 1	37	15,192	15,230
Coyote Creek	27,857	96,046	123,902
San Jose Creek	15,171	37,838	53,009
Reach 2 and Above (inc. SJC)	196,508	98,023	294,532
Total	224,518	212,193	**436,711**

Under a phased implementation approach, it is assumed that compliance with the grouped storm water waste load allocation could be achieved in 40% of the urbanized portion of the watershed through various iterations of non-structural BMPs. Compliance with the remaining 60% of the urbanized portion of the watershed could be achieved through structural BMPs. These percentages are approximately estimated based on the removal efficiencies of various non-structural and structural BMPs, as discussed below.

The first step of a potential phased implementation approach would include the implementation of non-structural BMPs by the permittees, such as source control, increased catch basin cleanings, good housekeeping practices, and more frequent and efficient street sweeping. In their National Menu of Best Management Practices for Stormwater - Phase II, U.S. EPA reports that conventional mechanical street sweepers can reduce non-point source pollution by 5-30% (U.S. EPA, 1999a.) The removal efficiencies of sediment for conventional sweepers are dependent on the size of particles. Conventional sweepers, including mechanical broom sweepers and vacuum-assisted wet sweepers, have removal efficiencies of approximately 15 to 50% for particles less than 500 micrometers and up to approximately 65% for larger particles (Walker and Wong, 1999). U.S. EPA reports that vacuum-assisted dry street sweeping can remove significantly more pollution, including fine sediment and metals, before they are mobilized by rainwater. U.S. EPA reports a 50 - 88 percent overall reduction in annual sediment loading for residential areas by vacuum-assisted dry street sweepers. Sutherland and Jelen (1997) showed a total removal efficiency of 70% for fine particles and up to 96% for larger particles by vacuum–assisted dry sweepers (also known as small-micron surface sweepers.) Upgrading to vacuum-assisted dry sweeping would translate to a significant reduction of metals in the particulate phase.

In their 1999 Preliminary Data Summary of Urban Stormwater Best Management Practices, U.S. EPA estimated cost data for both standard mechanical and vacuum-assisted dry sweepers as shown in Table 7-3.

Table 7-3. Estimated costs for two types of street sweepers.

Sweeper Type	Life (Years)	Purchase Price ($)	O&M Cost ($/curb mile)
Mechanical	5	75,000	30
Vacuum-assisted	8	150,000	15

Source: U.S. EPA, 1999b

Table 7-4 illustrates that while the purchase price of vacuum-assisted dry sweepers is higher, the operation and maintenance costs are lower than for standard sweepers. Based on this information, U.S. EPA determined the total annualized cost of operating street sweepers per curb mile, for a variety of frequencies (in Table 7-4). In their estimates, U.S. EPA assumed that one sweeper serves 8,160 curb miles during a year and assumed an annual interest rate of 8 percent (U.S. EPA, 1999b). According to Table 7-4, permittees would save money in the long-term by switching to vacuum-assisted dry sweepers.

Table 7-4. Annualized sweeper costs, including purchase price and operation and maintenance costs ($/curb mile/year).

Sweeper Type	Sweeping Frequency					
	Weekly	Bi-weekly	Monthly	Quarterly	Twice/ year	Annually
Mechanical	1,680	840	388	129	65	32
Vacuum-Assisted	946	473	218	73	36	18

Under a phased implementation approach, the permittees could monitor compliance using flow-weighted composite sampling of runoff throughout representative storms to determine the effectiveness of this first step of implementing non-structural BMPs. If monitoring showed non-compliance, permittees could adapt their approach by increasing frequency of street sweeping or incorporating other non-structural BMPs.

If compliance could still not be achieved through non-structural BMPs, permittees could incorporate structural BMPs. Two potential structural BMPs were analyzed in this cost analysis:

1. Infiltration trenches
2. Sand filters

These approaches are specifically designed to treat urban runoff and to accommodate high-density areas. They were chosen for this analysis because in addition to addressing metals loadings to the river, they have the additional positive impact of addressing the effects of development and increased impervious surfaces in the watershed. Both approaches can be designed to capture and treat 0.5 to 1 inch of runoff. When flow exceeds the design capacity of each device, untreated runoff is allowed to bypass the device and enter storm drains or the river.

Both infiltration trenches and sand filters must be used in conjunction with some type of pretreatment device such as a biofiltration strip or gross solids removal device to remove sediment and trash in order to increase their efficiency and service life. This analysis provides an estimate of the additional costs associated with installing sand filters or infiltration trenches.

In this cost analysis, it was assumed that 30% of the watershed would be treated by infiltration trenches and 30% of the watershed would be treated by sand filters. Costs were estimated using data provided by U.S. EPA (U.S. EPA, 1999a and 1999c) and the Federal Highway Administration (FHWA, 2003). U.S. EPA cost data were reported in 1997 dollars. FHWA costs were reported in 1996 dollars for infiltration trenches and 1994 dollars for sand filters. Where costs were reported as ranges, the highest reported cost was assumed. These costs were then compared to costs determined by Caltrans in their BMP Retrofit Pilot Program (Caltrans, 2004). Caltrans costs were reported in 1999 dollars. Analysis of costs based on U.S. EPA, FHWA estimates and those reported by Caltrans, as well as estimations of sizing constraints are included in Appendix III. All costs were adjusted to 2005 dollars using U.S. Department of Labor, Bureau of Labor Statistics data (http://www.bls.gov/data/). An analysis of size constraints for each type of structural BMP considered is also included in Appendix III, which could be used to estimate land acquisition costs. To estimate land acquisition cots for individual projects in this cost analysis would be purely speculative.

Infiltration trenches. Infiltration trenches store and slowly filter runoff through the bottom of rock-filled trenches and then through the soil. Infiltration trenches can be designed to treat any amount of runoff, but are ideal for treating small urban drainage areas less than five to ten acres. Soils and topography are limiting factors in design and siting, as soils must have high percolation rates and groundwater must be of adequate depth. Potential impacts to groundwater by infiltration trenches could be avoided by proper design and siting. Infiltration trenches are reported to achieve 75 to 90% suspended solids removal and 75-90% metals removal by U.S. EPA and FHWA. In their BMP Retrofit Pilot Program, Caltrans assumed that constituent removal was 100 percent for storm events less than the design storm, because all runoff would be infiltrated.

Table 7-5 presents estimated costs for infiltration trenches designed to treat 0.5 inches of runoff over a five-acre drainage area with a runoff coefficient equal to one. Staff determined that 12,732 devices, designed to treat five acres each, would be required to treat 30% of the urbanized portion of the watershed.

Table 7-5. Estimated costs for infiltration trenches.

	Construction Costs ($ million)	Maintenance Costs ($ million/year)
Based on U.S. EPA estimate (2005 dollars)	729	146
Based on FHWA estimate (2005 dollars)	709	Not reported

Sand Filters. Sand filters work by a combination of sedimentation and filtration. Runoff is temporarily stored in a pretreatment chamber or sedimentation basin, then flows by gravity or is pumped into a sand filter chamber. The filtered runoff is then discharged to a storm drain or natural channel. As with infiltration trenches, The costs of two types of sand filters were analyzed: 1) the Delaware sand filter, which is installed underground and suited to treat drainage areas of approximately one acre and 2) the Austin sand filter, which is installed at-grade and suited to larger drainage areas up to 50 acres. The underground sand filter is especially well adapted for applications with limited land area and is independent of soil conditions and depth to groundwater. However, both approaches must consider the imperviousness of the drainage areas in their design.

U.S. EPA estimated a 70% removal of total suspended solids and 45% removal of lead and zinc for both types of sand filters. FHWA reported high sediment, zinc and lead removal, but low copper removal for Austin sand filters and high sediment and moderate to high metals removal for Delaware sand filters. Caltrans reported a 50% reduction in total copper, a 7% reduction in dissolved copper, an 87% reduction in total lead, a 40% reduction in dissolved lead, an 80% reduction in total zinc and a 61% reduction in dissolved zinc by the Austin sand filters they tested. Caltrans reported a 66% reduction in total copper, a 40% reduction in dissolved copper, an 85% reduction in total lead, a 31% reduction in dissolved lead, a 92% reduction in total zinc and a 94% reduction in dissolved zinc by the Delaware sand filter they tested.

U.S. EPA and FHWA reported costs per acre for 0.5 inches of runoff. Total costs were calculated by multiplying the per-acre cost by the total acreage of the urbanized portion of the watershed not addressed through an integrated resources plan or non-structural BMPs. Estimated costs are presented in Table 7-6. There are significant economies of scale for Austin filters. U.S. EPA reported that costs per acre decrease with increasing drainage area. FHWA reported two separate costs based on drainage area served. Economies of scale are not a factor for Delaware filters, as they are limited to drainage areas of about one acre.

Table 7-6. Estimated costs for Austin and Delaware sand filters.

	Austin Sand Filter Construction Costs ($ million)	Austin Sand Filter Maintenance Costs ($ million/year)	Delaware Sand Filter Construction Costs ($ million)	Delaware Sand Filter Maintenance Costs ($ million/year)
Based on U.S. EPA estimate (2005 dollars)	743	37	442	22
Based on FHWA estimate (2005 dollars)*	143	Not reported	590	Not reported

*FHWA cost estimate for Austin filters calculated assuming a drainage area greater than five acres. Total costs would be $675 million for devices designed for a drainage area of less than two acres.

Based on the phased implementation approach, and some assumptions about the efficacy of each stage of the approach, the cost analysis arrived at the total costs for compliance with the Metals TMDL as shown in Table 7-7. The total costs do not include the cost savings associated with switching to vacuum-assisted street sweepers. As stated previously, the costs associated with this approach could be applied towards the cost of compliance with future TMDLs.

Table 7-7. Total estimated costs of phased implementation approach.

	Total Construction ($ million)	Total Maintenance ($million/year)
Based on U.S. EPA estimate (2005 dollars)	1913	205
Based on FHWA estimate (2005 dollars)	1442	Not reported

7.4.2 Comparison of costs estimates with Caltrans reported costs. Estimated costs for structural BMPs were compared to costs reported by Caltrans in their BMP Retrofit Pilot Program (Caltrans, 2004). Caltrans sited five Austin sand filters and one Delaware sand filter as part of their study. The five Austin sand filters served an average area of two acres and the Delaware sand filter served an area of 0.7 acres. Caltrans sited two infiltration trench/biofiltration strip combinations as part of their study. Each trench and biofiltration strip used in combination served an area of 1.7 acres. Based on these drainage areas, the average adjusted cost of the Austin sand filters in the Caltrans study was $190,258 per acre (2005 dollars), the adjusted cost of the Delaware filter was $377,181 per acre (2005 dollars) and the average adjusted cost of the infiltration trench/biofiltration strips was $102,656 per acre (2005 dollars). These costs are approximately an order of magnitude greater than the costs determined using estimates provided by U.S. EPA and FHWA. It should be noted that costs calculated using EPA and FHWA estimates were based on infiltration trench and sand filter designs that would treat 0.5 inches of runoff, while the Caltrans study costs were based on an infiltration trench design that would treat 1 inch of runoff and sand filter designs that would treat 0.56 to 1 inches of runoff. This could explain some of the differences in costs.

The differences in costs can also be explained by a third party review of the Caltrans study, conducted by Holmes & Narver, Inc. and Glenrose Engineering (Caltrans, 2001.) The review compared adjusted Caltrans costs with costs of implementing BMPs by other state transportation agencies and public entities. The adjusted costs exclude costs associated with the unique pilot program and ancillary costs such as improvements to access roads, landscaping or erosion control, and non-BMP related facilities. For the comparison, all costs were adjusted for differences in regional economies. The third party review determined that the median costs reported by Caltrans were higher than the median costs reported by the other agencies for almost every BMP considered, including sand filters and infiltration BMPs. The review attributed the higher Caltrans costs to the small scale and accelerated nature of the pilot program. The third party review then gave recommendations for construction cost reductions based on input from other state agencies. These included simplifying design and material components, combining retrofit work with ongoing construction projects, changing methods used to select and work with construction contractors, allowing for a longer planning horizon, constructing a larger number of BMPs at once, and implementing BMPs over a larger drainage area.

7.4.3 Results of a Region-wide Cost study

In their report entitled “Alternative Approaches to Storm Water Quality Control, Prepared for the Los Angeles Regional Water Quality Board,” Devinny et al. estimated the total costs for compliance with Regional Board storm water quality regulations as ranging from $2.8 billion, using entirely non-structural systems, to between $5.7 billion and $7.4 billion, using regional treatment or infiltration systems. The report stated that final costs would likely fall somewhere within this range. Table 7-8 presents the report’s estimated costs for the various types of structural and non-structural systems that could be used to achieve compliance with municipal storm water requirements throughout the Region.

Table 7-8. Estimated costs of structural and non-structural compliance measures for the entire Los Angeles Region. (Source: Devinny et al.)

Compliance Approach	Estimated Costs
Enforcement of litter ordinances	$9 million/year
Public Education	$5 million/year
Increased storm drain cleaning	$27 million/year
Installation of catch basin screens, enforcing litter laws, improving street cleaning	$600 million
Low –flow diversion	$28 million
Improved street cleaning	$7.5 million/year
On-site BMPs for individual facilities	$240 million
Structural BMPs – 1st estimation method	$5.7 billion
Structural BMPs – 2nd estimation method	$4.0 billion

The Devinny et al. study calculates costs for the entire Los Angeles Region, which is 3,100 square miles, while the San Gabriel River watershed is 682 square miles. When compared on a per square mile basis, the costs estimated in section 7.4.1 are within the range calculated by Devinny et al. Table 7-9 gives the estimated costs presented per square mile.

Table 7-9 Comparison of costs for storm water compliance on a per mile basis.

	Construction Costs ($ million/square mile)
Based on U.S. EPA estimate	2.8
Based on FHWA estimate	2.1
Maximum cost calculated by Devinny et al.	0.90 – 2.39

The Devinny et al. study also estimated benefits associated with storm water compliance. It was determined that the Region-wide benefits of a non-structural compliance program would equal approximately $5.6 billion while the benefits of non-structural and regional measures would equal approximately $18 billion. Region-wide estimated benefits included:

- Flood control savings due to increased pervious surfaces of about $400 million,
- Property value increase due to additional green space of about $5 billion,
- Additional groundwater supplies due to increased infiltration worth about $7.2 billion,
- Willingness to pay to avoid storm water pollution worth about $2.5 billion,
- Cleaner streets worth about $950 million,
- Improved beach tourism worth about $100 million (not applicable to San Gabriel River),
- Improved nutrient recycling and atmospheric maintenance in coastal zones worth about $2 billion,
- Savings from reduction of sedimentation in Regional harbors equal to about $330 million, and
- Unquantifiable health benefits of reducing exposure to fine particles

7.4.4 Cost Analysis for Power Plants

Based on recent effluent quality data, the Haynes and Alamitos power plants are not expected to meet their waste load allocations without implementing a compliance strategy. For the purposes of this cost analysis, it is assumed that the Alamitos and Haynes plants could achieve compliance by relocating their discharges out of the Estuary. The TMDL does not require the power plants to implement this particular strategy; it is merely analyzed here as a reasonably foreseeable means of TMDL compliance.

The cost to relocate the Haynes and Alamitos plants' discharges out of the Estuary can be approximated based on the costs of recent ocean outfall construction projects in California. The Point Loma Ocean Outfall, serving the Point Loma Wastewater Treatment Plant in San Diego, was extended in 1993 from a length of two miles offshore to 4.5 miles offshore. The 3.5 mile long South Bay Ocean Outfall, serving the International and South Bay Wastewater Treatment Plants in San Diego, was completed in 2000. The Point Loma Outfall handles an average flow of 190 MGD and cost $50 million to construct. The outfall is 12 feet in diameter and is 320 feet below sea level. The South Bay outfall handles an average flow of 174 MGD and cost $43 millon to construct. The outfall is 11 feet in diameter and 200 feet below sea level. This roughly translates to a cost of $0.3 million per million gallons, assuming similar outfall lengths and design. The Haynes plant discharges up to 1014 MGD and the Alamitos plants discharges up to 1283 MGD. This results in the costs for each plant presented in Table 7-10.

Table 7-10. Estimated costs of relocating power plant outfalls.

	Maximum Flow (MGD)	Cost per MGD ($million)	Total Cost ($ million)
Haynes Generating Station	1014	0.3	304
Alamitos Generating Station	1283	0.3	385

If replacing copper condensers was chosen as part of an overall compliance strategy, a gross estimate of associated costs could be made based on a recent repowering project at the Haynes generating station. LACDPW recently replaced two generating units (units 3 and 4), including copper condensers, at the Haynes plant for a total cost of $375 million (personal communication with Susan Damron, LADWP). The cost of the turbines and generators was $120 million. Subtracting this from the total cost results in a combined cost for the condensers and intake pumps equal to approximately $255 million, or $125 million for each unit. This costs analysis includes the cost of replacing both the condensers and intake pumps. The actual cost of replacing only the condensers would be significantly less.

In order to estimate the costs associated with replacing copper condensers at Alamitos, the Haynes replacement costs can be generally extrapolated to Alamitos, based on the relative size of the generating units at each plant. Units 3 and 4 at the Haynes plant have a design capacity of 250 megawatts each. Units 1 – 6 at the Alamitos plant have a combined design capacity of 2,093 megawatts. The cost scale is not linear with size. Nonetheless, based on typical equipment sizing and construction costs of power plant projects (including the planned repowering of the AES El Segundo power plant), the cost for replacing the condensers and pumps for Units 1-6 at Alamitos can be estimated at $1 billion. It should be noted that Alamitos, due to equipment compatibility issues, may be required to replace the generators along with the condensers, which could raise the total project cost by 40% to 50%.

These figures are general cost estimates of two potential means of compliance. Once the discharger determines specific compliance measures, more precise estimates can be made.

8. MONITORING

There are three objectives of monitoring associated with the TMDL. The first is to collect data (e.g., hardness, flow, and background concentrations) to evaluate the uncertainties and assumptions made in development of the TMDL. The second is to collect data to assess compliance with the waste load allocations. The third is to collect data to evaluate potential management scenarios. To achieve these objectives, a monitoring program will need to be developed for the TMDL that consists of three components: (1) ambient monitoring, (2) compliance assessment monitoring and (3) special studies.

The monitoring program and any required technical reports will be established pursuant to a subsequent order issued by the Executive Officer. As a planning document, the TMDL identifies the type of information necessary to refine and to update the TMDL, and to assess the TMDL's effectiveness. The Executive Officer will comply with any necessary legal requirements in developing the monitoring program, requiring technical reports, and establishing special studies.

8.1 Ambient Monitoring

An ambient monitoring program throughout the San Gabriel River and its tributaries is necessary to ensure that water quality standards are attained and to track trends in water quality improvements. Another goal is to provide background information on hardness values and the partitioning of metals between the total recoverable and dissolved fraction to refine load and waste load allocations.

The MS4 and Caltrans NPDES permittees assigned waste load allocations are jointly responsible for implementing the ambient monitoring program. The responsible agencies shall sample for total recoverable metals, dissolved metals, and hardness once per month at each proposed ambient monitoring location until at least year five when the TMDL is reconsidered. Detection limits shall be less than numeric targets. The ambient monitoring program shall contain monitoring in all reaches and major tributaries of the San Gabriel River, including but not limited to additional dry- and wet-weather monitoring in the San Gabriel River Reaches 4 and 5 and Walnut Creek, additional dry-weather monitoring in San Gabriel River Reach 2, and additional wet-weather monitoring in San Jose Creek, San Gabriel River Reaches 1 and 3, and the Estuary. In addition, sediment samples shall be collected semi-annually in the Estuary and analyzed for sediment toxicity resulting from copper, lead, selenium, and zinc.

Ambient monitoring efforts are already underway in the watershed. As part of their NPDES permit requirements for the Long Beach, Los Coyotes, Whittier Narrows, San Jose Creek and Pomona WRPs, LACSD developed a watershed-wide monitoring program for the San Gabriel River watershed. The project is funded by LACSD and managed through SCCWRP and the Los Angeles and San Gabriel Rivers Watershed Council with participation of a multistakeholder workgroup. Participants in the workgroup include LACDPW and other Los Angeles and Orange County MS4 permittees. The program design includes expanded ambient monitoring, coordinated multi-agency monitoring efforts, and a framework for periodic and comprehensive assessments of conditions in the watershed. The program design includes annual sampling at 12 fixed stations and 10 randomized sites[11] for a number of biological and chemical measurements including total recoverable and dissolved metals and hardness. These efforts are being coordinated and integrated with LACSD's ongoing NPDES sampling programs. LACSD has a number of stations in San Jose Creek, San Gabriel River Reach 3 and Reach 1 and Coyote Creek (Table 2-5) where they measure total recoverable metals on a monthly to quarterly basis and hardness on a weekly basis. Integration of monitoring programs to reduce redundancy and increase efficiency is a major goal of the San Gabriel watershed-wide program. The MS4 and Caltrans NPDES permittees are encouraged to participate in the San Gabriel watershed-wide monitoring program efforts to leverage resources.

8.2 TMDL Effectiveness Monitoring

TMDL effectiveness monitoring requirements for implementation will be specified in NPDES permits for POTWs, power plants, and other non-storm water NPDES permits. The permits should specify the monitoring necessary to determine if the waste load allocations are achieved. For the POTWs and power plants, daily and monthly effluent monitoring requirements will be developed to ensure compliance with waste load allocations. Receiving water monitoring requirements in the existing permits to assess impact of the POTWs and power plants will not change as a result of this TMDL.

The general industrial storm water permit shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general industrial permit shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. A group monitoring effort will not only assess individual compliance, but will assess the effectiveness of chosen BMPs to reduce pollutant loading on an industry-wide or permit category basis. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial and construction facilities within their jurisdiction because compliance with waste load allocations by these facilities will translate to reductions in metals loads to the MS4 system.

The MS4 and Caltrans storm water NPDES permittees are jointly responsible for assessing progress in reducing pollutant loads to achieve the dry- and wet-weather TMDLs. The permittees are required to submit for approval by the Executive Officer a coordinated monitoring plan that will demonstrate the effectiveness of the phased implementation schedule for this TMDL. Monitoring stations specified for the ambient monitoring program may also be used for TMDL effectiveness monitoring. Responsible parties are encouraged to coordinate with the San Gabriel watershed-wide monitoring program to avoid duplication and reduce costs.

8.2.1 Dry-weather TMDL Effectiveness Monitoring

The storm water NPDES permittees will be found to be effectively meeting the dry-weather waste load allocations if the in-stream pollutant concentration or load at the first downstream

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[11] 30 random sites were sampled the first year, with 10 additional random sites sampled each year thereafter.

effectiveness monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation. Alternatively, effectiveness of the TMDL may be assessed at the storm drain outlet based on the numeric target for the receiving water. For storm drains that discharge to other storm drains, effectiveness will be based on the waste load allocation for the ultimate receiving water for that storm drain system. The responsible agencies shall sample once per month during dry-weather conditions at each proposed TMDL effectiveness monitoring location. The final dry-weather monitoring stations shall be located in San Jose Creek Reach 1 and the Estuary.

8.2.2 Wet-weather TMDL Effectiveness Monitoring

The storm water NPDES permittees will be found to be effectively meeting wet-weather waste load allocations if the load at the downstream monitoring location is equal to or less then the loading capacity (Table 6-5). For practical purposes, this is when the EMC for a flow-weighted composite is less than or equal to the numeric target. Responsible agencies shall sample at least one wet-weather event per month in any month where flow meets wet-weather conditions (260 cfs in San Gabriel River Reach 2 and 156 cfs in Coyote Creek) and at least 4 wet-weather events total in a given storm season (November to March), unless there are less than 4 events total, at each proposed TMDL effectiveness monitoring location. Final wet-weather TMDL effectiveness monitoring stations may be located at the existing LACDPW mass emission sites in San Gabriel Reach 2 and Coyote Creek.

8.3 Special Studies

Additional monitoring and special studies may be needed to evaluate the uncertainties and the assumptions made in development of this TMDL. The results of special studies may be used to reevaluate waste load allocations when the TMDL is reconsidered.

Required Studies:

1. The San Jose Creek WRP, Los Coyotes WRP, Long Beach WRP, and the MS4 and Caltrans storm water permittees that discharge to San Gabriel River Reach 1 and Coyote Creek are jointly responsible for conducting a study to better understand the mixing of fresh and salt waters in the Estuary and to assess the effect of upstream freshwater discharges on water quality and aquatic life beneficial uses in the Estuary. The purpose of the study is to refine the assumptions made in establishing the copper waste load allocations for discharges to the Estuary and discharges to those reaches tributary to the Estuary. Results may lead to an adjustment of copper waste load allocations at the time the TMDL is reconsidered. Responsible agencies are encouraged to coordinate with the SCCWRP's ongoing effort to model the Estuary's hydrodynamic characteristics and the fate and transport of metals loading to the Estuary.

<u>Voluntary Studies</u>:

2. Special studies may be warranted to evaluate the numeric targets. Studies on background concentrations of total recoverable vs. dissolved metals concentrations, total suspended solids, and organic carbon will help with the refinement of metals conversion factors.

3. Special studies are allowed to better characterize metals loading from open space and natural sources. Studies may also be developed to assess natural soils as a potential background source of selenium in San Jose Creek Reach 1.

4. Studies should be considered to evaluate the potential contribution of atmospheric deposition to metals loading and sources of atmospheric deposition in the watershed.

5. Special studies should be considered to refine some of the assumptions used in the modeling, specifically source representation in dry-weather, the relationship between total recoverable and dissolved metals in storm water, the assumption that metals loading are closely associated with suspended sediments, the accuracy and robustness of the potency factors, the uncertainties in the understanding sediment washoff and transport, and the representation of reservoirs, spreading grounds, and other hydromodifications in the watershed. The assumptions made in model development are detailed in Appendices I and II.

6. Special studies should be considered to evaluate the effectiveness of various structural and non-structural BMPs in removing metals and meeting waste load allocations.

7. A WER study may be warranted to calculate a site-specific copper objective for the Estuary.

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TOTAL MAXIMUM DAILY LOADS FOR METALS
LOS ANGELES RIVER AND TRIBUTARIES

U.S. Environmental Protection Agency
Region 9

California Regional Water Quality Control Board
Los Angeles Region

June 2, 2005

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LIST OF ACRONYMS

µg/L	Micrograms per liter
ACF	Acute Conversion Factor
AU	Analytical Unit
BLM	Biotic Ligand Model
BMPs	Best Management Practices
Caltrans	California Department of Transportation
CCC	Criteria Continuous Concentration
CCF	Chronic Conversion Factor
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CMC	Criteria Maximum Concentration
CTR	California Toxics Rule
CWA	Clean Water Act
EFDC1D	Environmental Fluid Dynamics Code 1-D
EMC	Event Mean Concentration
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
GWR	Ground Water Recharge
HSPF	Hydrologic Simulation Program-Fortran
IPWP	Integrated Plan for the Wastewater Program
IRP	Integrated Resources Plan
LACDPW	Los Angeles County Department of Public Works
LARWQCB	Los Angeles Regional Water Quality Control Board
LSPC	Loading Simulation Program in C++
MCLs	Maximum Contaminant Levels
MGD	Million Gallons Per Day
MS4	Municipal Separate Storm Sewer System
MUN	Municipal Supply
NCDC	National Climatic Data Center
NHD	National Hydrography Dataset
NPDES	National Pollutant Discharge Elimination System
POTW	Publicly Owned Wastewater Treatment Works
SCAG	Southern California Association of Governments
SCCWRP	Southern California Coastal Water Research Project
SIP	State Implementation Plan
TMDL	Total Maximum Daily Loads
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOCs	Volatile Organic Compounds
WASP5	Water Quality Analysis Simulation Program
WDRs	Waste Discharge Requirements
WER	Water Effect Ratio

WLA	Waste Load Allocation
WMP	Watershed Monitoring Program
WQBELs	Water Quality Based Effluent Limits
WQOs	Water Quality Objectives
WRPs	Water Reclamation Plants

1. INTRODUCTION

Segments of the Los Angeles River and its tributaries (Figure 1) exceed water quality objectives for a variety of metals. These segments (*i.e.,* reaches) of the Los Angeles River and tributaries are included on the California 303(d) list of impaired waterbodies (LARWQCB, 1998a and 2002). The Clean Water Act requires a Total Maximum Daily Load (TMDL) be developed to restore the impaired waterbodies, including the Los Angeles River, to their full beneficial uses. Table 1-1 summarizes the stream reaches and tributaries of the Los Angeles River watershed included on the California 303(d) list for metals.

Table 1-1. Segments of the Los Angeles River and tributaries listed as impaired for metals (LARWQCB, 1998a and 2002)

Listed Waterbody Segment	Copper	Cadmium	Lead	Zinc	Aluminum	Selenium
Aliso Canyon Wash						X
Dry Canyon Creek						N
McCoy Canyon Creek						N
Monrovia Canyon Creek			X			
Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.)			X			
Tujunga Wash (from Hansen Dam to Los Angeles River)	X					
Burbank Western Channel		X				
Los Angeles River Reach 2 (from Figueroa St. to Carson St.)			X			
Rio Hondo Reach 1 (from the Santa Ana Fwy to Los Angeles River)	X		X	X		
Compton Creek	X		X			
Los Angeles River Reach 1 (from Carson St. to estuary)	N	N	X	N	N	

X: listed as impaired in 1998 303(d) list and part of analytical unit 13. N: New waterbody listing based on 2002 303(d) list, not part of analytical unit 13

TMDLs are developed for reaches on the 1998 and 2002 303(d) lists and for reaches where recent data indicates impairments. Metals allocations are developed for upstream reaches and tributaries that drain to impaired reaches. These TMDLs comply with 40 CFR 130.2 and 130.7, Section 303(d) of the Clean Water Act and U.S. Environmental Protection Agency (EPA) guidance for developing TMDLs in California (USEPA, 2000a). This document summarizes the information used by the EPA and the California Regional Water Quality Control Board, Los Angeles Region (Regional Board) to develop TMDLs and allocations for metals. The California Water Code (Porter-Cologne Water Quality Control Act) requires that an implementation plan be developed to achieve water quality objectives. Figure 1 shows the waterbodies addressed in this TMDL.

1.1 Regulatory Background

Section 303(d) of the Clean Water Act (CWA) requires that each State "shall identify those waters within its boundaries for which the effluent limitations are not stringent enough to implement any water quality objective applicable to such waters." The CWA also requires states to establish a priority ranking for waters on the 303(d) list of impaired waters and to establish TMDLs for such waters.

The elements of a TMDL are described in 40 CFR 130.2 and 130.7 and Section 303(d) of the CWA, as well as in the U.S. Environmental Protection Agency guidance (USEPA, 2000a). A TMDL is defined as the "sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background" (40 CFR 130.2) such that the capacity of the waterbody to assimilate pollutant loads (the loading capacity) is not exceeded. A TMDL is also required to account for seasonal variations and include a margin of safety to address uncertainty in the analysis (USEPA, 2000a).

States must develop water quality management plans to implement the TMDL (40 CFR 130.6). The EPA has oversight authority for the 303(d) program and is required to review and either approve or disapprove the TMDLs submitted by states. In California, the State Water Resources Control Board (State Board) and the nine Regional Water Quality Control Boards are responsible for preparing lists of impaired waterbodies under the 303(d) program and for preparing TMDLs, both subject to EPA approval. If EPA disapproves a TMDL submitted by a state, EPA is required to establish a TMDL for that waterbody. The Regional Boards also hold regulatory authority for many of the instruments used to implement the TMDLs, such as the National Pollutant Discharge Elimination System (NPDES) permits and state-specified Waste Discharge Requirements (WDRs).

The Regional Board identified over 700 waterbody-pollutant combinations in the Los Angeles Region requiring TMDLs (LARWCQB, 1996, 1998a). These are referred to as "listed" or "303(d) listed" waterbodies or waterbody segments. A schedule for development of TMDLs in the Los Angeles Region was established in a consent decree (Consent Decree) between USEPA and several environmental groups approved on March 22, 1999 (Heal the Bay Inc., et al. v. Browner, C 98-4825 SBA). For the purpose of scheduling TMDL development, the decree combined the more than 700 waterbody-pollutant combinations into 92 TMDL analytical units. The 303(d) list was updated in 2002. These updates and changes are not reflected in the Consent Decree.

This TMDL addresses Analytical Unit (AU) #13 of the Consent Decree which consists of segments of the Los Angeles River and tributaries with impairments by metals (cadmium, copper, lead, selenium, and zinc). Table 1-1 identifies the listed waterbodies by the metals causing impairments. The Consent Decree schedule requires that this TMDL be completed by March 22, 2004. If the Regional Board fails to develop the TMDL, EPA must promulgate the TMDL by March 22, 2005. EPA and the consent decree plaintiffs recently agreed to extend the completion deadline to December 22, 2005, in order to enable the State to complete its adoption process and EPA to approve the State-adopted TMDLs for this water body. The 2002 303(d) listings approved in 2003 are not required to be addressed per the Consent Decree; however, where appropriate, this TMDL addresses those listings as well.

This report presents the TMDLs for metals and summarizes the analyses performed by EPA and the Regional Board to develop this TMDL. This report does not address the metals TMDLs required for four lakes in the Los Angeles River watershed as part of Analytical Unit #20. These four lakes (Lake Calabasas, Echo Lake, Lincoln Park Lake and Peck Road Lake) are not hydrologically connected to the Los Angeles River or the listed tributaries. The TMDLs for these lakes are not scheduled in the Consent Decree but must be established by March 22, 2012. This report does not address metals impairments for Los Angeles Harbor or San Pedro Bay required under Analytical Units #75 and #78, respectively. These TMDLs have not been specifically scheduled in the Consent Decree, but are required to be completed by 2012.

The proposed TMDL for metals will be adopted as an amendment to the Regional Board's *Water Quality Control Plan for the Los Angeles Region* (Basin Plan). The Secretary of Resources has certified the basin planning process as exempt from certain requirements of the California Environmental Quality Act (CEQA), including preparation of an initial study, negative declaration, and environmental impact report (California Code of Regulations, Title 14, Section 15251(g)). The Basin Plan amendment and supporting documents, including this staff report and the CEQA checklist are considered substitute documents to an initial study, negative declaration, or environmental impact report. Regional Board staff held a CEQA Scoping meeting on April 23, 2004 in order to receive stakeholder input on the scope and content of the TMDL documents. Regional Board Staff presented an overview of reasonably foreseeable means of compliance with the TMDL in order to facilitate the scoping discussion and to identify possible impacts of the TMDL implementation.

1.2 Environmental Setting

The Los Angeles River flows for 55 miles from the Santa Monica Mountains at the western end of the San Fernando Valley to Queensway Bay located between the Port of Long Beach and the City of Long Beach. It drains a watershed with an area of 834 square miles. Approximately 44% of the watershed area can be classified as forest or open space. These areas are primarily within the headwaters of the Los Angeles River in the Santa Monica, Santa Susana, and San Gabriel Mountains, including the Angeles National Forest, which comprises approximately 200 square miles of the watershed. Approximately 36% of the land use can be categorized as residential, 10% as industrial, 8% as commercial, and 3% as agriculture, water and other. The more urban uses are found in the lower portions of the watershed.

The natural hydrology of the Los Angeles River Watershed has been altered by channelization and the construction of dams and flood control reservoirs. The Los Angeles River and many of its tributaries are lined with concrete for most or all of their lengths. Soft-bottomed segments of the Los Angeles River occur where groundwater upwelling prevented armoring of the river bottom. These areas typically support riparian habitat.

The mainstem of the Los Angeles River begins by definition at the confluence of Arroyo Calabasas (which drains the northeastern portion of the Santa Monica Mountains) and Bell Creek (which drains the Simi Hills). McCoy Canyon Creek and Dry Canyon Creek (listed for selenium) are tributary to Arroyo Calabasas. The river flows east from its origin along the southern edge of the San Fernando Valley. The Los Angeles River also receives flow from Browns Canyon, Aliso Canyon Wash (listed for selenium) and Bull Creek which drain the Santa Susana Mountains. The lower portions of Arroyo Calabasas and Bell Creek are channelized. Browns Canyon, Aliso Creek and Bull Creek are completely channelized.

Reach 5 of the Los Angeles River runs through Sepulveda Basin. There are no listings for metals in Reach 5 of the Los Angeles River. The Sepulveda Basin is a 2,150-acre open space designed to collect floodwaters during major storms. Because the area is periodically inundated, it remains in natural or semi-natural conditions and supports a variety of low-intensity land uses. The D.C. Tillman Wastewater Reclamation Plant (WRP), a publicly owned wastewater treatment works (POTW) operated by the City of Los Angeles, discharges to Reach 5 indirectly via two lakes in the Sepulveda Basin that are used for recreation and wildlife habitat. The POTW has a treatment design capacity of 80 million gallons per day (mgd) and contributes a substantial flow to the Los Angeles River. Most of the POTW flow discharges directly to Reach 4 of the Los Angeles River just below the Sepulveda Dam.

Reach 4 of the Los Angeles River runs from Sepulveda Dam to Riverside Drive. This section of the river is listed for lead. Pacoima Wash and Tujunga Wash are the two main tributaries to this reach. Both tributaries drain portions of the Angeles National Forest in the San Gabriel Mountains. Pacoima Wash is channelized below Lopez Dam to the Los Angeles River. Tujunga Wash (listed for copper) is channelized for the 10-mile reach below Hansen Dam. Some of the discharge from Hansen Dam is diverted to spreading grounds for groundwater recharge, but most of the flow enters the channelized portion of the stream.

Reach 3 of the Los Angeles River, which runs from Riverside Drive to Figueroa Street, is not listed for metals. The two major tributaries to this reach are the Burbank Western Channel and Verdugo which drain the Verdugo Mountains. Both tributaries are channelized. The Western Channel receives flow from the Burbank Water Reclamation Plant, a POTW with a design capacity of 9 mgd. The Burbank Western Channel is listed for cadmium.

At the eastern end of the San Fernando Valley, the Los Angeles River turns south around the Hollywood Hills and flows through Griffith Park and Elysian Park in an area known as the Glendale Narrows. This area is fed by natural springs during periods of high groundwater. The river is channelized and the sides are lined with concrete. The river bottom in this area is unlined because the water table is high and groundwater routinely discharges into the channel, in varying volumes depending on the height of the water table. The Los Angeles-Glendale Water Reclamation Plant, operated by the City of Los Angeles, has a design capacity of 20 mgd and discharges to the Los Angeles River in the Glendale Narrows.

Reach 2 of the Los Angeles River, which runs from Figueroa Street to Carson Street, is listed for lead. The first major tributary below the Glendale Narrows is the Arroyo Seco, which drains areas of Pasadena and portions of the Angeles National Forest in the San Gabriel Mountains. In wet periods, rising stream flows in the Los Angeles River above Arroyo Seco have been related to the increase of rising groundwater. There is up to 3,000 acre-feet of recharge from the Pollock

Well Field area that adds to the rising groundwater. For the 2000-01 water year, the total rising groundwater flow was estimated at 3,900 acre-feet (ULARA Watermaster Report, 2000-2001 Water Year, May 2002).

The next major tributary is the Rio Hondo. The Rio Hondo and its tributaries drain a large area in the eastern portion of the watershed. Flow in the Rio Hondo is managed by the Los Angeles County Department of Public Works (LACDPW). At Whittier Narrows, flow from the Rio Hondo can be diverted to the Rio Hondo Spreading Grounds. During dry weather, virtually all the water in the Rio Hondo goes to groundwater recharge, so little or no flow exits the spreading grounds to Reach 1 of the Rio Hondo. During storm events, Rio Hondo flow that is not used for spreading, reaches the Los Angeles River. This flow is comprised of both storm water and treated wastewater effluent from the Whittier Narrows Water Reclamation Plant. Reach 1 of the Rio Hondo is listed for copper, lead, and zinc. Monrovia Canyon Creek is also listed for lead. This creek, located in the foothills of the San Gabriel Mountains in the National Forest, is a tributary to Sawpit Creek which runs into Peck Lake and ultimately to Rio Hondo Reach 2 above the spreading grounds.

Reach 1 of the Los Angeles River, which runs from Carson Street to the estuary, was listed for lead in 1998. Listings for aluminum, copper, cadmium, and zinc were added in 2002 based on exceedances of standards in storm water samples. Compton Creek (listed for copper and cadmium) is the last large tributary to the system before the river enters the estuary. The creek is channelized for most of its 8.5 mile length.

The tidal portion of the Los Angeles River begins at Willow Street and runs approximately three miles before joining with Queensway Bay located between the Port of Long Beach and the City of Long Beach. In this reach, the channel has a soft bottom with concrete-lined sides. Sandbars accumulate in the portion of the river where tidal influence is limited.

During dry weather, most of the flow in the Los Angeles River is comprised of wastewater effluent from the Tillman, Los Angeles-Glendale and Burbank treatment plants. In the dry season, POTW mean monthly discharges totaled 70% to 100% of the monthly average flow in the river. The median daily flow in the Los Angeles River is 94 mgd (145 cfs), based on flows measured at the LACDPW Wardlow station over a 12-year period (October 1998 through December 2000). During wet weather, the river's flow may increase by two to three orders of magnitude due to storm water runoff. Average daily flows greater than 322 mgd (501 cfs) were observed 10% of the time. In months with rain events, POTW monthly average discharges together were less than 20% of the monthly average flow in the river.

The high flows in the wet season originate as storm runoff both from the areas of undeveloped open space in the mountains of the tributaries' headwaters and from the urban land uses in the flat low-lying areas of the watershed. Rainfall in the headwaters flows rapidly because the watershed and stream channels for the most part are steep. In the urban areas, about 5,000 miles of storm drains in the watershed convey storm water flows and urban runoff to the Los Angeles River. The watershed produces storm flow in the river with a sharply peaked hydrograph where flow increases quite rapidly after the beginning of rain events in the watershed, and declines rapidly after rainfall ceases. The Los Angeles River metals TMDL therefore accounts for differences in both flow and the relative contributions of pollutant sources between wet and dry periods.

1.3 Elements of a TMDL

Guidance from USEPA (2002a) identifies seven elements of a TMDL. Sections 2 through 8 of this document are organized such that each section describes one of the elements, with the analysis and findings of this TMDL for that element. The elements are:

- Section 2: Problem Identification. This section reviews the metals data used to add the waterbody to the 303(d) list, and summarizes existing conditions using that evidence along with any new information acquired since the listing. This element identifies those reaches that fail to support all designated beneficial uses; the beneficial uses that are not supported for each reach; the water quality objectives (WQOs) designed to protect those beneficial uses; and, in summary, the evidence supporting the decision to list each reach, such as the number and severity of exceedances observed.

- Section 3: Numeric Targets. For this TMDL, the numeric targets are based upon the WQOs described in the California Toxics Rule (CTR).

- Section 4: Source Assessment. This section develops the estimate of current metals loadings from point sources and non-point sources into the Los Angeles River.

- Section 5: Linkage Analysis. This analysis shows how the sources of metals compounds into the waterbody are linked to the observed conditions in the impaired waterbody. The linkage analysis addresses the critical conditions of stream flow, loading, and water quality parameters.

- Section 6: TMDL and Pollutant Allocation. This section identifies the total allowable loads that can be discharged without causing water quality exceedances. Each pollutant source is allocated a quantitative load of metals that it can discharge without exceeding the numeric targets. Allocations are designed such that the waterbody will not exceed numeric targets for any of the compounds or related effects. Allocations are based on critical conditions, so that the allocated pollutant loads may be expected to attain water quality standards at all times.

- Section 7: Implementation. This section describes the plans, regulatory tools, or other mechanisms by which the waste load allocations and load allocations are to be achieved.

- Section 8: Monitoring. This TMDL includes a requirement for monitoring the waterbody to ensure that the water quality standards are attained. If the monitoring results demonstrate the TMDL has not succeeded in removing the impairments, then revised allocations will be developed. It also describes special studies to address uncertainties in assumptions made in the development of this TMDL and the process by which new information may be used to refine the TMDL. While the TMDL identifies the goals for a monitoring program, the Executive Officer will issue subsequent orders to identify the specific requirements and the specific entities that will develop and implement a monitoring program and submit technical reports.

2. PROBLEM IDENTIFICATION

This section provides an overview of water quality standards for the Los Angeles River and reviews water quality data used in the 1998 water quality assessment, the 2002 303(d) listing and any additional data which may be pertinent to the assessment of condition.

2.1 Water Quality Standards

California state water quality standards consist of the following elements: 1) beneficial uses; 2) narrative and/or numeric water quality objectives; and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan. These are designed to be protective of the beneficial uses in each waterbody in the region or State Water Quality Control Plans.

For certain toxic pollutants, the EPA has established numeric criteria that serve as water quality standards for California's inland surface waters. (40 CFR 131.38.) EPA established the numeric criteria in the California Toxics Rule (CTR) at levels that reflect when toxic pollutants are present in toxic amounts. In other words, if a pollutant is present in a surface waterbody at a level higher than a CTR criterion, then the surface waterbody is toxic. The federal water quality criteria established by the CTR are equivalent to state water quality objectives and they serve the same purpose. For the Los Angeles region, numeric objectives for toxics can be found in the CTR (40 CFR 131.38).

2.1.1. Beneficial Uses. The Basin Plan for the Los Angeles Region (1994) defines 14 beneficial uses for the Los Angeles River. These uses are summarized in Table 2-1. The Basin Plan (1994) identifies beneficial uses as existing (E), potential (P), or intermittent (I) uses. Those uses that are most likely to be impacted by metals loadings to the Los Angeles River are the beneficial uses associated with aquatic life (i.e., wildlife habitat, warm freshwater water habitat, rare threatened or endangered species, wetland habitat, and marine habitat) and water supply (i.e., groundwater recharge).

Existing use designations for warm freshwater, wildlife, wetland, and rare, threatened or endangered species habitats (WARM, WILD, WET, and RARE) apply over much of the mainstem and Compton Creek in the lower part of the watershed. The WARM designation applies as either an intermittent or potential use to the remaining listed tributaries. The WILD designation is for the protection of fish and wildlife. This use applies to much of the mainstem of the Los Angeles River, as an intermittent use in Rio Hondo, and as potential use in the remainder of the tributaries. Water quality objectives developed for the protection of fish and wildlife are applicable to the reaches with the WARM, WILD, WET and RARE designations.

Table 2-1. Beneficial uses in listed reaches of the Los Angeles River (LARWQCB, 1994)

STREAM REACH	MUN	GWR	REC1	REC2	WILD	WARM	SHELL	RARE	MIGR	SPWN	WET	MAR	IND	PROC
Aliso Canyon Wash	P*	I	I[1]	I	E	I								
Dry Canyon Creek	P*	I	I[1]	I	E	I								
McCoy Canyon Creek	P*	I	I	I	E	I								
Monrovia Canyon Creek	I	I	I	I	E	I					E			
Los Angeles River (Reach 4)	P*	E	E	E	E	E					E		P	
Tujunga Wash	P*	I	P[1]	I	P	P								
Burbank Western Channel	P*		P[1]	I	P	P								
Los Angeles River (Reach 2)	P*	E	E[1]	E	P	E							P	
Rio Hondo (Reach 1)	P*	I	P[1]	E	I	P								
Compton Creek	P*	E	E[1]	E	E	E					E			
Los Angeles River (Reach 1)	P*	E	E[1]	E	E	E	P[1]	E	P	P		E	P	P

*Municipal designations marked with an asterisk are conditional.
E: Existing beneficial use, P: Potential beneficial use, I: Intermittent beneficial use, 1: Use restricted by LACDPW

The municipal supply (MUN) use designation applies to several tributaries to the Los Angeles River and all groundwater in the Los Angeles River watershed. Other waterbodies within Region 4 also have a conditional designation for MUN. These waterbodies are indicated with an asterisk in the Basin Plan. Conditional designations are not recognized under federal law and are not water quality standards requiring TMDL development at this time. (See Letter from Alexis Strauss [USEPA] to Celeste Cantú [State Board], Feb. 15, 2002.) The ground water recharge (GWR) use designation applies to the Los Angeles River and its tributaries as either an existing or intermittent beneficial use.

2.1.2 Water Quality Objectives (WQOs). Narrative water quality objectives are specified by the 1994 Regional Board Basin Plan. The following narrative standards are most pertinent to the metals TMDL:

> *Surface waters shall not contain concentrations of chemical constituents in amounts that adversely affect any designated beneficial use.*

> *Toxic substances shall not be present at levels that will bioaccumulate in aquatic life resources to levels which are harmful to aquatic life or human health.*
>
> *All waters shall be maintained free of toxic substance in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.*

The Regional Board's narrative toxicity objective reflects and implements national policy set by Congress. The Clean Water Act states that, 'it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited." (33 U.S.C. 1251(a)(3).) In 2000, EPA established numeric water quality objectives for several pollutants addressed in this TMDL in the CTR. The listed pollutants covered by CTR objectives include selenium, cadmium, copper, lead, and zinc (Table 2-2). The freshwater CTR values for cadmium, copper, lead, and zinc are based on the dissolved fraction and are hardness dependent (USEPA 2000b). The freshwater CTR standard for selenium is based on the total recoverable metals concentration.

EPA expressed the CTR criteria as concentrations. Therefore, whenever a pollutant is present in a surface waterbody at a concentration in excess of a CTR criterion, the surface waterbody is toxic. EPA did not differentiate between wet and dry weather conditions in establishing the CTR. The CTR criteria therefore apply at all times to inland surface waters. This result is reached on both legal and technical grounds. Legally, the result is compelled because the CTR establishes water quality criteria (i.e., objectives) to protect aquatic life in all of California's inland surface waters. (See, 40 CFR 131.38(a), (c)(1), and (d)(1).) There is no exception for wet weather conditions in the CTR. Moreover, aquatic life is also present in wet weather conditions. The CTR is legally necessary to protect these uses in wet weather conditions. It would be illogical and illegal to conclude that the CTR does not apply in wet weather.

From a technical perspective, it would be equally inappropriate to find a wet weather exception in the CTR. Because the CTR criteria are expressed as concentrations, the volume of water is irrelevant. The concentration-based criteria essentially account for dilution in wet-weather conditions. In high-volume, wet-weather conditions, if the concentration of a toxic pollutant in a water body exceeds the CTR criterion, the water body is toxic.

The CTR establishes short-term (acute) and long-term (chronic) aquatic life criteria for metals in both freshwater and saltwater. The acute criterion, defined in the CTR as the Criteria Maximum Concentration, equals the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time without deleterious effects. The chronic criterion, defined in the CTR as the Criteria Continuous Concentration, equals the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects.

CTR freshwater aquatic life criteria for certain metals are expressed as a function of hardness because hardness and/or water quality characteristics that are usually correlated with hardness can impact the toxicity of some metals. Hardness is used as a surrogate for a number of water quality characteristics, which affect the toxicity of metals in a variety of ways. Increasing hardness generally has the effect of decreasing the toxicity of metals. Water quality criteria to protect aquatic life may be calculated at different concentrations of hardness measured in milligrams per liter (mg/L) as calcium carbonate ($CaCO_3$). The CTR lists freshwater aquatic life criteria based on a hardness value of 100 mg/L and provides hardness dependent equations to calculate the freshwater aquatic life metals criteria using site-specific hardness data.

Table 2-2. Water quality objectives established in CTR. Values in table are based on a hardness value of 100 mg/L as calcium carbonate. Metals values reported as µg/L.

Metal	Freshwater Chronic	Freshwater Acute
Cadmium (dissolved)	2.2	4.3
Copper (dissolved)	9	13
Lead (dissolved)	2.5	65
Selenium (total recoverable metals)	5	Reserved
Zinc (dissolved)	120	120

The formula for calculating the hardness-adjusted acute and chronic objectives for cadmium, copper, lead, and zinc in the CTR take the form of the following equations:

$$CMC = WER * ACF * EXP[(m_a)(\ln(hardness)+b_a] \qquad \text{Equation (1)}$$
$$CCC = WER * CCF * EXP[(m_c)(\ln(hardness)+b_c] \qquad \text{Equation (2)}$$

Where:

CMC = Criteria maximum concentration
CCC = Criteria continuous concentration
WER = Water Effects Ratio (assumed to be 1)
ACF = Acute conversion factor (to convert from the total recoverable metals concentration to the dissolved fraction)
CCF = Chronic conversion factor (to convert from the total recoverable metals concentration to the dissolved fraction)
m_A = slope factor for acute criteria
m_C = slope factor for chronic criteria
b_A = y intercept for acute criteria
b_C = y intercept for chronic criteria

The CTR allows for the adjustment of criteria through the use of a water-effect ratio (WER) to assure that the metals criteria are appropriate for the site-specific chemical conditions under which they are applied. A WER represents the correlation between metals that are measured and metals that are biologically available and toxic. A WER is a measure of the toxicity of a material in site water divided by the toxicity of the same material in laboratory dilution water. No site-specific WER has been developed for the Los Angeles River. Therefore, a WER default value of 1.0 is assumed.

The coefficients needed for the calculation of objectives are provided in the CTR for most metals (Table 2-3). The conversion factors for cadmium and lead are hardness-dependent. The following equations can be used to calculate the conversion factors based on site-specific hardness data:

$$\text{Cadmium ACF} = 1.136672 - [(\ln\{hardness\})(0.041838)] \qquad \text{Equation (3)}$$
$$\text{Cadmium CCF} = 1.101672 - [(\ln\{hardness\})(0.041838)] \qquad \text{Equation (4)}$$

Lead ACF = 1.46203 - [(ln{hardness})(0.145712)] Equation (5)
Lead CCF = 1.46203 - [(ln{hardness})(0.145712)] Equation (6)

Table 2-3. Coefficients used in formulas for calculating CTR standards.

Metal	ACF	m_A	b_A	CCF	m_C	b_C
Cadmium	0.944*	1.128	-3.6867	0.909*	0.7852	-2.715
Copper	0.960	0.9422	-1.700	0.960	0.8545	-1.702
Lead	0.791*	1.2730	-1.460	0.791*	1.2730	-4.705
Zinc	0.978	0.8473	0.884	0.986	0.8473	0.884

* The ACF and CCF for cadmium and lead are hardness dependent. Conversion factors in this table are based on a hardness of 100 mg/L as $CaCO_3$.

2.1.3 Antidegradation. State Board Resolution 68-16, 'Statement of Policy with Respect to Maintaining High Quality Water" in California, known as the "Antidegradation Policy," protects surface and ground waters from degradation. Any actions that can adversely affect water quality in all surface and ground waters must be consistent with the maximum benefit to the people of the state, must not unreasonably affect present and anticipated beneficial use of such water, and must not result in water quality less than that prescribed in water quality plans and policies. Furthermore, any actions that can adversely affect surface waters are also subject to the federal Antidegradation Policy (40 CFR 131.12). The proposed TMDL will not degrade water quality, and will in fact improve water quality as it is designed to achieve compliance with existing, numeric water quality standards.

2.2 Water Quality Data Review

This review section summarizes water quality data used to develop this TMDL. The summary includes data considered by the Regional Board and EPA in developing the 1998 and the 2002 303(d) listings for metals and additional data submitted by the City of Los Angeles, the City of Burbank and the County of Los Angeles.

The receiving water data collected by the City of Los Angeles and the City of Burbank as part of NPDES monitoring requirements for D.C. Tillman WRP, the Los Angeles-Glendale WRP, and the Burbank WRP were reviewed to evaluate dry-weather conditions. The City of Los Angeles measures metals and hardness in receiving waters from several locations upstream and downstream of its treatment plants (Figure 1) on a quarterly basis. The data from the Tillman and Glendale receiving water stations represent six locations sampled from February 1998 to November 2002. The City of Burbank samples water quality in the Burbank Western Channel on a quarterly basis. The data from the Burbank WRP represent four stations sampled from November 1998 to December, 2003. Data from these programs were compared to the hardness adjusted dissolved criteria in the CTR using the hardness value for each sample. As both agencies analyze for concentrations of total recoverable metals, the comparison of their data to the dissolved criteria provides a conservative assessment of water quality impairment. These NPDES monitoring programs provide water quality information for Reaches 3, 4 and 5 of the Los Angeles River and the Burbank Western Channel, the results of which are summarized in Tables 2-4 and 2-5.

Table 2-4. Summary of dry-weather chronic metals criteria exceedances. Values in table reflect number of samples exceeding the chronic criteria over the total number of samples (Values below detection levels counted as zero). Source: City of Los Angeles and City of Burbank WRP NPDES receiving water monitoring.

Metals by Reach	LA River Reach 5	LA River Reach 4	LA River Reach 3	Burbank Western Channel
Cadmium	0/16	0/36	0/54	1/96
Copper	1/17	18/34	6/51	41/96
Lead	2/17	12/34	6/48	2/96
Zinc	0/17	0/34	0/51	1/96

Table 2-5. Summary of dry-weather acute metals criteria exceedances. Values in table reflect number of samples exceeding the acute criteria over the total number of samples (Values below detection levels counted as zero). Source: City of Los Angeles and City of Burbank WRP NPDES receiving water monitoring.

Metals by Reach	LA River Reach 5	LA River Reach 4	LA River Reach 3	Burbank Western Channel
Cadmium	0/16	0/34	0/42	0/96
Copper	0/18	4/36	0/51	10/96
Lead	0/17	0/34	0/48	0/96
Zinc	0/17	0/34	0/51	1/96

In January 2002, the City of Los Angeles began their Watershed Monitoring Program (WMP) which involves the monthly collection of water quality data at eight stations along the Los Angeles River (Figure 2). In this program, water quality samples are analyzed for both total recoverable and dissolved metals at eight stations along the entire length of the River. The data that were assessed were collected through May 2003, which included 17 samples collected at each station. These data provide information on spatial variability in water quality in all six reaches of the Los Angeles River (Figures 3a-3d) and can be used in conjunction with median hardness data (Table 3-1) to assess compliance with chronic CTR criteria. As with the POTW receiving water data, concentrations of total recoverable metals are compared to the dissolved criteria (adjusted using median hardness values) to provide a conservative assessment of water quality impairment. The results of this comparison are summarized in Table 2-6.

Table 2-6. Summary of dry weather chronic metals criteria exceedances. Values in table reflect number ofsamples exceeding the criteria over the total number of samples. Median hardness values for each reach (Table 3-1) were used to assess compliance with CTR criteria. Source: City of Los Angeles WMP.

Metals by Reach	LA River Reach 5	LA River Reach 4	LA River Reach 3	LA River Reach 2	LA River Reach 1
Hardness (mg/L as $CaCO_3$)	400	246	278	268	282
Cadmium	0/17	0/17	0/34	0/34	0/17
Copper	2/17	4/17	4/34	5/34	2/17
Lead	0/17	6/17	6/34	5/34	3/17
Zinc	0/17	0/17	0/34	0/34	0/17

To assess wet-weather impairments, storm water data collected by LACDPW as part of the NPDES municipal storm water permit monitoring requirements were evaluated. The LACDPW has been sampling approximately five storms per year at the Wardlow gage station since 1996. LACDPW samples hardness and metals (both dissolved and total recoverable metals) from composite storm water samples. The results of these data are summarized in Table 2-7.

Table 2-7. Summary of wet-weather acute and chronic metals criteria exceedances. Values in table reflect number of samples exceeding the criteria over the total number of samples (Values below detection levels counted as zero). Source: NPDES MS4 Monitoring at LACDPW Wardlow station between 1996 and 2002.

Metal	Number >Detection Level	Number > Chronic Criteria	Number > Acute Criteria
Cadmium (dissolved)	3/42	3/42	3/42
Copper (dissolved)	32/42	19/42	13/42
Lead (dissolved)	11/42	11/42	4/42
Selenium (total recoverable)	1/42	NA	0/42
Zinc (dissolved)	18/42	6/42	6/42

2.2.1. Summary of Results

Cadmium – The Burbank Western Channel is on the 1998 303(d) list for cadmium. In the 2002 303(d) list, a cadmium listing was added for Reach 1 of the Los Angeles River based on storm water data. Cadmium was detected in only 1 of 96 samples in any of the NPDES receiving water samples from Burbank Western Channel (Table 2-4). For a large number of samples, the reported detection limits were greater than the chronic criteria. However, the most recent data have detection limits that are below the chronic criteria and contain no exceedances. Cadmium was detected in 3 out of 42 storm water samples collected at Los Angeles River Reach 1 (Table 2-6). All three samples exceeded both the chronic and acute criteria. There were no exceedances of cadmium in Reaches 3, 4, or 5 of Los Angeles River based on data collected by the City of Los Angeles.

In summary, there is no evidence that cadmium is being exceeded in Burbank Western Channel or any other reach during dry weather. There are occasional exceedances of the cadmium standard in storm water samples. A wet-weather TMDL is required for cadmium in Reach 1. Wet-weather allocations will be applied to all upstream reaches because discharges of cadmium in upstream reaches may cause or contribute to an exceedance of water quality standards in Reach 1.

Copper – The 1998 303(d) listings for copper are in Tujunga Wash, Rio Hondo (Reach 1), and Compton Creek. In the 2002 303(d) list, a copper listing was added for Reach 1 of the Los Angeles River based on storm water data. Copper was detected in 32 out of 42 storm water samples - 19 samples exceeded the chronic criteria and 13 samples exceeded the acute criteria. A review of the City's WMP data indicates a dry-weather impairment in Reach 1 as well. The City's WMP data indicates dry-weather impairments in Reaches 1, 2, 3, 4, and 5 of the river. The data from the POTWs (Tables 2-4 and 2-5) indicate that there are dry-weather exceedances of both the chronic and acute criteria in the Los Angeles River (Reaches 3, 4 and 5) and in the Burbank Western Channel.

In summary, TMDLs are required for Tujunga, Rio Hondo, Compton, and LA Reach 1 to address the 1998 and 2002 303(d) listings. Data also indicate the need to develop TMDLs to address impairments in Reaches 2, 3, 4 and 5 of the LA River and the Burbank Western Channel.

Lead – The lead listings are from the 1998 303(d) list and are for Monrovia Canyon Creek, Rio Hondo (Reach 1), Compton Creek, and the Los Angeles River (Reaches 1, 2 and 4). There are no new data for Monrovia Canyon, Rio Hondo or Compton Creek.

A review of the dry-weather data for the Los Angeles River indicates occasional exceedances of the chronic standard in Los Angeles River (Reaches 3, 4, and 5) and Burbank Western Channel (Tables 2-4 and 2-6). The reported detection limits for lead in many of the samples from the Burbank Western Channel were higher than the chronic standard, complicating the assessment for 38 out of 96 of the samples. High detection levels were not an issue in comparing reported data with the acute standard (Table 2-5). There were no exceedances of the acute standard in samples from the Burbank Western Channel or Reaches 3, 4 or 5 of the Los Angeles River. There were exceedances of both the acute and chronic standard in Reach 1 of the Los Angeles River during storms (Table 2-6). Of the 11 samples with lead concentrations greater than the detection limit, 11 samples exceeded the chronic criteria and 4 samples exceeded the acute criteria.

In summary, TMDLs are required for Monrovia Canyon Creek, Rio Hondo (Reach 1), Compton Creek, and LA River Reaches 1, 2 and 4 to address the 1998 303(d) listings. Data also indicate the need develop TMDLs to address impairments in Reaches 3 and 5 of the LA River.

Zinc – The Rio Hondo is listed for zinc on the 1998 303(d) list. There are no new data for the Rio Hondo. In 2002, a listing for dissolved zinc was added for Reach 1 of the Los Angeles River, based on the LACDPW storm water data. There do appear to be some exceedances of the zinc standard during storms (Table 2-6). Of the 18 samples with zinc concentrations greater than the detection limit, 6 samples exceeded the chronic and acute criteria. There do not appear to be any exceedances of the acute or chronic zinc criteria in Reaches 3, 4 and 5 of the Los Angeles River (Tables 2-4 and 2-5). There was one incidence of elevated zinc in the Burbank Western Channel.

With the possible exception of Rio Hondo, there are no dry-weather impairments associated with zinc. Zinc occasionally exceeds the acute criteria in storm water samples. A dry-weather TMDL is required for zinc in the Rio Hondo (Reach 1). A wet-weather TMDL is required for LA River Reach 1. Wet-weather allocations will be applied to all upstream reaches because discharges of zinc in upstream reaches may cause or contribute to an exceedance of water quality standards in Reach 1.

Aluminum – This is not part of analytical unit #13, but aluminum was added in 2002 based on LACDPW storm water data. The total recoverable metals values for aluminum were compared to the maximum contaminant level (MCL) of 1 mg/L. The MCL was exceeded in only 2 out of 26 storm water samples collected since the year 2000. Although the MCL has been incorporated into the Basin Plan to protect the MUN beneficial use, conditional designations are not recognized under federal law and are not water quality standards requiring TMDL development at this time. (See Letter from Alexis Strauss [USEPA] to Celeste Cantú [State Board], Feb. 15, 2002.)

Selenium – Aliso Canyon Wash was listed for selenium on the 1998 303(d) list. In 2002, two more tributaries (McCoy Canyon Creek and Dry Canyon Creek) were listed for selenium. We analyzed selenium data collected by the City of Calabasas on a monthly basis between July 2000 and July 2002 as part of a 319h grant provided by the Regional Board. At the two stations in

McCoy Canyon Creek, the CTR value of 5 µg/l was exceeded in 27 out of 29 samples. The maximum measured value was 44 µg/l. The selenium values were lower at the two Dry Canyon Creek stations. At these stations, values greater than 5 µg/l were observed in 12 out of 54 samples. We also assessed selenium data collected by the City of Los Angeles at eight stations along the Los Angeles River in 2002 and 2003 as part of their Watershed Monitoring Program. Selenium values greater than 5 µg/l were observed in 14 out of 136 samples. All of these were from the Los Angeles River Reach 6 (where 14 out of 17 exceeded the CTR value). None of the other samples from any of the downstream stations on the Los Angeles River exceeded the CTR value. The selenium issue seems to be confined to the upper reaches of the watershed and tributaries draining to Reach 6. Because there is little industrial activity in this area, we believe that the selenium in the waterbody originates from natural sources such as marine shales (EDAW, 2003). A concentration-based load allocation is therefore being assigned to Reach 6 and its tributaries. Separate studies are underway to evaluate whether selenium levels represent a natural condition for this watershed.

Conclusions. Our review of the data indicates that there are occasional exceedances of copper and lead during dry-weather conditions in reaches1, 2, 3, 4, and 5 and some tributaries. A single exceedance for cadmium was identified in the Burbank Western Channel during dry weather. There are also occasional exceedances of CTR criteria in storm water for copper, lead and to a lesser extent for zinc and cadmium. High selenium values were only observed at stations located in the upper portion of the watershed, which we believe are associated with natural sources. Finally, we find that a TMDL for aluminum is not warranted to protect a conditional use. Table 2-8 presents a summary of the data review used to determine which reaches and tributaries require TMDLs.

Table 2-8. Summary of recent data review. Values reflect percent excedances of CTR criteria by NPDES receiving water data unless otherwise noted.

Listed Waterbody Segment (Dry)	Data Source	Cadmium	Copper	Lead	Zinc	Aluminum	Selenium
Aliso Canyon Wash							No new data
Dry Canyon Creek	319h grant						93%
McCoy Canyon Creek	319h grant						22%
Los Angeles River Reach 6	319h grant						10%
Los Angeles River Reach 5	NPDES, WMP	0%	6%, 12%[1]	12%	0%		
Los Angeles River Reach 4 (Sepulveda Dam to Riverside Dr.)	NPDES, WMP	0%	53%, 24%[1]	35%	0%		
Tujunga Wash (from Hansen Dam to Los Angeles River)		No new data					
Burbank Western Channel	NPDES	1%	4%	2%			
Los Angeles River Reach 3	NPDES, WMP	0%	12%	13%, 18%[1]			
Los Angeles River Reach 2	WMP	0%	15%[1]	No new			

Listed Waterbody Segment (Dry)	**Data Source**	**Cadmium**	**Copper**	**Lead**	**Zinc**	**Aluminum**	**Selenium**
(from Figueroa St. to Carson St.)				data			
Monrovia Canyon Creek				No new data			
Rio Hondo Reach 1 (from the Santa Ana Fwy to Los Angeles River)			No new data	No new data	No new data		
Compton Creek			No new data	No new data			
Los Angeles River Reach 1 (from Carson St. to estuary)	WMP	0%	12%[1]	18%[1]	0%		
Listed Waterbody Segment (Wet)		**Cadmium**	**Copper**	**Lead**	**Zinc**	**Aluminum**	**Selenium**
Los Angeles River Reach 1 (from Carson St. to estuary)	Storm Water	7%	31%	10%	14%	8%	0%

1 – WMP samples compared to dissolved CTR criteria using median hardness values.

Dry-weather TMDLs will be developed for the following pollutant waterbody combinations:

- Copper for the Los Angeles River Reaches 1, 2, 3, 4, and 5, Burbank Western Channel, Rio Hondo Reach 1, Compton Creek and Tujunga Wash. Allocations will be developed for upstream reaches and tributaries to meet TMDLs in downstream reaches. No copper allocation will be assigned to Monrovia Canyon creek because its flow does not reach the mainstem of the river during dry weather.
- Lead for the Los Angeles River Reaches 1, 2, 3, 4, and 5, Burbank Western Channel, Rio Hondo Reach 1, Compton Creek, and Monrovia Canyon Creek. Allocations will be developed for upstream reaches and tributaries to meet TMDLs in downstream reaches.
- Zinc for Rio Hondo Reach 1.
- Selenium for Reach 6, Aliso Creek, Dry Canyon Creek and McCoy Canyon Creek.

Wet-weather TMDLs will be developed for cadmium, copper, lead and zinc for the Los Angeles River Reach 1. Allocations will be developed for upstream reaches and tributaries that drain to the river in order to meet the TMDL for Reach 1. Discharges to these upstream reaches cause or contribute to exceedances of water quality standards in Reach1, and therefore, contribute to the impairment in Reach. Applying allocations to upstream reaches will also address impairments in Reach 2, Compton Creek and Tujunga Wash.

3. NUMERIC TARGETS

Numeric targets for the TMDL have been calculated based on the numeric standards in the CTR. The TMDL targets are expressed in terms of total recoverable to address the potential for transformation between the total recoverable and the dissolved metals fraction.

Separate targets are developed for dry and wet weather because hardness values and flow conditions in the Los Angeles River and tributaries vary between dry and wet weather. In this TMDL, dry-weather targets are based on the most limiting of the chronic or acute CTR criteria. For copper and lead, these are the chronic criteria. For zinc, this is the acute criterion. Wet-weather targets are developed for storm conditions based on acute criteria because it would be inappropriate to apply criteria based on long-term exposure (4-days) to storms which are generally short-term and episodic in nature. Another reason for developing distinct targets for dry and wet-weather conditions is to account for differences in hardness or fractionation between dissolved and total recoverable metals, which may affect the numeric target. The wet-weather storm condition is operationally defined when the maximum daily flow is equal to or greater than 500 cfs at the LA River Wardlow gage station. The 500 cfs value represents the 90th percentile of average daily flow at that station (1998 – 2000). The dry-weather targets apply to days when the maximum daily flow in the River is less than 500 cfs.

3.1 Dry-Weather Targets

Dry-weather numeric targets are developed for copper and lead for all reaches of the Los Angeles River and for tributaries feeding into the Los Angeles River. Dry-weather targets are also developed for lead in Monrovia Canyon Creek, Zinc in the Rio Hondo, and selenium for Los Angeles River Reach 6 and its tributaries.

The dry-weather targets for copper, lead and zinc are dependent on hardness and metals conversion factors. Hardness data for Burbank Western Channel and Reaches 3, 4, and 5 of the LA River were obtained from NPDES ambient monitoring data collected by the three POTWs in the ambient water upstream and downstream of the plants. Additional hardness data for the LA River upstream and downstream of the Tillman and Glendale plants came from a special study to develop site-specific conversion factors for copper (LWA, 2004).

Hardness values from 1988 to 1995 for Reaches 1 and 2 of the Los Angeles River and Compton Creek, Monrovia Canyon Creek and Rio Hondo Reach 1 were obtained from LACDPW. To assess the comparability of these older data, we compared the historic hardness data associated with Reaches 4 and 3 collected by LACDPW with the more recent data collected by the Tillman and Glendale POTWs in these same reaches. The results from the two data sets were extremely close (within 10 mg/), suggesting that the older data from 1988 to 1995 are comparable to the newer data and therefore appropriate for setting numeric targets. Dry-weather hardness data are presented in Table 3-1. Hardness values were not available for the Arroyo Seco, Verdugo Wash or the Tujunga Wash.

Table 3-1. Summary of dry-weather reach-specific hardness data (mg/L as CaCO3) for Los Angeles River and listed tributaries (Maximum hardness value correction is 400 mg/L).

River Reach	Number of measurements	10th Percentile	Median	90th Percentile
LA River Reach 5. Above Tillman (Station LAR-9)	40	608	702	832
LA River Reach 4. Below Tillman (Stations LAR-7 and LAR-8)	69	196	246	400
LA River Reach 3. Above Glendale (Station LAG-7)	17	232	282	330
LA River Reach 3. Below Glendale (Stations LAG-4, and LAG-5)	69	242	278	322
Western Channel Above Burbank (Station 1)	41	272	326	395
Western Channel Below Burbank (Stations 1.5, 2 and 5)	61	197	229	275
LA River Reach 2	83	221	268	322
Rio Hondo Reach 1	74	111	141	199
LA River Reach 1	82	219	282	340
Compton Creek	65	148	225	296
Monrovia Canyon Creek	81	182	209	239

Dry-weather targets for copper and lead are based on chronic CTR criteria. The target for the chronic criteria is based on the 50th percentile of the hardness data for each reach. This is consistent with the procedures for choosing conversion factors specified by the Policy for Implementation of Toxics Objectives for Inland Surface Waters, Enclosed Bays, and Estuaries, or SIP, (SWRCB, 2000). Targets for Tujunga Wash, Verdugo Wash and Arroyo Seco are based on hardness values in the Los Angeles River Reaches 4, 3 and 2, respectively. Targets for Reach 6 and Bell Creek are based on hardness values for Reach 5.

Table 3-2. Dry-weather numeric targets for copper and lead (µg/l). Reach-specific targets based on chronic criteria and 50th percentile hardness. Conversion of dissolved to total recoverable based on default or site specific conversion factors.

Los Angeles River	Dissolved Copper	Conversion factor	Total recoverable Copper	Dissolved Lead	Conversion factor	Total recoverable Lead
LA Reach 6	29	0.96	30	11	0.59	19
LA Reach 5 above Tillman	29	0.96	30	11	0.59	19
LA Reach 4 below Tillman	19	0.74	26	6.6	0.66	10
LA Reach 3 Above LAG WRP	22	0.96	23	7.6	0.64	12
LA Reach 3 below LAG WRP	21	0.80	26	7.5	0.64	12
LA Reach 2	21	0.96	22	7.3	0.65	11
LA Reach 1	22	0.96	23	7.6	0.64	12
Tributaries	**Dissolved Copper**	**Conversion factor**	**Total recoverable Copper**	**Dissolved Lead**	**Conversion factor**	**Total recoverable Lead**
Bell	29	0.96	30	11	0.59	19
Tujunga	19	0.96	20	6.6	0.66	10
Verdugo Wash	22	0.96	23	7.6	0.64	12
Burbank (above WRP)	25	0.96	26	9.1	0.67	14
Burbank (below WRP)	18	0.96	19	6.1	0.67	9.1
Arroyo Seco	21	0.96	22	7.3	0.65	11
Compton Creek	18	0.96	19	6.0	0.67	8.9
Rio Hondo Reach 1	12	0.96	13	3.7	0.74	5.0
Monrovia Canyon Creek				5.6	0.68	8.2

The City of Los Angeles proposed site specific copper conversion factors for the areas downstream of the Tillman Plant (Reach 4) and the Glendale Plant (Reach 3) based on a study performed by Larry Walker and Associates (LWA) (LWA, 2003). For the area downstream of the Tillman Plant, the proposed conversion factors for copper were 0.57 for chronic and 0.72 for acute. For the area downstream of the Glendale Plant, the proposed conversion factors were 0.77 for chronic and 0.84 for acute. EPA and the Regional Board expressed concern about the use of these numbers given the lack of consistent relationships between total recoverable and dissolved concentrations in the dataset.

Suspecting that relationship may be affected by total suspended solids, LWA used partition coefficient modeling to account for variation due to total suspended solids. In this approach, the conversion factor is the dissolved fraction (fd), calculated using a site a specific partition coefficient (Kp) and total suspended solids. This is in accordance with EPA guidance for calculating conversion factors (USEPA, 1996) and is allowed for in the SIP (SWRCB, 2000). Using this approach LWA proposed using 0.74 as a chronic conversion factor and 0.92 as an acute conversion factor for the area downstream of Tillman. For the area downstream of Glendale, they proposed conversion factors of 0.80 for chronic and 0.89 for acute. Because the revised values were determined according to EPA and SIP guidance, they will be used in this TMDL for the areas of the River downstream of the Tillman and Glendale plants.

CTR default conversion factors for copper are used in the other reaches. CTR default values are used for lead and zinc in all reaches. Application of these default values is applied to the margin of safety for the TMDL. Evaluation of the City of Los Angeles WMP data shows that the default conversion factor over estimates the fraction of metal in the dissolved form.

The City of Los Angeles is currently pursuing an alternative method for determining site-specific copper water quality criteria based on the Biotic Ligand Model (BLM). This TMDL will include a re-opener to allow for application of site specific-water quality criteria for copper if and when these site-specific water quality criteria approved by U.S. EPA and the Regional Board.

The dry-weather target for zinc is based on acute CTR criterion, rather than chronic criterion, because the acute criterion is more protective for zinc. The target for the acute criteria is based on the 10th percentile of the hardness data in the Rio Hondo (141 mg/L as $CaCO_{3)}$. The resulting target is 131 µg/l total recoverable metals, calculated using the CTR default conversion factor of 0.978.

The dry-weather target for selenium in Reach 6 and its tributaries is 5 µg/l based on the CTR criterion for total recoverable metals. The criterion is independent of hardness or conversion factors.

3.2 Wet-Weather Targets

A wet-weather day is any day when the maxium daily flow measured at the Wardlow station is equal to or greater than 500 cfs (the 90th percentile of flow). Wet-weather targets are defined for cadmium, copper, lead and zinc based on hardness a value of 80 mg/l. This represents the median hardness value from 42 storm composite samples collected by LACDPW at Wardlow Station between 1996 and 2002.

The data collected by LACDPW at Wardlow were also used in a regression analysis to evaluate the relationship between dissolved and total recoverable metals in storm water (Table 3-3). The slope of the regression reflects the ratio of the dissolved to total recoverable concentration; the r-squared value reflects the strength of the relationship.

Table 3-3. Relationship between dissolved and total recoverable metals in storm water data at Wardlow Station (1996-2002) and CTR default conversion factors.

Metal	LADPW Storm water data			Acute Coversion Factors (ACF)
	N	Slope	R^2	
Cadmium	3	-	-	0.95*
Copper	33	0.65	0.69	0.960
Lead	13	0.82	0.98	0.824*
Zinc	20	0.61	0.61	0.978

* ACF for cadmium and lead are hardness dependent and were calculated based on the hardness at Wardlow (80 mg/L as Ca CO_3)

These regressions suggest that the CTR default conversion factors generally overestimate the dissolved portion of metals in storm water. Data from literature confirm this and suggest that an even greater portion of metals is associated with particulates in wet weather. Young et al. 1980 estimated that the 90% of the cadmium, copper, lead, and zinc in storm water samples were associated with the particle phase. McPherson et al. 2004 found similar results in storm water from nearby Ballona Creek. In that study, 83% of the cadmium, 63% of the copper, and 86% of the lead were associated with the particle phase. Use of the CTR default values for wet-weather would be overly conservative. The slopes of the regressions are therefore used as conversion factors for copper, lead and zinc. The default CTR conversion factor is used for cadmium because there is insufficient local data for a site-specific value (Table 3-4).

Table 3-4. Wet-weather numeric targets.

Metal	Wet-weather Target Dissolved (µg/l)	Conversion Factor	Wet-weather Target Total Recoverable (µg/L)
Cadmium	3	0.95	3.1
Copper	11	0.65	17
Lead)	51	0.82	62
Zinc	97	0.61	159
Selenium	NA	NA	5

4. SOURCE ASSESSMENT

This section identifies the potential sources of metals to the Los Angeles River and tributaries. The toxic pollutants can enter surface waters from both point and nonpoint sources. In the context of TMDLs, pollutant sources are either point sources or nonpoint sources. Point sources include discharges for which there are defined outfalls such as wastewater treatment plants, industrial discharges and storm drain outlets. These discharges are regulated by National Pollution Discharge Elimination System (NPDES) permits (Table 4-1). Nonpoint sources, by definition, include pollutants that reach waters from a number of diffuse land uses and source activities that are not regulated through NPDES permits. An example of this would be the runoff from the National Forest and State Parks. While not subject to a NPDES permit, pollutant loadings from these areas must be addressed in the TMDL.

4.1 Point Sources.

Table 4-1. Summary of NPDES permits in Los Angeles River watershed. (SOURCE: LARWQCB).

Type of Permit	No. of Permits
Publicly Owned Treatment Works	6
Municipal Storm water	3
Industrial Storm water	1307
Construction Storm water	204
Other Major NDPES Discharges	3
Minor NPDES Discharges	15
General NPDES Discharges	
Construction Dewatering	35
Petroleum Fuel Cleanup Sites	7
VOCs Cleanup Sites	6
Hydrostatic Test Water	8
Non-Process Wastewater	9
Potable Water	25
Total	**1628**

4.1.1. Publicly Owned Treatment Works (POTWs)

There are several POTWs that either discharge, or have the potential to discharge into the Los Angeles River or listed tributaries. The three largest POTWs (Donald C. Tillman Water Reclamation Plant, Los Angeles-Glendale Water Reclamation Plant, and Burbank Water Reclamation Plant) constitute the major sources in the watershed.

- Tillman is a tertiary treatment plant with a design capacity of 80 mgd. The Tillman plant discharges approximately 53 mgd to the Los Angeles River. Most of the flow is discharged directly into the Los Angeles River (Reach 4). However, a portion of the flow goes into a recreation lake, which then drains into Bull Creek and Hayvenhurst Channel and back into the Los Angeles River (Reach 5). Another portion of the flow goes to a wildlife lake, which then drains into Haskell Channel and ultimately back into the Los Angeles River (Reach 5).

- The Los Angeles-Glendale POTW is a 20-mgd design capacity plant that discharges approximately 13 mgd directly into the Reach 3 of the Los Angeles River in the Glendale Narrows. Approximately 4 mgd of the treated wastewater is used for irrigation and industrial uses.

- Burbank has a design capacity of 9 mgd. Approximately 4 mgd is discharged directly into the Burbank Western Channel. The City of Burbank and Caltrans reclaim a portion of the effluent for irrigation (freeway landscapes, golf courses, parks etc.). Treated water from the plant is also used as cooling water for the Burbank Steam Power Plant.

- The Tapia Water Reclamation Facility (Tapia) is a 16-mgd plant that discharges into Malibu Creek. However, due to a discharge prohibition in Malibu Creek from April 15 to November 15, the permittee is allowed to discharge up to 1 mgd of wastewater to the Los Angeles River. However, this discharge is infrequent. The permitted flow from the Tapia is less than 2% of the mean flows from the major POTWs discharging to the Los Angeles River.

- The Whittier Narrows Water Reclamation Plant discharges to the Rio Hondo above the Whittier Narrows Dam, into spreading grounds where most of the effluent enters the groundwater. It has been estimated that less than 1% (0.1 mgd) of Whittier Narrows WRP effluent remains in the channel downstream of the spreading grounds.

- The Los Angeles Zoo Wastewater Facility has a 1.8 million gallon retention basin, and discharges into Reach 3 of the Los Angeles River near the Glendale Narrows only during wet weather when the retention capacity is exceeded.

4.1.2. Storm water Permits

Storm water runoff in the Los Angeles River Watershed is regulated through a number of permits. There are the municipal separate sewer system (MS4) permits issued to the Los Angeles County and the City of Long Beach. There is the statewide storm water permit issued to Caltrans. As of the writing of this TMDL, there are 1,307 permits issued under the Statewide Industrial Activities Storm Water General Permit and 204 permits issued under the Statewide Construction Activities Strom Water General Permit.

MS4 Storm Water Permits

In 1990 USEPA developed rules establishing Phase I of the NPDES storm water program, designed to prevent pollutants from being washed by storm water runoff into MS4s (or from being discharged directly into the MS4s) and then discharged from the MS4s into local waterbodies. Phase I of the program required operators of medium and large MS4s (those generally serving populations of 100,000 or more) to implement a storm water management program as a means to control polluted discharges from the MS4s. Approved storm water management programs for medium and large MS4s are required to address a variety of water quality-related issues, including roadway runoff management, municipally owned operations, and hazardous waste treatment. Large and medium MS4 operators are required to develop and implement Storm Water Management Plans that address, at a minimum, the following elements:

- Structural control maintenance
- Areas of significant development or redevelopment
- Roadway runoff management
- Flood control related to water quality issues
- Municipally owned operations such as landfills, and wastewater treatment plants
- Municipally owned hazardous waste treatment, storage, or disposal sites
- Application of pesticides, herbicides, and fertilizers
- Illicit discharge detection and elimination
- Regulation of sites classified as associated with industrial activity
- Construction site and post-construction site runoff control
- Public education and outreach

The County of Los Angeles Municipal Storm Water NPDES permit (MS4 Permit) was renewed in December 2001 (Regional Board Order No. 01-182) and is on a five-year renewal cycle. There are 85 co-permittees covered under this permit including 84 cities and the County of Los Angeles. The City of Long Beach MS4 was renewed on June 30, 1999 and is renewed on a five-year cycle.

Caltrans Storm Water Permit

Caltrans is regulated by a statewide storm water discharge permit that covers all municipal storm water activities and construction activities (State Board Order No. 99-06-DWQ). The Caltrans storm water permit authorizes storm water discharges from Caltrans properties such as the state highway system, park and ride facilities, and maintenance yards.

The storm water discharges from most of these Caltrans properties and facilities eventually end up in either a city or county storm drain. The metals loading specifically from Caltrans properties have not been determined in the Los Angeles River watershed. A conservative estimate of the percentage of the Los Angeles River watershed covered by state highways is 1.3% (approximately 6,950-acres). This reflects the area of the Department's Right-of-Way that drains to Los Angeles River (Caltrans comment letter dated 8/26/04.)

General Storm Water Permits

Federal regulations for controlling pollutants in storm water discharges were issued by the USEPA on November 16, 1990 (40 Code of Federal Regulations [CFR] Parts 122, 123, and 124). The regulations require operators of specific categories of facilities where discharges of storm water associated with industrial activity occur to obtain an NPDES permit and to implement Best Available Technology Economically Achievable (BAT) to reduce or prevent nonconventional and toxic pollutants, including metals, associated with industrial activity in storm water discharges and authorized non-storm discharges. In addition, the regulations require discharges of storm water to surface waters associated with construction activity including clearing, grading, and excavation activities (except operations that result in disturbance of less than five acres) to obtain an NPDES permit and to implement BAT to reduce or eliminate storm water pollution. On December 8, 1999, federal regulations promulgated by USEPA (40CFR Parts 122, 123, and 124) expanded the NPDES storm water program to include storm water discharges from construction sites that resulted in land disturbances equal to or greater than one acre but less then five acres.

On April 17, 1997, State Board issued a statewide general NPDES permit for Discharges of Storm Water Associated with Industrial Activities Excluding Construction Activities Permit (Order No. 97-03-DWQ). This Order regulates storm water discharges and authorized non-storm water discharges from ten specific categories of industrial facilities, including but not limited to manufacturing facilities, oil and gas mining facilities, landfills, and transportation facilities. On August 19, 1999, State Board issued a statewide general NPDES permit for Discharges of Storm Water Runoff Associated with Construction Activities (Order No. 99-08-DQW). All dischargers covered under these general NPDES storm water permits are required to develop and implement an effective Storm Water Pollution Prevention Plan (SWWPPP) and Monitoring Program. The SWPPP has two main objectives. One, to identify and evaluate sources of pollutants associated with industrial or construction activities that may affect the quality of storm water discharges. Two, to identify and implement site-specific BMPs to reduce or prevent pollutants associated with industrial activities in storm water discharges.

As of the writing of this TMDL, there are 1307 dischargers enrolled under the general industrial storm water permit in the watershed, the largest numbers occur in the cities of Los Angeles, Vernon, South Gate, Long Beach, Compton, and Commerce. Metal plating, recycling and manufacturing, transit, trucking and warehousing, and wholesale trade are a large component of these facilities. There is a potential for metals loadings from these types of facilities, especially metal plating, transit, and recycling facilities. Facilities enrolled under this permit are required to sample runoff and report monitoring data twice annually. A review of the available monitoring data demonstrates that several industrial facilities are exceeding applicable CTR values and are therefore a source of metals loadings to the Los Angeles River. This finding is supported by Stenstrom et al. in their final report on the industrial storm water monitoring program under the existing general permit. In the summary of existing data, the report found that although the data collected by the monitoring program were highly variable, the mean values for copper, lead and zinc were 1010, 2960, and 4960 µg/L, respectively (Stenstrom et al., 2005). During dry weather, the potential contribution of metals loadings from industrial storm water is low. Under Order No. 97-03-DWQ, non-storm water discharges are authorized only when they do not contain significant quantities of pollutants, where BMPs are in place to minimize contact with significant materials and reduce flow, and when they are in compliance with Regional Board and local agency requirements.

As of the writing of this TMDL, there are a total of 207 construction sites enrolled under the construction storm water permit. The larger sites are in the upper watershed (which includes the San Fernando Valley) and the construction in this watershed is fairly evenly divided between commercial and residential. Potential pollutants from construction sites include sediment, which may contain metals as well as metals from construction materials and the heavy equipment used on construction sites. During wet weather, runoff from construction sites has the potential to contribute metals loadings to the river. In their final report to State Board, Raskin et al. found that building materials and construction waste exposed to storm water can leach metals and contribute metals loadings to waterways (Raskin et al., 2004). During dry weather, the potential contribution of metals loadings is low. Under Order No. 99-08-DWQ, discharges of non-storm water are authorized only where they do not cause or contribute to a violation of any water quality standard and are controlled through implementation of appropriate BMPs for elimination or reduction of pollutants.

4.1.3. Other NPDES Permits

An individual NPDES permit is classified as either major or minor. The discharges flows associated with minor individual NPDES permits and general NPDES permits are typically less than 1 million gallons per day (MGD). Many of these are for episodic discharges rather than continuous flows.

Major Individual NPDES Permits

There are three major NPDES facilities in addition to the POTWs. These permits include storm water discharges and would therefore exert the greatest potential influence on metals loadings during wet weather.

Pacific Terminals LLC Tank Farm has a permitted discharge of up to 4.32 mgd of hydrostatic test water, fuel equipment wash water and storm water runoff to Compton Creek. This permit contains effluent limits for metals, but since the permit was issued prior to the adoption of CTR, there is the potential for the facilities to discharge metals in exceedance of the numeric targets. This permit is scheduled for renewal in 2005.

The Boeing Company Santa Susana Field Lab discharges up to 160 mgd of storm water (based on the 24-hour duration, 10 year return storm event) mixed with industrial wastewater to Bell Creek via two discharge points. Discharges from these two points have a low potential to contribute to metals loading because the permit contains CTR-based effluent limits, based on a total hardness of 100 mg/l or other hardness values when applicable. However, storm water is also discharged to Bell Creek through another discharge point, for which there are no effluent limitations for metals. There is a potential for metals loadings from this point. The permit requires monitoring and the imposition of effluent limits if monitoring indicates reasonable potential.

The Metropolitan Transit Authority has a permit to discharge treated wastewater from the underground construction activities (site water, storm water, and groundwater generated from dewatering activities) of the Eastside Light Rail Transit (ELRT) Project. Wastewater that is not discharged to the municipal sanitary sewer will be discharged to the Los Angeles River through sixteen outfalls. The maximum permitted cumulative discharge from the outfalls is 4.032 mgd. There is a low potential for loadings from this discharge because the permit contains CTR-based effluent limits and wastewater will be treated for metals.

Minor Individual NPDES Permits

Minor permits cover miscellaneous wastes such as ground water dewatering, swimming pool wastes, and ground water seepage. Some of these permits contain effluent limits for metals. However, some of these permits were issued prior to the adoption of CTR and there is the potential for these facilities to discharge metals in exceedance of the numeric targets in this TMDL. There are 15 minor NPDES permits in the Los Angeles River watershed.

Other General NPDES Permits

Pursuant to 40 CFR parts 122 and 123, the State Board and the Regional Boards have the authority to issue general NPDES permits to regulate a category of point sources if the sources: involve the same or substantially similar types of operations; discharge the same type of waste; required the same type of effluent limitations; and require similar monitoring. The Regional Board has issued general NPDES permits for the following categories of discharges: construction dewatering, non-process wastewater; petroleum fuel cleanup sites; volatile organic compounds (VOCs) cleanup sites; potable water; and hydrostatic test water.

The general NPDES permit for Discharges of Groundwater from Construction and Project Dewatering to Surface Waters (Order No. R4-2003-0111) covers wastewater discharges, including but not limited to, treated or untreated groundwater generated from permanent or temporary dewatering operations. Currently, there are 29 dischargers enrolled under this Order in the Los Angeles River watershed. There are two dischargers with permits for the Discharge of Treated Ground Water from Construction Dewatering (Order No. 97-043) and four dischargers with permits for the Discharge of Untreated Ground Water from Construction Dewatering (Order No. 97-045). There are five discharges enrolled under general NPDES permit for Discharges of Nonprocess Wastewater to Surface Waters (Order No. R4-2004-0058) which covers waste discharges, including but not limited to, noncontact cooling water, boiler blowdown, air conditioning condensate, water treatment plant filter backwash, filter backwash, swimming pool drainage, and/or groundwater seepage. There are four dischargers enrolled under Order No. 98-055 specifically for non-contact cooling water.

Discharges from construction dewatering and nonprocess wastewater have a low potential to contribute to metals loadings. In order to be eligible to be covered under this Order, a discharger must perform an analysis using a representative sample of the groundwater or nonprocess wastewater to be discharged. The sample is analyzed and the data compared to the water quality screening criteria for metals, which are based on the CTR criteria. The permit includes effluent limitations for metals, which are based on the CTR. For the hardness dependent metals, the effluent limitations are based on site-specific hardness values.

The general NPDES permit for Treated Groundwater and Other Wastewaters from Investigation and/or Cleanup of Petroleum Fuel-Contaminated Sites to Surface Waters (Order No. R4-2002-0125) covers discharges, including but not limited to, treated groundwater and other wastewaters from the investigation, dewatering, or cleanup of petroleum contamination arising from current and former leaking underground storage tanks or similar petroleum contamination. Currently, there are seven dischargers enrolled under this Order in the Los Angeles River watershed. There are approximately six dischargers enrolled under the general NPDES permit for Discharges of Treated Groundwater from Investigation and/or Cleanup of VOCs-Contaminated Sites to Surface Waters (Order No. R4-2002-0107) which includes but is not limited to, treated groundwater and other wastewaters from the investigation, cleanup, or construction dewatering of VOCs only (or VOCs commingled with petroleum fuel hydrocarbons) contaminated groundwater.

Discharges from site cleanup operations have a low potential to contribute to metals loadings. In order to be eligible to be covered under these Orders, the discharger must demonstrate that a representative sample of the contaminated groundwater to be treated and discharged does not exceed the water quality screening criteria for metals, which are based on the CTR criteria. In addition, the permit includes effluent limitations for lead. The effluent limitations for lead are based on the CTR default hardness value of 100 mg/L.

The general NPDES permit for Discharges of Groundwater from Potable Water Supply Wells to Surface Waters (Order No. R4-2003-0108) covers discharges of groundwater from potable supply wells generated during well purging, well rehabilitation and redevelopment, and well drilling, construction and development. Currently, there are 25 dischargers enrolled under this Order in the Los Angeles River watershed. The general NPDES permit for Discharges of Low Threat Hydrostatic Test Water to Surface Waters (Order No. R4-2004-0109) covers waste discharges from hydrostatic testing of pipes, tanks, and storage vessels using domestic/potable water. Currently, there are eight dischargers enrolled under this Order in the Los Angeles River watershed.

Discharges of potable water from water supply wells and from hydrostatic testing have a low potential to contribute metals loadings to the Los Angeles River or its tributaries, since these pollutants are not expected to be in potable water. In order to be eligible to be covered under this Order, the discharger must demonstrate that concentrations are not greater than the maximum contaminant levels (MCLs). The MCLs are health protective drinking water standards adopted by the California Department of Health Services. The MCLs define the maximum permissible level of a contaminant in water delivered to any user of a public drinking water supply system. In general, the MCLs for the metals are greater than the numeric targets.

4.1.4. Summary of NPDES Permits

A summary of permit requirements and potential for significant contribution to water quality impairments are presented in Table 4-2.

Table 4-2. Source assessment summary.

Type of NPDES Permit	Number of Permits	Screening for Pollutants	Permit Limits for metals?	Potential for significant contribution
Publicly Owned Treatment Works	6	Yes	Yes	High
Municipal Storm water	3	Yes	No	High
Industrial Storm water	1307	Yes	No	High
Construction Storm water	204	Yes	No	High
Other Major NDPES Discharges	3	Yes	Yes	Medium
Minor NPDES Discharges	15	Yes	varies	Varies
Other General NPDES Discharges				
Construction Dewatering	35	Yes	Yes	Low
Non-Process Wastewater	9	Yes	Yes	Low
Petroleum Fuel Cleanup Sites	7	Yes	Lead only	Low
VOCs Cleanup Sites	6	Yes	Lead only	Low
Hydrostatic Test Water	8	Yes	Not CTR	Low
Potable Water	25	Yes	Not CTR	Low
Total	**1628**			Low

4.2. Quantification of loads

4.2.1. Dry-Weather Loadings

During low flow periods the three major POTWs typically account for 70% to 100% of the total volume of discharge in the river. The remaining dry weather flow represents a combination of tributary flows, groundwater discharge, flows from other permitted NPDES discharges within the watershed (Table 4-4), and dry-weather urban runoff.

The total metals loads from the Tillman, Burbank and Glendale WRPs were estimated using monthly flow and effluent concentration data provided as part of the annual self monitoring reports (Table 4-3). On a daily basis these three POTWs contribute approximately 0.2 kg/d of cadmium, 4.5 kg/d of copper, 0.5 kg/d of lead and 12.8 kg/d of zinc to the Los Angeles River.

Table 4-3. Total annual metals loadings from three POTWs (kg/yr).

Metal	Facility	1998	1999	2000	2001	2002	Ave
Cadmium	Tillman	105	59	53	33	33	57
	Burbank2	7	4	14	13	1	8
	Glendale	19	16	15	16	16	16
	Total	**131**	**79**	**82**	**62**	**50**	**81**
Copper	Tillman	1427	1292	1690	1574	1260	1449
	Burbank2	27	24	37	8	66	32
	Glendale	119	135	166	205	150	155
	Total	**1573**	**1451**	**1893**	**1787**	**1476**	**1636**
Lead	Tillman	122	105	120	94	86	105
	Burbank2	46	26	64	95	3	47
	Glendale	29	30	32	24	24	28
	Total	**197**	**161**	**216**	**213**	**113**	**180**
Zinc	Tillman	4134	2955	4398	3671	2994	3630
	Burbank2	157	138	238	353	207	219
	Glendale	1002	814	771	801	749	827
	Total	**5293**	**3907**	**5407**	**4825**	**3950**	**4676**

To assess the relative contributions of metals during dry weather, sampling was conducted in September 2000 and July 2001. The monitoring consisted of synoptic sampling of flow and concentration from the three POTWs, the headwaters of the tributaries, and 49 storm drains on September 11-12, 2000 (Ackerman et al., 2003). This was followed up by another synoptic survey in July 2001. In this second survey, more focus was put on the storm drains, and the number of storm drains sampled during this event was 84. Table 4-4 provides the summary results from these two surveys in terms of total mass for each metal and the relative contribution from each major source.

Table 4-4. Relative loading (%) of total recoverable metals by source to the Los Angeles River during dry-weather conditions (Based on data from 2000 and 2001 Los Angeles River synoptic surveys).

Sources	Cadmium		Copper		Lead		Zinc	
	2000	2001	2000	2001	2000	2001	2000	2001
Tributaries	7%	6%	8%	5%	10%	6%	5%	3%
POTWs	59%	39%	69%	38%	55%	41%	81%	51%
Dry Weather Runoff	34%	55%	23%	57%	35%	53%	14%	46%
Total Mass (kg/d)	0.3	0.3	5.6	6.9	2.8	2.4	14.8	20.4

The POTWs contribute a fairly large percentage of the total dry-weather metals loadings. The concentrations of metals in the POTWs may be low, but loadings are high because the POTW flows are large. The storm drains also contribute a large percentage of the loadings. Storm drain flows are typically low during dry weather, but concentrations of metals in urban runoff may be quite high. In calculating the dry-weather loadings estimates in Table 4-4, non-detects were treated as ½ the detection limit. Lead and to a lesser extent for cadmium were generally below detection limits on both sampling dates. We did not treat detection limits as zeros because these metals have been frequently detected in POTW effluent monitoring data supplied by the dischargers and in dry-weather urban runoff, as reported by LACDPW.

During dry weather, background concentrations may come from tributaries which drain the hills of the Angeles National Forest and the open areas of the Santa Monica Mountains. The flows from these areas are relatively small during dry weather and much of it is captured behind dams. The metals concentrations in flows from these areas are also likely to be low. The estimated loadings from the tributaries were generally less than 10%. This may be an overestimate, since the sites for the tributary samples were not selected for the purpose of defining natural background conditions. Rather sites were selected to define conditions at the boundary of the listed reaches and in many cases there are inputs from storm drains upstream of the listed reaches.

4.2.2 Wet-Weather Loadings

Most of the annual metals loadings to the Los Angeles River are associated with wet weather (Stein et al., 2003). In addition to the MS4 and Caltrans storm water permits, there are more than one thousand industrial facilities in the Los Angeles River watershed that are enrolled under the statewide NPDES general storm water permit for industry (Table 4-1). However, the data collected under the monitoring program for this permit are not of sufficient frequency or quality to be used to estimate loadings (Duke et al., 1998). Therefore, to assess total storm water loadings we relied on the LACDPW storm water monitoring data from the mass emission station at Wardlow (LACDPW, 2000). Table 4-5 summarizes the aggregate seasonal loads from flow-weighted composites of multiple storms sampled between 1996 and 2002.

Wet weather loadings can vary by an order of magnitude depending on the rainfall and size of storms in a given year. In a report to State Board, SCCWRP estimated the mass loadings for a typical year (Stein et al., 2003). In this report, data are modeled from 30-year average rainfall, land use runoff data, and land use distribution data. These values are generally consistent with the average loadings calculated from the LACDPW mass emission stations (Table 4-5).

Table 4-5. Seasonal storm water total recoverable metals loadings (kg/yr) to Los Angeles River watershed. Data are from LACDPW and Stein et al., 2003.

LACDPW	Cadmium	Copper	Lead	Zinc
96/97	-	3,629	3,760	16,692
97/98	-	36,741	94,347	210,012
98/99	-	1,075		6,078
99/00	-	286	207	1,012
00/01	-	1,409	879	5,645
01/02	-	514	106	1022
Average	-	7,276	19,860	40,077
SCCWRP	**Cadmium**	**Copper**	**Lead**	**Zinc**
Typical year	62	6,960	2,304	42,479

Average annual POTW loadings (Table 4-3) can be compared to the typical storm water loadings (Table 4-5) to provide an indication of the relative contributions from these sources. On an annual basis, storm water contributes about 40% of the cadmium loading, 80% of the copper loading, 95% of the lead loading, and 90% of the zinc loading.

Atmospheric deposition is another potential source of metals to the watershed. Deposition of metals to the surface area of the Los Angeles River watershed may be substantial, on the order of several thousand kilograms per year (Sabin et al., 2004). Direct atmospheric deposition during dry weather was quantified by multiplying the surface area of the river times the rate of atmospheric deposition. These numbers (Table 4-6) are generally small because the actual surface area of the river system is small. Direct deposition of metals is insignificant relative to either the annual dry-weather loadings or the total annual loadings. Indirect atmospheric deposition reflects the process by which metals deposited on the land surface may be washed off during rain events and be delivered to the Los Angeles River and tributaries. Not all the metals deposited on the land from the atmosphere are loaded to the river. Estimates of metals deposited on land (Table 4-6) are much higher than estimates of loadings to the river (Table 4-5). Sabin et al. (2004) calculated the ratio of wet-weather water runoff to indirect atmospheric deposition as 19% for copper, 9% for lead, and 22% for zinc. The loadings of metals associated with indirect atmospheric deposition are accounted for in the estimates of the storm water loadings.

Table 4-6. Estimates of dry weather direct and indirect deposition (kg/year). Source: Sabin et al., 2004.

Type of deposition	Copper	Lead	Zinc
Indirect	16,000	12,000	80,000
Direct	3	2	10

5. LINKAGE ANALYSIS

Information on sources of pollutants provides one part of the TMDL equation. To determine the effects of these sources on water quality, it is also necessary to determine the assimilative capacity of the receiving water. Variations between wet and dry weather can strongly affect the delivery of metals to the Los Angeles River and the assimilative capacity of the river to accommodate these loadings so that standards are met. Given the differences in sources and flows between dry and wet weather, two distinct approaches for the linkage analysis were taken. This section describes the use of hydrodynamic and water quality models to assess the effects of metals loadings in the Los Angeles River on water quality under both dry and wet weather conditions.

5.1 Development of the Dry-Weather Model

The Environmental Fluid Dynamics Code 1-D (EFDC1D) was used to model the hydrodynamic characteristics of the Los Angeles River and its tributaries (Table 5-1) during dry weather. EFDC1D is a one dimensional variable cross-section model for flow and transport in surface water systems. For simulation of the water quality within the Los Angeles River, the EFDC model was linked to the Water Quality Analysis Simulation Program (WASP5). The details associated with development of the dry-weather model are presented in Appendix I.

Table 5-1. Los Angeles River segments modeled for dry-weather linkage analysis.

Los Angeles River Mainstem	Los Angeles River Tributaries
Reach 6: above Sepulveda Flood Control Basin	Bell Creek
Reach 5: within Sepulveda Basin	Tujunga Wash
Reach 4: Sepulveda Dam to Riverside Dr	Burbank Western Channel
Reach 3: Riverside Dr to Figueroa St	Verdugo Wash
Reach 2: Figueroa St to Carson St	Arroyo Seco
Reach 1: Carson St to Estuary	Rio Hondo River
	Compton Creek

To support the model development a comprehensive set of in-stream hydrodynamic and water quality data were collected in the late summer of 2000 (September 11-12) and summer of 2001 (July 29-30) as part of the synoptic surveys. These data were used as model input as well as for comparison to model results during calibration and validation. Flow and water quality measurements were used as model input to represent the tributary discharges and dry-weather discharges from storm drains. In addition, instream flow and water quality measurements were compared with model results during model calibration, validation and comparison.

5.1.1. Calibration and Validation of the Dry-Weather Model - Flow. The LA River hydrodynamic model was calibrated for low-flow conditions measured on the dates of the first intensive data collection (September 10 and 11, 2000) and then validated to the flow conditions measured during the second monitoring effort (July 29-30, 2001).

There are four stream gages along the mainstem of the Los Angeles River (Figure 5). The uppermost station (designated F300-R) is in Reach 4 of the Los Angeles River below Tillman plant. The lowest station is the Wardlow gage station (designated F319-R), which is below the confluence of all tributaries within the Los Angeles River and all simulated point sources. The variability in daily flow measured at these gages is high. On September 11, 2000 the measured flows ranged from 50 to 120 cfs at the upper most station to 135 to 200 cfs at the lowest station. On July 29, 2001 the measured flow ranged from 50 and 75 cfs at the upper-most station and 170 to 200 cfs at the lowest station. The long-term median flows (12-year) at Tujunga, Firestone and Wardlow are 78 cfs, 124 cfs, and 145 cfs respectively. The days selected for the calibration and validation of the model are generally representative of the low-flow condition. A comparison of the measured flow on September 11 at these four stations to the modeled dry-weather flow is presented in (Figure 6).

5.1.2. Comparison of Dry-Weather Model - Water Quality. Model results were compared to observed data. The first comparison of the dry-weather water quality model was performed using field measurements collected on September 10, and 11, 2000 (Tables 5-2). The second comparison of the dry-weather water quality model was performed using field measurements from July 29 and 30, 2001 (Tables 5-3).

Table 5-2. Flow (cfs) and concentrations of total recoverable metals (µg/l) used in model comparison based on samples collected on September 10 and 11, 2000.

POTWs	**Flows**	**Cd[1]**	**Cu**	**Pb[2]**	**Zn**
Tillman POTW					
Direct Discharge	53.3	0.5	13	5	39
Japanese Gardens	7.4	0.5	13	5	39
Recreation Lake	27.0	0.5	13	5	39
Wildlife Lake	9.1	0.5	13	5	39
Glendale POTW	14.4	0.5	5	5	30
Burbank POTW	14.3	0.5	18	5	52
Tributaries	**Flows**	**Cd[1]**	**Cu**	**Pb[2]**	**Zn**
Bell Creek	4.3	0.5	15	5	5
Tujunga Wash	0.7	0.5	18	5	16
Burbank Western Channel	1.4	0.5	18	5	52
Verdugo Wash	2.8	0.5	14	19	41
Arroyo Seco	3.7	0.5	5	5	5
Compton Creek	3.1	0.5	5	5	11

1 – Detection limit for cadmium was 1 µg/L. Non-detects were treated as ½ the detection limit.

2 - Detection limit for lead was 10µg/L. Non-detects were treated as ½ the detection limit.

Table 5-3. Flows (cfs) and concentrations of total recoverable metals (µg/l) used in model comparison based on samples collected on July 29 and 30, 2001.

POTWs	Flows	Cd[1]	Cu	Pb[2]	Zn
Tillman POTW					
Direct Discharge	14.4	0.5	12.5	5	50.6
Japanese Gardens	7.0	0.5	5	5	35.1
Recreation Lake	27.0	0.5	14.7	5	67.2
Wildlife Lake	8.8	0.5	5	5	35.1
Glendale POTW	14.3	0.5	20.1	5	43.1
Burbank POTW	8.1	0.5	16.2	5	69.7
Tributaries	**Flows**	**Cd[1]**	**Cu**	**Pb[2]**	**Zn**
Bell Creek	2.7	0.5	6.9	5	5
Tujunga Wash	0.4	0.5	32.2	5	17.9
Burbank Western Channel	1.4	0.5	16.2	5	69.7
Verdugo Wash	2.2	0.5	17.9	5	25.3
Arroyo Seco	3.3	0.5	5	5	1.08
Rio Hondo	0.5	0.5	18.2	25.5	33.2
Compton Creek	1.8	0.5	9.2	5	24.9

1 – Detection limit for cadmium was 1 µg/L. Non-detects were treated as ½ the detection limit.
2 - Detection limit for lead was 10 µg/L. Non-detects were treated as ½ the detection limit.

The model performs well in predicting the average concentrations of these metals (Figure 7.). These can be compared to the long-term averages as represented by the City of Los Angeles Watershed monitoring program (Figures 3a – 3d). On both days, the model indicated that concentrations were below the CTR standards. This is consistent with our expectation, since the POTWs that provide most of the dry-weather flows to the river are generally discharging effluent that meets the water quality standards. The model is not able to represent all the temporal and spatial variability observed in the in-stream metals concentrations due to the inherent variability and uncertainty associated with estimates of storm drain flow and concentrations. The variability in concentrations seen over time in the City's data set suggests that episodic exceedances in water quality are likely to be a result of irregular inputs from urban runoff rather than the more stable POTW flow. The model provides a reasonable assurance that we understand the relationship between in-stream loads and targets.

5.2 Development of the Wet-Weather Model

Wet-weather sources are generally associated with wash-off of pollutant loads accumulated on the land surface. During a rainy period, these loads are delivered to the waterbody through creeks and storm water collection systems. USEPA's Loading Simulation Program in C++ (LSPC) was selected to simulate the hydrologic processes and pollutant loading from the Los Angeles River watershed. LSPC is a recoded C++ version of USEPA's Hydrologic Simulation Program-Fortran (HSPF). The details associated with the development and validation of the wet-weather model system are presented in Appendix II.

The Los Angeles River watershed area was divided into thirty-five smaller, discrete sub-watersheds for modeling and analysis (Figure 8). This subdivision was primarily based on the stream and storm sewer networks and topographic variability. Other factors such as the presence of existing watershed boundaries, consistency of land use, and the locations of existing monitoring stations were also considered in delineation. Each delineated subwatershed was represented with a single stream reach from the National Hydrography Dataset (NHD) stream network. Information on the length, slope, mean depth and channel widths for each reach was used to route flow and pollutants through the watershed.

Two sources of land use data were used in this modeling effort. The primary source of data was the Southern California Association of Governments (SCAG) 2000 land-use dataset that covers Los Angeles County. This data set was supplemented with land-use data from the 1993 USGS Multi-Resolution Land Characteristic data to fill data gaps. Land-use categories were grouped into seven categories for modeling (Residential, Commercial, Industrial, Open, Agriculture, Water, and Other). Table 5-4 presents the land use distribution within the watershed for each of the 35 sub-watersheds.

Hourly rainfall data were obtained from the National Climatic Data Center for 11 weather stations located in and around the Los Angeles River watershed for October 1998 through December 2001 (Figure 9). The USDA's STATSGO soils data base served as a starting point for hydrologic parameters such as infiltration and groundwater flow parameters. This was augmented with information from other modeling applications in the area (i.e., for Santa Monica Bay, Ballona Creek, San Gabriel River). These starting values were refined through the calibration process.

Loading processes for metals (copper, lead, and zinc) for each land use were represented in LSPC through their associations with sediment. The accumulation and washoff of sediments were modeled using the SDMNT module for pervious lands and the SOLIDS module for impervious lands. Sediments washed off by rain are delivered to the stream channel by overland flow. Processes such as transport, deposition and scour of sediments in the stream channels were modeled using the SEDTRN module.

The model was then used to simulate the in-stream total suspended solids concentrations. Metals associated with these sediments were simulated using the LSPC water quality module. The relationships between sediment and metals (copper, lead and zinc) were parameterized as potency factors developed by SCCWRP (Ackerman et al., 2004). Potency factors were defined for copper, lead and zinc for each of seven land-uses categories (agriculture, commercial, industrial, residential, water, other, and open).

Table 5-4. Land use distribution in the watershed (square miles).

Watershed	Residential	Commercial	Industrial	Open	Agriculture	Water	Other	Total
1	8.55	0.87	0.52	7.44	0	0	0.32	17.69
2	7.91	0.91	0.28	5.17	0.08	0.04	0.44	14.83
3	4.49	0.60	1.55	15.75	0.20	0	0	22.59
4	4.53	1.23	0.87	5.96	0.40	0.04	0.08	13.12
5	9.86	1.91	2.86	6.52	0	0	0.32	21.47
6	8.67	1.39	0.60	1.67	0.08	0	0	12.41
7	8.11	1.15	3.38	8.23	0.24	0.28	0.12	21.51
8	10.94	1.91	0.44	3.34	0.24	0.12	0.36	17.34
9	17.93	3.58	2.78	4.89	0.48	0.16	0.04	29.86
10	0.76	0	0	33.00	0.04	0.20	0	34.00
11	7.04	1.67	1.67	6.88	0.48	0	0.08	17.81
12	7.59	1.59	1.19	0.76	0.16	0	0	11.29
13	4.10	0.36	2.19	120.09	0.12	0.08	0	126.9
14	0.56	0.04	0.24	20.32	0.28	0	0	21.43
15	3.14	0.4	2.62	3.74	0.16	0	0	10.06
16	6.68	1.03	0.95	0.28	0	0	0	8.95
17	5.49	1.59	1.95	0.52	0	0	0	9.54
18	0.95	0.04	0	0.08	0	0	0	1.07
19	9.42	1.55	5.49	12.21	0.12	0	0.20	28.99
20	6.64	1.67	1.59	2.98	0.08	0.04	0.08	13.08
21	9.86	1.35	0.76	13.04	0	0	0.08	25.09
22	2.58	0.28	0.72	4.49	0	0	0	8.07
23	17.5	2.15	2.15	28.39	0.08	0	0.04	50.30
24	10.66	2.07	3.82	7.67	0.08	0	0.28	24.57
25	16.62	6.76	17.5	4.49	0.08	0	0.24	45.69
26	0.00	0.04	0.04	10.42	0	0	0	10.50
27	9.15	1.55	2.74	15.35	0.56	0.32	0.12	29.78
28	16.06	2.86	1.47	12.29	0.36	0	0	33.04
29	10.74	2.58	1.19	0.99	0	0	0.04	15.55
30	18.37	4.29	2.11	1.99	0.32	0.04	0.12	27.24
31	6.16	1.67	2.35	2.58	0.40	0.20	0	13.36
32	10.30	3.10	5.05	2.27	0.64	0	0.04	21.39
33	23.34	6.16	9.3	1.03	0.08	0.04	0.16	40.12
34	14.04	3.86	3.66	1.63	0.24	0	0.12	23.54
35	6.12	1.87	2.51	1.39	0.04	0.20	0.08	12.21
Total Area	304.86	64.08	86.54	367.85	6.04	1.76	3.36	834.39
Percent of Total Area	36.54%	7.68%	10.37%	44.08%	0.72%	0.21%	0.40%	834.39

5.2.1. Calibration and Validation of the Wet-Weather Model – Flow. Hydrology is the first model component calibrated because estimation of metals loading relies heavily on flow prediction. The hydrology calibration involves a comparison of model results to in-stream flow observations at selected locations. Key considerations in the hydrology calibration included the overall water balance, the high-flow/low-flow distribution, storm flows, and seasonal variation. Calibration was focused on flow gages with data for the entire period of record, including a gage in the upper portion of the watershed (Los Angeles River at Tujunga Avenue) and a gage in the more urban area of the watershed (Rio Hondo above Stuart and Gray Road). Validation was performed using data from 6 other gages in the water shed (Table 5-5). The validation essentially confirmed the applicability of the hydrologic parameters derived during the calibration process.

Table 5-5. Stream gage stations used for calibration and validation of flow data.

Gage Number	Station description	Use
F-45B-R	Rio Hondo above Stuart and Gray Road	Calibration
F-300-R	Los Angeles River at Tujunga Avenue	Calibration
F-285-R	Burbank Western Stormdrain at Riverside Drive	Validation
F-37B-R	Compton Creek near Greenleaf Drive	Validation
F252-R	Verdugo Wash at Estelle Avenue	Validation
F57C-R	Los Angeles River above Arroyo Seco	Validation
F34D-R	Los Angeles River below Firestone Boulevard	Validation
F319-R	Los Angeles River below Wardlow	Validation

Figure 10a depicts a time-series plot of modeled and observed daily flows at the bottom of the watershed (Los Angeles River below Wardlow River Rd.). A regression of average monthly model-predicted and observed flows (Figure 10b) indicates a slight under-prediction of measured flows. This under-prediction is due mostly to events occurring in the winter of 1992-1993 and 1994-1995 (Figure 10a). Flow volumes generated by the model were compared under different flow regimes and seasonal periods (Table 5-6). For higher flows (highest 10%), the model performs well in predicting storm volumes with an error of –4%. However, for lower flows (lowest 50%) the model is less accurate in predicting flow volumes (–17%) due largely to the inability of the model to simulate variability in point sources and dry-weather urban runoff. A review of the time-series plots also shows that the model is less accurate for low-flow conditions. This is justification for a separate approach for expressing dry-weather allocations and compliance assurance. Hydrology calibration and validation results, including time series plots and relative error tables, are presented for each gage in Appendix II.B.

Table 5-6. Volumes (acre-feet) and relative error of modeled flows versus observed flow for the Los Angeles River at Wardlow (10/1/1989 – 3/3/1998).

Flows Volumes	Simulated Flow	Observed Flow	Error (%)	Recommended Criteria (%)
Total Stream Volume	394,911	431,200	-9	±10
Highest 10% flows	307,787	320,578	-4	±15
Lowest 50% flows	39,309	46,158	-17	±10
Summer flow volume	20,205	24,797	-23	±30
Fall flow volume	70,661	63,764	10	±30
Winter flow volume	275,206	311,727	-13	±30
Spring flow volume	28,840	30,912	-7	±30

Overall, during model calibration the model predicted storm volumes and storm peaks well. Since the runoff and resulting streamflow are highly dependent on rainfall, occasional storms were over-predicted or under-predicted depending on the spatial variability of the meteorological and gage stations. The validation results also showed a good fit between modeled and observed values, thus confirming the applicability of the calibrated hydrologic parameters to the Los Angeles River watershed.

5.2.2. Calibration and Validation of the Wet-Weather Model - Pollutant Loading. Total suspended solids (TSS) and the potency factors used to determine the relationships between sediment and total recoverable metals were developed and calibrated by SCCWRP at specific watersheds in the Los Angeles area. These were validated for use in the Ballona Creek watershed. We did not re-calibrate these parameters for the Los Angeles River. Use of these parameters for the Los Angeles River was validated by comparing model output to in-stream water quality measurements collected during storms. In the validation process, we tested the ability of the model to predict 1) the event mean concentration (EMC) at the watershed scale, 2) the EMC at the sub-watershed scale and 3) changes in the instantaneous concentrations over the course of a storm.

The EMCs predicted by the model at the bottom of the watershed were comparable to EMCs calculated from flow-weighted composite measurements made by the LACDPW at the Wardlow Station (1994-2001). To evaluate the model performance at the sub-watershed scale, EMCs were calculated for Verdugo Wash, Arroyo Seco, Los Angeles River above Arroyo Seco and Los Angeles River at Wardlow based on storm water sampling that was conducted in 2001. Two to three storms were sampled at each of these subwatersheds. TSS and metals concentrations were measured numerous times (8 to 12) over the course of the individual storms. There is quite a bit of variability in the EMCs calculated from the monitoring data. The predicted EMCs for TSS were generally within the range of the calculated EMCs. The predicted EMCs for copper, lead and zinc were generally higher than the calculated EMCs. The model was not able to adequately represent the variability in concentrations within a storm at the sub-watershed scale.

We conclude that the wet-weather model performs better at the watershed level than at the sub-watershed level. The model provides reasonable estimates of storm water EMCs, but is not refined enough to predict instantaneous storm water concentrations. The EMCs for TSS were comparable to estimates based on storm water composites. The EMCs for copper, lead and zinc tend to be higher than predicted from storm water composite samples.

5.3 Summary of Linkage Analysis

The dry-weather model is able to predict flow and concentration in the Los Angeles River. The wet-weather model predicts storm flow reasonably well. Estimates of storm loadings predicted by the wet-weather model tend to be higher than loadings estimated from monitoring data. However, as described in Section 6.1 and 6.3, neither of the dry- or wet-models were used in developing load capacity. The wet-weather model was only used to estimate the load allocation for open space. Since the wet-weather model predicted loads are higher than measured loads, this provides a conservative assessment of the contribution from open space, which can be applied to the margin of safety. While not used to develop load capacity, the models should prove useful in evaluating management scenarios to help achieve load reductions in TMDL implementation.

6. Total Maximum Daily Loads

In this section, we develop the loading capacity and allocations for metals in the Los Angeles River. EPA regulations require that a TMDL include waste load allocations (WLAs), which identify the portion of the loading capacity allocated to existing and future point sources (40 CFR 130.2(h)) and load allocations (LAs), which identify the portion of the loading capacity allocated to nonpoint sources (40 CFR 130.2(g)). As discussed in previous sections, the flows, sources of metals and the relative magnitude of inputs vary between dry-weather and wet-weather periods. TMDLs are developed to address both dry- and wet-weather conditions.

6.1 Dry-Weather Loading Capacity and TMDLs

Dry-weather TMDLs are developed for the following pollutant waterbody combinations:

- Copper for the Los Angeles River Reaches 1, 2, 3, 4, and 5, Burbank Western Channel, Compton Creek, Rio Hondo Reach 1 and Tujunga Wash. Allocations are developed for upstream reaches and tributaries to meet TMDLs in downstream reaches. No copper allocations are assigned to reaches above Rio Hondo Reach 1 because little or no flow from these reaches enters Rio Hondo Reach 1 during dry weather.
- Lead for the Los Angeles River Reaches 1, 2, 3, 4, and 5, Burbank Western Channel, Rio Hondo Reach 1, and Compton Creek. Allocations are developed for upstream reaches and tributaries to meet TMDLs in downstream reaches. Concentration-based allocations are developed for lead in Monrovia Canyon Creek. Lead allocations are not assigned to other non-impaired reaches above Rio Hondo Reach 1 because little or no flow from these reaches enters Rio Hondo Reach 1 during dry weather.
- Zinc for Rio Hondo Reach 1. Allocations are only developed for Rio Hondo Reach 1.
- Selenium for Reach 6, Aliso Creek, Dry Canyon Creek and McCoy Canyon Creek. Concentration-based allocations are only developed for Reach 6 and its tributaries.

The dry-weather loading capacity for each reach is determined by multiplying the reach-specific dry-weather target expressed as total recoverable metals (Table 3-2) by a critical flow assigned to each reach.

Dry-weather flows in the Los Angeles River are influenced highly by the amount of effluent discharge and by the presence of dams on the tributaries. Critical flows for each reach were established from the long-term flow records (1988-2000) generated by stream gages located throughout the watershed (Figure 5). In general, the median flow measured at each gage was selected as the critical flow. In areas where there were no flow records, an area-weighted approach was used to assign flows.

Critical flows for Verdugo Wash, Rio Hondo and Compton Creek were obtained directly from stream gages. The critical flow for Burbank-Western Channel was obtained directly from the stream gage minus the median flow from Burbank WRP. The stream gages for the Tujunga Wash and Arroyo Seco are located at the dams for these tributaries. The critical flows for these tributaries were thus calculated by multiplying the ratio of the area of their subwatersheds to the area above their dams by the median flow measured at their gages. The critical flow for Bell

Creek was calculated by multiplying the ratio of the Bell Creek subwatershed to the combined area of the tributary watersheds by the combined median flow of the tributaries. The critical flows for each reach of the river were obtained by multiplying the ratio of the area of the subwatershed for each reach to the total watershed area by the total median storm drain and tributary flow. The total median storm drain and tributary flow (34 cfs) is calculated by subtracting the existing combined median flow of the three POTWs (111 cfs) from the existing total median flow of the river as measured at Wardlow (145 cfs).

In reaches with POTW discharge, the critical flow is equal to the total median storm drain and tributary flow plus the design capacity of the POTW that discharges to the reach. To account for flow from Tillman, the design flow of 124 cfs was applied to Reach 4. Similarly, a design flow of 31 cfs was applied to Reach 3 to account for flows from the Glendale plant and a design flow of 14 cfs was applied to the Burbank Western Channel to account for flows from the Burbank plant. Because these three major POTWs account for the majority of flow during dry weather, dry-weather flow is relatively constant. The critical flow for the entire river is thus equal to the design capacity of the three POTWs (169 cfs) plus the existing median flow from the storm drains and tributaries (34 cfs). Critical dry-weather flows are presented in Table 6-1.

Table 6-1. Critical dry-weather flows used to set dry-weather loading capacity.

Los Angeles River	**Area of Subwatershed (acres)**	**Median Non-POTW Flow (cfs)**	**POTW design flow (cfs)**	**Critical Flow (cfs)**
LA River Reach 6	53,860	7.20	-	7.20
LA River Reach 5	5593	0.75	-	0.75
LA River Reach 4	38,380	5.13	124	129.13
LA River Reach 3	36,231	4.84	31	35.84
LA River Reach 2	28,893	3.86	-	3.86
LA River Reach 1	19,330	2.58	-	2.58
Tributaries				
Bell Creek	11,357	0.79	-	0.79
Tujunga Wash	14,7448	0.15	-	0.15
Burbank-Western Channel	18,674	3.34	14	17.3
Verdugo Wash	16,117	3.30	-	3.3
Arroyo Seco	32,271	0.58	-	0.58
Rio Hondo Reach 1	96,425	0.50	-	0.50
Compton Creek	25,506	0.90	-	0.90
Total	530,086	34	169	203

The dry-weather loading capacity for each impaired reach based on these critical flows is identified in Table 6-2. Loading capacities for impaired reaches include the critical flows for upstream reaches. The dry-weather loading capacity for Reach 5 includes flows from Reach 6 and Bell Creek, the dry-weather loading capacity for Reach 3 includes flows from Verdugo Wash, and the dry-weather loading capacity for Reach 2 includes flows from Arroyo Seco.

Table 6-2. Dry-weather loading capacity (TMDL) for impaired reaches and tributaries of the Los Angeles River (total recoverable metals)

Los Angeles River	**Critical Flow (cfs)**	**Copper (kg/day)**	**Lead (kg/day)**	**Zinc (kg/day)**
LA River Reach 5	8.74	0.65	0.39	
LA River Reach 4	129.13	8.1	3.2	
LA River Reach 3	39.14	2.3	1.01	
LA River Reach 2	4.44	0.16	0.084	
LA River Reach 1	2.58	0.14	0.075	
Tributaries	**Critical Flow (cfs)**	**Copper**	**Lead**	
Tujunga Wash	0.15	0.0070	0.0035	
Burbank Western Channel	17.3	0.80	0.39	
Rio Hondo Reach 1	0.50	0.015	0.0061	0.16
Compton Creek	0.90	0.041	0.020	
Total	203	12.2	5.2	0.16

6.2 Dry-Weather Allocations

Allocations are assigned to point and nonpoint sources throughout the watershed in order to meet the TMDLs for impaired reaches. Mass-based waste load allocations are developed for the three POTWs (Tillman, Glendale, and Burbank) and mass-based load allocations are developed for open space and direct atmospheric deposition. A grouped mass-based waste load allocation is developed for storm water permitees (Los Angeles County MS4, Long Beach MS4, Caltrans, General Industrial and General Construction) by subtracting the mass-based waste load and load allocations from the total loading capacity according to the following equation:

TMDL = POTW + Direct Air Deposition + Open Space + Combined Storm Water Sources Equation (7)

Concentration-based waste load allocations are developed for other point sources in the watershed. These other point sources have intermittent flow and calculation of mass-based waste load allocations is not possible. These sources will have a minor impact on metals loading if they are limited by concentration to the applicable CTR-based waste load allocations. In addition, these sources can provide assimilative capacity equal to or greater than their loading, so their mass-based contribution would roughly cancel out of equation 7.

6.2.1. Dry-weather waste load allocations for three POTWs. Mass- and concentration-based waste load allocations for Tillman, Los Angeles-Glendale and Burbank POTWs are developed (Table 6-3) to meet the reach-specific dry-weather targets for copper and lead (Table 3-2). For Tillman, the in-stream targets are based on conditions in Reach 4 of the Los Angeles River below the plant. For Glendale, the in-stream targets are based on conditions in Reach 3 of the Los Angeles River below the plant. For Burbank, the in-stream targets are based on conditions in the Burbank Western Channel downstream of the plant.

Table 6-3. Dry-weather waste load allocations for three POTWs (expressed as total recoverable metals)

Facility	Design Flow (cfs)	WLA	Copper	Lead
Tillman	124	Concentration-based	26 µg/L	10 µg/L
		Mass-based	7.8 kg/day	3.03 kg/day
Glendale	31	Concentration-based	26 µg/L	12 µg/L
		Mass-based	2.0 kg/day	0.88 kg/day
Burbank	14	Concentration-based	19 µg/L	9.1 µg/L
		Mass-based	0.64 kg/day	0.31 kg/day
Total	169	Mass-based	10 kg/day	4.2 kg/day

6.2.2. Dry-weather load allocations. Dry-weather nonpoint source mass-based load allocations for copper and lead are developed for open space and direct atmospheric deposition to the river. Most of the land area in the watershed is served by the storm drain system. The exception is the area of the Angeles National Forest and the open areas of the Santa Susana Mountains. Therefore, in equation 7, "open space" refers to opens space that discharges directly to the river and not through the storm drain system. Once drainage from "open space" is collected by the storm drain system it becomes a point source and is included with the storm water allocation. The area not served by the storm drain is approximately 200 square miles[1]. Limited data are available on flows from Aliso Canyon Wash, Browns Canyon and Bull Creek, which drain the Santa Susana Mountains. Dry-weather flow from the Santa Susana Mountains is therefore not included in the calculation of open space load allocations for copper and lead. Because their area is small compared to the National Forest and because there is no evidence of copper or lead impairments in Reach 6, it is reasonable to assume that the contribution from Santa Susana Mountains to downstream impairments in Reaches 5,4, 3, 2 and 1 is negligible. Therefore, for the purposes of calculating load allocations for copper and lead to address these impairments, open space is limited to the Angeles National Forest. Tributaries of the Rio Hondo, including Monrovia Canyon Creek, drain the Angeles Forest, but since their flows do not reach Rio Hondo Reach 1 or the mainstem of the Los Angeles River during dry weather, they are not included in the copper and lead load allocations. The two remaining major tributaries that drain the Angeles Forest are the Tujunga Wash and Arroyo Seco. In order to calculate the copper and lead load allocations for nonpoint sources in these tributaries, the median flow from the upper portion of each tributary, based on LACDPW flow records (1988-2000) is multiplied by the numeric targets (Table 3-2) for each reach. These load allocations are presented in Table 6-4.

Table 6.4. Dry-weather load allocations (total recoverable metals) for open space not served by the storm drain system, based on tributaries that drain the Angeles National Forest.

Tributaries	Open Space Critical Flow (cfs)	Copper (kg/day)	Lead (kg/day)
Tujunga Wash	0.12	0.0056	0.0028
Arroyo Seco	0.33	0.018	0.009
Total	0.45	0.023	0.012

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[1] As determined by Regional Board staff through GIS mapping using City and County storm drain layers and U.S. Census information on populated areas.

Load allocations for direct atmospheric deposition are based on the calculations by Sabin et al., as discussed Section 4 (Table 4-6), and allocated to each reach based on the length of each reach and tributary (Table 6-5). The ratio of the length of each segment over the total length of all segments is multiplied by the estimates of direct atmospheric loading (3 kg/year for copper, 2 kg/year for lead and 10 kg/year for zinc.) Segment lengths are presented in the dry-weather model (Appendix I).

Table 6-5. Dry-weather load allocations (total recoverable metals) for direct atmospheric deposition.

Los Angeles River	Length of Reach (miles)	Copper (kg/day)	Lead (kg/day)	Zinc (kg/day)
LA River Reach 6	4.3	3.3x10^{-4}	2.2x10^{-4}	
LA River Reach 5	4.7	3.6x10^{-4}	2.4x10^{-4}	
LA River Reach 4	10.6	8.1x10^{-4}	5.4x10^{-4}	
LA River Reach 3	7.9	6.04x10^{-4}	4.03x10^{-4}	
LA River Reach 2	18.7	1.4 x10^{-3}	9.5x10^{-4}	
LA River Reach 1	5.8	4.4x10^{-4}	2.96x10^{-4}	
Tributaries	**Length of Reach (miles)**	**Copper**	**Lead**	
Bell Creek	3.9	2.98x10^{-4}	1.99x10^{-4}	
Tujunga Wash	9.7	7.4x10^{-4}	4.9x10^{-4}	
Verdugo Wash	6.2	4.7x10^{-4}	3.2x10^{-4}	
Burbank Western Channel	9.3	7.1x10^{-4}	4.7x10^{-4}	
Arroyo Seco	9.6	7.3x10^{-4}	4.9x10^{-4}	
Rio Hondo Reach 1	8.3	6.4x10^{-4}	4.2x10^{-4}	0.0021
Compton Creek	8.5	6.5x10^{-4}	4.3x10^{-4}	
Total	107.5	0.0082	0.0055	0.0021

A concentration-based load allocation equal to 5 µg/L for selenium is assigned to Reach 6 and its tributaries. This load allocation is not assigned to a particular nonpoint source or group of nonpoint sources because the sources of selenium are uncertain. Separate studies are underway to evaluate whether selenium levels represent a natural condition for this watershed.

A concentration-based load allocation for lead equal to 8.2 µg/L (based on numeric targets in table 3-2) is also developed for lead in Monrovia Canyon Creek. The Monrovia Canyon Creek watershed is entirely open space, the majority of which is National Forest or State Park. This load allocation is not assigned to a particular nonpoint source or group of nonpoint sources because the sources of lead are uncertain. However, based on the open space land uses in this sub-watershed, the sources are likely natural or background sources. Because there is no flow information for Monrovia Canyon Creek, a concentration-based load allocation is developed. A study by SCCWRP is currently underway to quantify natural contributions of pollutants during wet and dry weather.

6.2.3 Dry-weather waste load allocations for storm water permittees. A dry-weather mass-based waste load allocation is developed for storm water permittees according to the following equation:

Storm Water = TMDL – POTW – Open Space - Direct Air Deposition **Equation (8)**

More specifically, the waste load allocation for storm water is calculated by multiplying reach specific critical flows attributable to storm drains (total critical flow minus median POTW flows minus median open space flows) by reach-specific numeric targets, then subtracting the contribution from direct air deposition, according to the following equation:

$$\textbf{Storm Water} = \text{target} * (\text{Flow}_{\text{Critical}} - \text{Flow}_{\text{median POTW}} - \text{Flow}_{\text{median Open}}) - \text{Direct Air Deposition} \qquad \textbf{Equation (9)}$$

For accounting purposes, it is assumed that the Caltrans and general storm water permittees discharge entirely to the MS4 system. This assumption has largely been borne out in out permit review. A zero waste load allocation is assigned to all industrial and construction stormwater permits during dry weather. Order Nos. 97-03 DWQ and 99-08 DWQ already prohibit non-storm water discharges with few exceptions as discussed in Section 4.1.2. The remaining waste load allocation (Table 6-6) is shared by the MS4 permittees and Caltrans. It is not possible to divide this allocation between the MS4 and Caltrans permittees because there is not enough data on the relative reach-specific extent of MS4 and Caltrans areas.

Table 6-6. Dry-weather waste allocations for storm water permittees (expressed as total recoverable metals)

Los Angeles River	**Critical Flow (cfs)**	**Copper (kg/day)**	**Lead (kg/day)**	**Zinc (kg/day)**
LA River Reach 6	7.20	0.53	0.33	
LA River Reach 5	0.75	0.05	0.03	
LA River Reach 4	5.13	0.32	0.12	
LA River Reach 3	4.84	0.06	0.03	
LA River Reach 2	3.86	0.13	0.07	
LA River Reach 1	2.58	0.14	0.07	
Tributaries	**Critical Flow**	**Copper**	**Lead**	**Zinc**
Bell Creek	0.79	0.06	0.04	
Tujunga Wash	0.03	0.001	0.0002	
Verdugo Wash	3.3	0.15	0.07	
Burbank Western Channel	3.30	0.18	0.10	
Arroyo Seco	0.25	0.01	0.01	
Rio Hondo Reach 1	0.50	0.01	0.006	0.16
Compton Creek	0.90	0.04	0.02	
Total	34	1.70	0.89	0.16

6.2.4. Dry-weather waste load allocations for other NPDES permits.

Concentration-based waste load allocations are developed for the minor and general (non-storm water) NPDES dischargers that discharge to the reaches in Table 3-2. Concentration-based waste load allocations are also assigned to the Tapia and Whittier Narrows WRPs, which have low infrequent flows. The permitted flow from Tapia is less than 2% of the mean flow from Tillman WRP, Burbank WRP and Glendale WRP. Concentration-based waste load allocations are also assigned to the three major non-POTW permits. These permits are for intermittent discharges of storm water runoff mixed with industrial wastewater and miscellaneous designated waste and it is not possible to assign them a mass-based allocation. If waste load allocations were assigned to intermittent discharges based on the maximum permitted daily flow, collectively their loads combined with the POTW loads would exceed the TMDL for the river, leaving no allocation for the storm water permittees. By providing concentration-based limits, we ensure that the loads from intermittent discharges are associated with an increased assimilative capacity such that water quality standards will be attained. Concentration-based waste load allocations are equal to the dry-weather numeric targets, expressed as total recoverable metals, provided in Table 3-2.

The Los Angeles Zoo wastewater facility discharges only in wet weather when capacity of the retention basin is exceeded. It is assigned a dry-weather waste load allocation equal to zero.

6.3. Wet-Weather Loading Capacity (Load-Duration Curves) and TMDLs

During wet weather, the allowable load is a function of the volume of water in the river. Given the variability in wet-weather flows, the concept of a single critical flow is not justified. Instead, a load-duration curve approach is used to establish the wet-weather loading capacity. In brief, a load-duration curve is developed by multiplying the wet-weather flows by the in-stream numeric target. The result is a curve which identifies the allowable load for a given flow. Table 6-7 presents the equations used to calculate the load duration curves. The wet-weather TMDLs for metals are defined by these load-duration curves. The wet-weather loading TMDLs apply for days when the maximum flow at Wardlow equals or exceeds 500 cfs, which represents the 90th percentile flow.

Table 6-7. Wet-weather loading capacity (TMDLs) for metals expressed in terms of total recoverable metal

Metal	Load Duration Curve
Cadmium	Daily storm volume x 3.1 µg/L
Copper	Daily storm volume x 17 µg/L
Lead	Daily storm volume x 62 µg/L
Zinc	Daily storm volume x 159 µg/L

An example of a load duration curve is presented in Figure 11. This example is generated by multiplying the wet-weather numeric target for copper by daily storm volumes generated by the wet-weather model for a 12-year period. A daily flow of 500 cfs (daily storm volume = 1.2×10^9 liters) results in the loading capacities presented in Table 6-8. For practical purposes the wet-weather loading capacity defined using the load-duration curve is equivalent to a storm water event-mean concentration based on a flow weighted composite.

Table 6-8. Loading capacity based on a daily flow equal to 500 cfs.

Metal	Loading Capacity (kg/day)
Cadmium	3.8
Copper	21
Lead	76
Zinc	194

6.4 Wet-Weather Allocations

Wet-weather allocations are assigned in the same way as dry-weather allocations (Equation 7), except that there are no reach specific allocations. Wet-weather allocations apply to all reaches and tributraies of the Los Angeles River. With the exception of the Tillman, Glendale, and Burbank WRPs, wet-weather allocations are based on flows and hardness values for the Wardlow station in Reach 1.

6.4.1. Wet-weather waste load allocations for three POTWs. Wet-weather allocations are based on dry-weather in-stream numeric targets because the POTWs exert the greatest influence over in-stream water quality during dry weather, and collectively they contribute minimally to the total wet-weather loading. During wet weather, the concentration-based dry-weather waste load allocations apply but the mass-based dry-weather allocations do not apply when influent flows exceed the design capacity of the treatment plants. In addition to the waste load allocations for copper and lead in dry weather, the POTWs are assigned reach-specific allocations for cadmium and zinc based on dry-weather targets to meet the wet-weather TMDLs in Reach 1 (Table 6-9).

Table 6-9. Wet-weather waste load allocations for three POTWs (expressed as total recoverable metals)

Facility	Design Flow (cfs)	WLA	Cadmium	Copper	Lead	Zinc
Tillman	124	Concentration-based	4.7 µg/L	26 µg/L	10 µg/L	212 µg/L
		Mass-based	1.4 kg/day	7.8 kg/day	3.03 kg/day	64 kg/day
Glendale	31	Concentration-based	5.3 µg/L	26 µg/L	12 µg/L	253 µg/L
		Mass-based	0.40 kg/day	2.0 kg/day	0.88 kg/day	19 kg/day
Burbank	14	Concentration-based	4.5 µg/L	19 µg/L	9.1 µg/L	212 µg/L
		Mass-based	0.15 kg/day	0.64 kg/day	0.31 kg/day	7.3 kg/day
Total	169	Mass-based	1.95 kg/day	10 kg/day	4.2 kg/day	90 kg/day

6.4.2. Wet-weather load allocations.

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Wet-weather Load Allocations for Open Space

As with the calculation of dry-weather allocations, wet-weather load allocations are only assigned to open space that discharges directly to the river. In order to assign load allocations to open space, the model-predicted percent contribution from open space is multiplied by the total loading capacity, or TMDL. This product is then multiplied by the ratio of open space located outside the storm drain system (see section 6.2.2) to the total open space area ($200 \text{ mi}^2/368\text{mi}^2 = 0.54$), according to the following equation:

Open Space = % Open Space Contribution * TMDL* 0.54 **Equation (10)**

Based on the wet-weather model (Appendix II) open space contributes 2.8% of the copper load, 0.7% of the lead load and 1.6% of the zinc load. The model tends to overestimate loads, which provides a conservative assessment of the contribution from open space and can be applied to the margin of safety. The wet-weather model does not estimate contributions from cadmium, but there is little evidence to suggest undeveloped areas as a potential source of cadmium. The wet-weather cadmium impairment could only be confirmed in Reach 1. There is no evidence of impairment in Reaches 3, 4, 5, and 6, or tributaries where there is open space. Therefore, no load allocation is developed for cadmium.

Wet-weather Load Allocations for Direct Air Deposition

An estimate of direct atmospheric deposition is developed based on the percent area of surface water, which is about 0.2% of the total watershed area (Table 5-4). The load allocation for atmospheric deposition is calculated by multiplying this percentage by the total loading capacity, according to the following equation:

Direct Air Deposition = 0.002 * TMDL **Equation (11)**

The loadings associated with indirect deposition are included in the wet-weather storm water waste load allocations.

As with the dry-weather condition, a concentration-based wet-weather WLA equal to 5 µg/L for selenium has been assigned to Reach 6 and its tributaries.

6.4.3. Wet-weather waste load allocations for storm water permittees. Wet-weather waste load allocations are calculated by combining equations 8, 10, and 11, resulting in the following equation:

Storm Water = (1– 0.002 - %Open Space Contribution*0.54)*TMDL–POTW **Equation (12)**

Wet-weather allocations for POTWs, open space, direct air deposition and storm water are presented in Table 6-10.

Table 6.10. Wet-weather allocations for open space, direct air, POTWs and storm water.

	Open Space (kg/day)	Direct Air (kg/day)	Burbank WRP (kg/day)	Tillman WRP (kg/day)	LAG WRP (kg/day)	Storm water permittees (kg/day)
Cadmium		6.2×10^{-12} * daily volume (L)	0.15	1.4	0.40	3.1×10^{-9}*daily volume(L) – 1.95
Copper	2.6×10^{-10} * daily volume (L)	3.4×10^{-11} * daily volume (L)	0.64	7.8	1.99	1.7×10^{-8}*daily volume (L) – 10.4
Lead	2.4×10^{-10} * daily volume (L)	1.2×10^{-10} * daily volume (L)	0.31	3.03	0.88	6.2×10^{-8}*daily volume (L) – 4.2
Zinc	1.4×10^{-9} * daily volume (L)	3.2×10^{-10} * daily volume (L)	7.3	64	19	1.6×10^{-7}*daily volume (L) – 90

L = Liters

For example, a daily flow of 500 cfs (daily storm volume = 1.2×10^{9} liters) results in the allocations presented in Table 6-11.

Table 6-11. Wet-weather allocations based on a daily flow equal to 500 cfs.

	Open Space (kg/day)	Direct Air (kg/day)	Burbank WRP (kg/day)	Tillman WRP (kg/day)	LAG WRP (kg/day)	Storm water permittees (kg/day)
Cadmium		0.0074	0.15	1.4	0.4	1.8
Copper	0.31	0.041	0.64	7.8	1.9	10
Lead	0.29	0.14	0.31	3.03	0.88	71
Zinc	1.7	0.38	7.3	64	19	102

EPA allows allocations for NPDES-regulated municipal storm water discharges from multiple point sources to be expressed as a single categorical waste load allocation when data and information are insufficient to assign each source or outfall an individual allocation. We recognize that these municipal storm water allocations may be fairly rudimentary because of data limitations and variability in the system. The combined storm water waste load allocation is apportioned between the different storm water categories based on acreage. For the Los Angeles River watershed, the total acreage for each category is:

- Combined stormwater permittees: 405,760 acres. This is equal to the total watershed area minus the open space area not covered by storm drains.
- Caltrans: 6950 acres or 2% of the portion of the watershed served by storm drains. This is an approximation that reflects the area of the Department's Right-of-Way that drains to Los Angeles River (Caltrans comment letter dated 8/26/04.)
- Industrial: 21,415 acres or 5% of the portion of the watershed served by storm drains. Total acreage was obtained from State Board enrollment database.
- Construction: 7764 acres or 2% of the portion of the watershed served by storm drains. Total acreage was obtained from State Board enrollment database.
- Remaining allocated to the MS4: 369,631 acres or 91% of the portion of the watershed served by strom drains.

Based on these areas, the waste load allocations estimated for each permit type are presented in Table 6-12.

Table 6.12. Wet-weather combined storm water allocations, apportioned based on percent of total urbanized portion of watershed.

	General Industrial permittees (kg/day)	General Construction permittees (kg/day)	Caltrans (kg/day)	MS4 Permittees (kg/day)	Combined storm water permittees (kg/day)
Cadmium	1.6E-10*daily volume(L) – 0.11	5.9E-11*daily volume(L) – 0.04	5.3E-11*daily volume(L) – 0.03	2.8E-09*daily volume(L) – 1.82	3.1E-09*daily volume(L) – 1.95
Copper	8.8E-10*daily volume (L) – 0.5	3.2E-10*daily volume (L) – 0.2	2.9E-10*daily volume (L) – 0.2	1.5E-08*daily volume (L) – 9.5	1.7E-08*daily volume (L) – 10
Lead	3.3E-09*daily volume (L) – 0.22	1.2E-09*daily volume (L) – 0.08	1.06E-09*daily volume (L) – 0.07	5.6E-08*daily volume (L) – 3.85	6.2E-08*daily volume (L) – 4.2
Zinc	8.3E-09*daily volume (L) – 4.8	3.01E-09*daily volume (L) – 4.8	2.7E-09*daily volume (L) – 1.6	1.4E-07*daily volume (L) – 83	1.6-07*daily volume (L) – 90

For example, a daily flow of 500 cfs (daily storm volume = 1.2×10^9 liters) results in the storm water waste load allocations presented in Table 6-13.

Table 6-13. Wet-weather waste load allocations for storm water based on a daily flow of 500 cfs.

	General Industrial permittees (kg/day)	General Construction permittees (kg/day)	Caltrans (kg/day)	MS4 Permittees (kg/day)	Combined storm water permittees (kg/day)
Cadmium	0.089	0.036	0.036	1.6	1.8
Copper	0.50	0.20	0.20	9.1	10
Lead	3.6	1.4	1.4	65	71
Zinc	5.08	2.03	2.03	93	102

Each storm water permittee under the general industrial and construction storm water permits will receive an individual waste load allocations per acre based on the total acres of their facility. This results in the same per acre allocation for the industrial and construction storm water permittees (Table 6-14).

Table 6-14. Wet-weather waste load allocations for individual general construction or industrial storm water permittees (kg/day/acre).

Metal	Individual General Construction or Industrial Permittee (g/day/acre)
Cadmium	7.6×10^{-12} * daily storm volume (L) – 4.8×10^{-6}
Copper	4.2×10^{-11} * daily storm volume (L) – 2.6×10^{-5}
Lead	1.5×10^{-10} * daily storm volume (L) -1.04×10^{-5}
Zinc	3.9×10^{-10} * daily storm volume (L) – 2.2×10^{-4}

For example, a daily flow of 500 cfs (daily storm volume = 1.2×10^9 liters) results in the general construction and industrial storm water waste load allocations presented in Table 6-15.

Table 6-15. We-weather waste load allocations for individual general construction or industrial storm water permittees (g/day/acre) based on a daily flow equal to 500 cfs.

Metal	Individual General Construction Permittee (g/day/acre)
Cadmium	0.0044
Copper	0.026
Lead	0.18
Zinc	0.26

6.4.4. Wet-weather waste load allocations for other NPDES permits. Concentration-based WLAs are established for the minor and general NPDES permits (other than storm water permittees) that discharge to the Los Angeles River and its tributaries to ensure that these do not contribute significant loadings to the system. This was done because the flows are so variable that a representative collective flow and loading cannot be calculated. Concentration-based waste load allocations are also assigned to the Los Angeles Zoo wastewater facility and the Tapia and Whittier Narrows WRPs, which have low infrequent flows. The zoo facility discharges only during wet-weather and only when capacity of the 1.8 million-gallon retention basin is exceeded. The permitted flow from Tapia is less than 2% of the mean flow from Tillman WRP, Burbank WRP and Glendale WRP. It is estimated that less than 1% of the flow from Whittier Narrows WRP leaves the spreading grounds and enters the Rio Hondo. Concentration-based allocations are also assigned to the three non-POTW major NPDES permits because their discharges are a mixture of intermittent storm water and wastewater. The concentration-based WLAs are based on CTR targets adjusted for hardness and expressed as total recoverable metals. (Table 6-16.)

Table 6-16. Concentration-based wet -weather waste load allocations (µg/L total recoverable metals).

Cadmium	Copper	Lead	Zinc
3.1	17	62	159

6.5 Margin of Safety

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationships between effluent limitations and water quality. A margin of safety is appropriate for each TMDL because there is significant uncertainty in the analysis of pollutant loads and effects on water quality. There is an implicit margin of safety that stems from the use of conservative values for the conversion total recoverable to the dissolved fraction during the dry and wet periods. In addition, the TMDL includes a margin of safety by evaluating wet-weather conditions separately from dry-weather conditions, which is in effect, assigning allocations for two distinct critical conditions. Furthermore, the use of the wet-weather model to calculate load allocations for open space can be applied to the margin of safety because it tends to overestimate loads from open space, thus reducing the available waste load allocations to the permitted discharges.

7. IMPLEMENTATION

In this section, we describe the implementation procedures that will be used to provide reasonable assurances that water quality standards will be met. Further, the reasonably foreseeable means of compliance with the TMDL are discussed.

Nonpoint sources will be regulated through the authority contained in sections 13263 and 13269 of the Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy (May 2004).

The mass- and concentration-based WLAs established for the three major POTWs in this TMDL will be implemented through NPDES permit limits. The renewal of the NPDES permits for the three major POTWs is tentatively scheduled for July 2005. The three POTWs will have permit limits designed to meet the water quality targets established in this TMDL and maintain water quality standards in the Los Angeles River. These limits take into account the variability in the effluent data and the frequency of monitoring. During wet weather when the inflow to the treatment plants exceeds the design capacity, the mass-based limit will not apply.

If a POTW determines that advanced treatment (necessitating long design and construction timeframes) will be required to meet final waste load allocations, the Regional Board will consider extending the implementation schedule to allow the POTW up to 10 years from the effective date of the TMDL. POTWs that are unable to demonstrate compliance with final waste load allocations must conduct source reduction audits within two years of the effective date of the TMDL. POTWs that will be requesting the Regional Board to extend their implementation schedule to allow for the installation of advanced treatment must prepare work plans, with time schedules to allow for the installation of advanced treatment. The work plan must be submitted within four years from the effective date of the TMDL. POTWs that require advanced treatment to meet waste load allocations would be required to conduct a separate project level analysis of potential environmental impacts associated with installation and operation of advanced treatment (Public Resources Code 21159.2).

The concentration-based waste load allocations for minor NPDES discharges, NPDES discharges covered under a general permit and major NPDES discharges excluding the Tillman, LA-Glendale, and Burbank POTWs will be implemented through NPDES permit limits. Reach-specific dry-weather waste load allocations are equal to the numeric targets in Table 3-2 and wet-weather waste load allocations are described in Table 6-12. Permit writers for the non-storm water permits may translate waste load allocations into effluent limits by applying the SIP procedures or other applicable engineering practices authorized under federal regulations. Compliance schedules may be established in individual NPDES permits, allowing up to 5 years within a permit cycle to achieve compliance. Compliance schedules may not be established in general NPDES permits. A discharger that could not comply immediately with effluent limitations specified to implement waste load allocations would be required to apply for an individual permit in order to demonstrate the need for a compliance schedule. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional

Board discretion) compliance schedules up to 10 years from the effective date of the TMDL to achieve compliance with final WLAs.

Non-storm water flows authorized by Order No. 97-03 DWQ, or any successor order, are exempt from the dry-weather waste load allocation equal to zero. Instead, these authorized non-storm water flows shall meet the reach-specific concentration-based waste load allocations assigned to the "other NPDES permits" in Table 3-2. The dry-weather waste load allocation equal to zero applies to unauthorized non-storm water flows, which are prohibited by Order No. 97-03 DWQ. It is anticipated that the dry-weather waste load allocations will be implemented in future general permits through the requirement of improved BMPs to eliminate the discharge of non-storm water flows.

The wet-weather mass-based waste load allocations for the general industrial storm water permittees (Table 6-15) will be incorporated into watershed specific general permits. Concentration-based permit conditions may be set to achieve the mass-based waste load allocations. These concentration-based conditions would be equal to the concentration-based waste load allocations assigned to the other NPDES permits (Table 6-16). Compliance with permit conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. If this method of compliance is chosen, permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of the numeric waste load allocations.

General industrial storm water permittees are allowed interim concentration-based wet-weather waste load allocations based on benchmarks contained in EPA's Storm Water Multi-sector General Permit for Industrial Activities. The interim waste load allocations apply to all industry sectors and will apply for a period not to exceed ten years from the effective date of the TMDL.

Table 7-1. Interim wet- weather WLAs for general industrial storm water permittees, expressed as total recoverable metals (µg/L)*:

Cadmium	Copper	Lead	Zinc
15.9	63.6	81.6	117

*Based on USEPA benchmarks for industrial storm water sector

In the first five years from the effective date of the TMDL, interim wet-weather waste load allocations will not be interpreted as enforceable permit conditions. If monitoring demonstrates that interim waste load allocations are being exceeded, the permittee shall evaluate existing and potential BMPs, including structural BMPs, and implement any necessary BMP improvements. It is anticipated that monitoring results and any necessary BMP improvements would occur as part of an annual reporting process. After five years from the effective date of the TMDL, interim waste load allocations shall be translated into enforceable permit conditions. Compliance with conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of waste load allocations. In addition, permittees shall begin an iterative BMP process to meet final waste load allocations. Permittees shall comply with final waste load allocations within 10 years from the effective date of the TMDL, which shall be expressed as water quality based effluent limitations. Effluent limitations may be expressed as permit conditions. Compliance with conditions may be demonstrated through the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permit writers must provide adequate justification and documentation to demonstrate that specified BMPs are expected to result in attainment of waste load allocations.

Waste load allocations for the general construction storm water permits will be incorporated into the State Board general permit upon renewal or into a watershed-specific general permit developed by the Regional Board. Non-storm water flows authorized by the General Permit for Storm Water Discharges Associated with Construction Activity (Water Quality Order No. 99-08 DWQ), or any successor order, are exempt from the dry-weather waste load allocation equal to zero as long as they comply with the provisions of sections C.3.and A.9 of the Order No. 99-08 DWQ, which state that these authorized non-storm discharges shall be (1) infeasible to eliminate (2) comply with BMPs as described in the Storm Water Pollution Prevention Plan prepared by the permittee, and (3) not cause or contribute to a violation of water quality standards, or comparable provisions in any successor order. Unauthorized non-storm water flows are already prohibited by Order No. 99-08 DWQ.

Within seven years of the effective date of the TMDL, the construction industry will submit the results of BMP effectiveness studies to determine BMPs that will achieve compliance with the final waste load allocations assigned to construction storm water permittees. Regional Board staff will bring the recommended BMPs before the Regional Board for consideration within eight years of the effective date of the TMDL. General construction storm water permittees will be considered in compliance with final waste load allocations if they implement these Regional Board approved BMPs. All permittees must implement the approved BMPs within nine years of the effective date of the TMDL. If no effectiveness studies are conducted and no BMPs are approved by the Regional Board within eight years of the effective date of the TMDL, each general construction storm water permit holder will be subject to site-specific BMPs and monitoring requirements to demonstrate compliance with final waste load allocations.

A grouped dry-weather and wet-weather mass-based waste load allocation has been developed for the two MS4 permits and the Caltrans permit (Tables 6-6 and 6-10). EPA regulation allows allocations for NPDES-regulated stormwater discharges from multiple point sources to be expressed as a single categorical waste load allocation when the data and information are insufficient to assign each source or outfall individual WLAs. The grouped allocation will apply to all NPDES-regulated municipal stormwater discharges in the Los Angeles watershed including the Los Angeles County MS4 permit, the City of Long Beach MS4 permit, and the Caltrans stormwater permit. The watershed is divided into six subwatersheds, with jurisdictional groups assigned to each subwatershed, as presented in Table 7-2. Jurisdictional groups can be reprganized or subdivided upon approval by the Executive Offcier.

Table 7-2. Los Angeles River and Tributaries Metals TMDL: Jurisdictional Groups

Jurisdictional Group	Responsible Jurisdictions & Agencies	Subwatershed(s)
1	Carson County of Los Angeles City of Los Angeles Compton Huntington Park Long Beach Lynwood Signal Hill Southgate Vernon	Los Angeles River Reach 1 and Compton Creek
2	Alhambra Altadena Arcadia Bell Bell Gardens Bellflower Bradbury Carson Commerce Compton County of Los Angeles Cudahy Downey Duarte El Monte Glendale Glendale Huntington Park Irwindale La Canada Flintridge Lakewood City of Los Angeles Long Beach Lynwood Maywood Monrovia Montebello Monterey Park Paramount Pasadena Pico Rivera Rosemead San Gabriel San Marino Sierra Madre South El Monte South Pasadena Southgate Temple City Vernon	Los Angeles River Reach 2, Rio Hondo, Arroyo Seco, and all contributing sub watersheds
3	City of Los Angeles County of Los Angeles Burbank Glendale La Canada Flintridge Pasadena	Los Angeles River Reach 3, Verdugo Wash, Burbank Western Channel
4-5	Burbank City of Los Angeles County of Los Angeles Glendale San Fernando	Los Angeles River Reach 4, Reach 5, Tujunga Wash, and all contributing sub watersheds
6	Calabasas City of Los Angeles County of Los Angeles Hidden Hills	Los Angeles River Reach 6, Bell Creek, and all contributing sub watersheds

EPA policy requires that the waste load allocations for stormwater be expressed in numeric form. For the dry-weather condition, mass-based waste load allocations (Table 6-6) will be incorporated into the permits of the NPDES-regulated municipal stormwater discharges. A review of available water quality data suggests that applicable CTR limits are being met most of the time during dry weather, with episodic exceedances. Due to the expense of obtaining accurate flow measurements required for calculating loads, concentration-based permit limits may apply during dry weather. These concentration-based limits would be equal to the dry-weather reach-specific numeric targets (Table 3-2). Dry-weather waste load allocations apply to each jurisdictional group based on the subwatershed(s) defining the group. For example, the dry-weather waste load allocations for Compton Creek and Reach 1 apply to responsible agencies within Jurisdictional Group 1. For wet weather, the municipal stormwater waste load allocations are presented in Table 6-10. These may be allocated to each jurisdictional group.

Each municipality and permittee will be responsible for the waste load allocations shared by their jurisdictional group, and will not necessarily be given a specific allocation for the land uses under their jurisdiction. Therefore, the focus of compliance should be on developed areas where the contribution of metals is highest and areas where activities occur that contribute significant loading of metals (e.g., high-density residential, industrial areas and highways). Flexibility will be allowed in determining how to reduce metals as long as the waste load allocations are achieved. The information provided in Table 7-3 should help MS4 and Caltrans stormwater permittees identify areas of high pollutant loading and may be used to target BMPs. In this table, many of the land use categories that share hydrologic or pollutant loading characteristics are grouped into similar classifications. For example, transportation is grouped with the industrial land use since the potency factors used in the wet-weather modeling (section 5.2) were very similar.

Table 7-3. Land use contributions to total metal loads from surface runoff from the Los Angeles River watershed. Based on wet-weather model predictions (Appendix II)

Land Use	Copper	Lead	Zinc
Agriculture	0.5%	0.2%	0.5%
Commercial	13.4%	18.6%	18.2%
Industrial	11.2%	9.1%	19.9%
Mixed Urban	0.7%	0.3%	0.6%
Residential	71.5%	71.1%	59.3%
Open Space	2.8%	0.7%	1.6%

To achieve the necessary reductions to meet the waste load allocations, permittees will need to balance short-term capital investments directed to addressing this and other TMDLs in the Los Angeles River watershed with long-term planning activities for stormwater management in the region as a whole. It should be emphasized that the potential implementation strategies discussed below may contribute to the implementation of other TMDLs for the Los Angeles River watershed. Likewise, implementation of other TMDLs in the Los Angeles River watershed may contribute to the implementation of this TMDL. The Los Angeles River Trash TMDL, effective date August 2, 2002, is now in its first year of implementation. Compliance with the Trash TMDL requires permittees to install either full capture systems, partial capture systems and/or implement institutional controls. At a minimum, the full capture systems must be designed to treat the peak flow rate resulting from a one-year, one-hour storm. A secondary benefit of the trash removal systems also referred to as gross solids removal systems has been the removal of sediments and other pollutants.

Figures 12 a-12c present the estimated load reductions needed to meet the grouped storm water waste load allocations. In these figures, allowable loads are plotted against storm volume to assist permittees in the design of BMPs to achieve the necessary load reductions. As described in section 5.2, The LSPC model was used to simulate storm volumes and associated loads over a 12-year period. For these figures, the loading capacity is a green line, the model-predicted historical loads below the loading capacity are shaded with blue and the model-predicted historical loads above the loading capacity are shaded with red. Because the model tends to overestimate loads, actual reductions needed to meet the waste load allocations are likely less than predicted by the load-duration curves. Wet-weather historical loadings for cadmium were not modeled in this TMDL. A data review (section 2.2) provided little evidence of wet-weather exceedances for cadmium and estimates of wet-weather loadings of cadmium (LACDPW, 2000 and Ackerman and Schiff, 2003) were well below the allowable load.

7.1 Integrated Resources Plan

The Regional Board supports in concept an integrated water resources approach to improving water quality during wet weather, such as the City of Los Angeles' Integrated Plan for the Wastewater Program (IPWP). An integrated water resources approach takes a holistic view of regional water resources management by integrating planning for future wastewater, stormwater, recycled water, and potable water needs and systems, and focusing on beneficial re-use of stormwater at multiple points throughout a watershed to preserve local groundwater resources and reduce the need for imported water where feasible. The City's IPWP is intended to meet the wastewater and water resource management needs for year 2020.

The Integrated Resources Plan (IRP) is Phase 2 of the IPWP. The IRP is a City-wide strategy developed by the City of Los Angeles and does not specifically focus on the Los Angeles River watershed. The goal of the plan is to increase the amount of wet weather urban runoff that can be captured and beneficially used in Los Angeles. However, it is not known what portion of this runoff will be in the Los Angeles River Watershed. Furthermore, capture and beneficial use of the wet-weather urban runoff specified in the IRP may not achieve the waste load allocations in this TMDL during very wet years. The implementation strategy proposed below could be designed to achieve the TMDL requirements, while remaining consistent with the goals of the City's IPWP and addressing any shortfall of the IRP in achieving implementation with this TMDL.

One component of the IRP is a Runoff Management Plan, which could provide a framework for implementing runoff management practices to meet the IRP goals and address protection of public health and the environment. The Runoff Management Plan as described in the IRP will include consideration of structural Best Management Practices (BMPs) to achieve reduction of pollutant loadings to receiving waters. Urban runoff can be treated at strategic locations throughout the watershed or subwatersheds.

7.2 Potential Implementation Strategies for MS4 and Caltrans Permits

The implementation strategy selected will need to address the different sources of metals loading during dry and wet weather. During dry weather, metals loading are predominately in the dissolved phase. During wet weather, the metals loading are predominately bound to sediment, which are transported with storm runoff. During rain events, partitioning between particulate and dissolved metals often does not reach equilibrium. Municipalities may employ a variety of implementation strategies to meet the required WLAs such as non-structural and structural BMPs, and/or diversion and treatment. Specific projects, which may have a significant environmental impact, would be subject to an environmental review. The lead agency for subsequent projects would be obligated to mitigate any impacts they identify, for example by mitigating potential flooding impacts by designing the BMPs with adequate margins of safety.

7.2.1 Non-structural BMPs. The non-structural BMPs are based on the premise that specific land uses or critical sources can be targeted to achieve the TMDL waste load allocations. Non-structural BMPs provide several advantages over structural BMPs. Non-structural BMPs can typically be implemented in a relatively short period of time. The capital investment required to implement non-structural BMPs is generally less than for structural BMPs. However, the labor costs associated with non-structural BMPs may be higher. Therefore, in the long-term, the non-structural BMPs may be more costly. Examples of non-structural controls include more frequent and appropriately timed storm drain catch basin cleanings, improved street cleaning by upgrading to vacuum type sweepers and educating industries of good housekeeping practices. Since dry-weather exceedances appear to be episodic, the permittees are encouraged to initially concentrate on source reduction strategies including detection and elimination of illicit discharges, reduction of dry-weather nuisance flows, and increased inspection of industrial facilities. In addition, improved enforcement of BMPs for construction sites and improved detection and elimination of illicit connections to the storm drain system may result in significant reductions in discharges of metal pollutants to the Los Angeles River.

A known source of copper loading is from brake pads. The use of alternative materials for brake pads would help to reduce the discharge of copper in all watersheds. Staff acknowledges the Brake Pad Partnership, a multistakeholder effort in the San Francisco Bay to understand and address as necessary the impacts on surface water quality that may arise from break pad wear debris.

7.2.2 Structural BMPs. The structural BMPs are based on the premise that specific land uses, critical sources, or specific periods of a storm event can be targeted to achieve the TMDL waste load allocations. Structural BMPs may include placement of stormwater treatment devices specifically designed to reduce metals loading, such as infiltration trenches or filters, at critical points in the stormwater conveyance system. During storm events, when flow rates are high, these types of filters may require surge control, such as an underground storage vault or detention basin. If these filters are placed in series with the gross solids removal systems being installed to meet the Trash TMDL, then these filters will operate more efficiently and will require less maintenance.

7.2.3 Diversion and Treatment. The diversion and treatment strategy includes the installation of facilities to provide capture and storage of dry and/or wet-weather runoff and diversion of the stored runoff to a wastewater collection system for treatment. A small, dedicated runoff treatment facility or alternative BMPs may be implemented to meet the TMDL requirements.

The volume of flow requiring storage and treatment would have to be estimated in order to size the storage facilities, estimate diversion flow rates, and determine the collection system and treatment capacities needed to accommodate these diverted flows. Wet-weather flows beyond the capacities of these facilities will be bypassed. However, a portion of these larger storm events will still be captured and treated, thereby eliminating the metals loading of small storms and reducing those of larger storms. Overflows from these systems could be routed through structural BMPs designed to remove sediment for further reduction of metal loads.

To assist responsible jurisdictions and agencies in determining the optimal volume of flow to be diverted, analyses were performed to assess relative improvements and benefits associated with capture of storm volumes. The capture of storm volumes reduces the associated metals loads, and therefore reduces the likelihood of exceedances of loading capacities of the receiving waters. These analyses were based primarily on conceptual assumptions and analyses of model results for guidance in future planning. To begin quantifying loading reductions, the results of the wet-weather model were re-analyzed with respect to size of storm flow. This was done by first developing a relationship between rainfall and storm volume for storms greater than 0.1 inch (Figure 13). We then used the regression to assess the effect of storm capture to reduce the associated metals loads, and therefore number of exceedances. The model suggests that the number of instances where model-predicted historical loads exceed the loading capacity can be halved through the capture of a 0.5 inch storm. These results are provided as guidance only and are not meant to imply that structural means are either necessary or adequate to meet the load reductions in this TMDL. Indeed, we believe that BMPs that result in source reductions rather than in-stream storm load reductions should be encouraged.

Additional studies that evaluate the effect of short duration rainfall intensity (i.e., one-year, one-hour rainfall event) on the mobilization and transport of metals are encouraged and would be useful in designing the flow through design capacity of in-line BMPs.

The administrative record and the fact sheets for the Los Angeles MS4 permit, the Long Beach MS4 permit, and the Caltrans stormwater permit must provide reasonable assurance that the BMPs selected will be sufficient to implement the waste load allocations in the TMDL. We expect that reductions to be achieved by each BMP will be documented and that sufficient monitoring be put in place to verify that the desired reductions are achieved. The permits should also provide a mechanism to make adjustments to the required BMPs as necessary to ensure their adequate performance. If non-structural BMPs alone adequately implement the waste load allocations then additional controls are not necessary. Alternatively, if the non-structural BMPs selected prove to be inadequate then structural BMPs or additional controls may be imposed.

7.3 Implementation Schedule

The implementation schedule for all permis is summarized in Table 7-4. For the MS4 and Caltrans storm water permittees, the implementation schedule shall consist of a phased approach. Each jurisdictional group shall achieve compliance in prescribed percentages of its subwatershed, with total compliance to be achieved within 22 years. The dry-weather compliance schedule is more accelerated because the dry-weather exceedances occur infrequently and major structural BMPs are not anticipated. The MS4 and Caltrans storm water permittees are encouraged to work together to identify areas to be addressed first.

The Regional Board intends to reconsider this TMDL in five years after the effective date of the TMDL to re-evaluate the waste load allocations based on the additional data obtained from special studies. Until the TMDL is revised, the waste load allocations will remain as presented in this report. Revising the TMDL will not create a conflict, since full compliance with the dry-weather WLAs and wet-weather WLAs are not required until 18 and 22-years after the effective date, respectively.

Table 7-4. Implementation Schedule.

Date	Action
Effective date of TMDL	Regional Board permit writers shall incorporate waste load allocations into NPDES permits. Waste load allocations will be implemented through NPDES permit limits in accordance with the implementation schedule contained herein, at the time of permit issuance, renewal, or re-opener.
4 years after effective date of the TMDL	Responsible jurisdictions and agencies shall provide to the Regional Board results of the special studies. POTWs that will be requesting the Regional Board to extend their implementation schedule to allow for the installation of advanced treatment must submit work plans.
5 years after effective date of the TMDLs	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
NON-STORM WATER NPDES PERMITS (INCLUDING POTWS, OTHER MAJOR, MINOR, AND GENERAL PERMITS)	
Upon permit issuance, renewal, or re-opener	The non-storm water NPDES permits shall achieve waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. . Compliance schedules may allow up to 5 years in individual NPDES permits to meet permit requirements. Compliance schedules may not be established in general NPDES permits. If a POTW demonstrates that advanced treatment will be required to meet final waste load allocations, the Regional Board will consider extending the implementation schedule to allow the POTW up to 10 years from the effective date of the TMDL to achieve compliance with the final WLAs. Permittees that hold individual NPDES permits and solely discharge storm water may be allowed (at Regional Board discretion) compliance schedules up to 10 years from the effective date of the TMDL to achieve compliance with final WLAs.
GENERAL INDUSTRIAL STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	The general industrial storm water permitees shall achieve dry-weather waste load allocations of zero, which shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall begin to install and test BMPs to meet the interim wet-weather WLAs. BMP effectiveness monitoring will be implemented to determine progress in achieving interim wet-weather waste load allocations.

Date	Action
5 years after effective date of the TMDLs	The general industrial storm water permittees shall achieve interim wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs. Permittees shall beginan iterative BMP process including BMP effectiveness monitoring to achieve compliance with final waste load allocations.
10 years after the effective date of TMDL	The general industrial storm water NPDES permittees shall achieve final wet-weather waste load allocations, which shall be expressed as NPDES water quality-based effluent limitations. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
GENERAL CONSTRUCTION STORM WATER PERMITS	
Upon permit issuance, renewal, or re-opener	Non-storm water flows not authorized by Order No. 99-08 DWQ, or any successor order, shall achieve dry-weather waste load allocations of zero. Waste load allocations shall be expressed as NPDES water quality-based effluent limitations specified in accordance with federal regulations and state policy on water quality control. Effluent limitations may be expressed as permit conditions, such as the installation, maintenance, and monitoring of Regional Board-approved BMPs.
Seven years from the effective date of the TMDL	The construction industry will submit the results of wet-weather BMP effectiveness studies to the Regional Board for consideration. In the event that no effectiveness studies are conducted and no BMPs are approved, permittees shall be subject to site-specific BMPs and monitoring to demonstrate BMP effectiveness.
Eight years from the effective date of the TMDL	The Regional Board will consider results of the wet-weather BMP effectiveness studies and consider approval of BMPs no later than six years from the effective date of the TMDL.
Nine years from the effective date of the TMDL	All general construction storm water permittees shall implement Regional Board-approved BMPs.
MS4 AND CALTRANS STORM WATER PERMITS	
15 months after the effective date of the TMDL	In response to an order issued by the Executive Officer, each jurisdictional group must submit a coordinated monitoring plan, to be approved by the Executive Officer, which includes both TMDL effectiveness monitoring and ambient monitoring. Once the coordinated monitoring plan is approved by the Executive Officer, ambient monitoring shall commence.
48 months after effective date of TMDL (Draft Report) 54 months after effective date of TMDL (Final Report)	Each jurisdictional group shall provide a written report to the Regional Board outlining how the subwatersheds will achieve compliance with the waste load allocations. The report shall include implementation methods, an implementation schedule, proposed milestones, and any applicable revisions to the TMDL effectiveness monitoring plan.

Date	Action
6 years after effective date of the TMDL	Each jurisdictional group shall demonstrate that 50% of the group's total drainage area served by the storm drain system is effectively meeting the dry-weather waste load allocations and 25% of the group's total drainage area served by the storm drain system is effectively meeting the wet-weather waste load allocations.
14 years after effective date of the TMDL	Each jurisdictional group shall demonstrate that 75% of the group's total drainage area served by the storm drain system is effectively meeting the dry-weather WLAs.
18 years after effective date of the TMDL	Each jurisdictional group shall demonstrate that 100% of the group's total drainage area served by the storm drain system is effectively meeting the dry-weather WLAs and 50% of the group's total drainage area served by the storm drain system is effectively meeting the wet-weather WLAs.
22 years after effective date of the TMDL	Each jurisdictional group shall demonstrate that 100% of the group's total drainage area served by the storm drain system is effectively meeting both the dry-weather and wet-weather WLAs.

7.4 Cost Analysis

This section takes into account a reasonable range of economic factors in estimating potential costs associated with this TMDL. This analysis, together with the other sections of this staff report, CEQA checklist, response to comments, Basin Plan amendment and supporting documents, were completed in fulfillment of the applicable provisions of the California Environmental Quality Act (Public Resources Code Section 21159.)[2]

This cost analysis focuses on compliance with the grouped waste load allocation by the MS4 and Caltrans stormwater permittees in the urbanized portion of the watershed[3]. The BMPs and potential compliance approaches analyzed here could apply to the general industrial and construction storm water permittees as well. An evaluation of the costs of implementing this TMDL amounts to evaluating the costs of preventing metals and sediment from entering storm drains and/or reaching the river. Most permittees would likely implement a combination of the structural and non-structural BMPs to achieve compliance with their waste load allocations. This analysis considers a potential strategy combining structural and non-structural BMPs through a phased implementation approach and estimates the costs for this strategy. It will also be

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[2] Because this TMDL implements existing water quality objectives (namely, the numeric CTR criteria established by EPA), it does not "establish" water quality objectives and no further analysis of the factors identified in Water Code section 13241 is required. However, the staff notes that its CEQA analysis provides the necessary information to properly "consider" the factors specified in Water Code section 13241. As a result, the section 13241 analysis would at best be redundant.

[3] For the purposes of the cost analysis, the urbanized portion of the watershed is assumed to be 56% of the watershed or 467 square miles (Table 5-4).

important to document reductions in metals loading already being achieved via BMPs currently employed under the Trash TMDL.

In addition to achieving compliance with this TMDL, such a strategy could be used to achieve compliance with the Los Angeles River Trash TMDL, now in its first year of implementation,[4] as well as the upcoming Los Angeles River Bacteria TMDL. Therefore, this cost analysis reflects the potential costs of compliance with multiple TMDLs based on likely implementation scenarios.

7.4.1 Cost estimate based on a phased implementation approach. Under a phased implementation approach, it is assumed that compliance with the grouped waste load allocation could be achieved in 30% of the urbanized portion of the watershed through an integrated resources plan. Costs of implementing an IRP are not estimated for the purposes of this analysis because metals removal is not the primary goal of an IRP, which addresses multiple wastewater and water resource management needs. Compliance in another 30% of the urbanized portion of the watershed could be achieved through various iterations of non-structural BMPs. Compliance with the remaining 40% of the urbanized portion of the watershed could be achieved through structural BMPs. These percentages are approximately estimated based on the removal efficiencies of various non-structural and structural BMPs, as discussed below.

The first step of a potential phased implementation approach would include the implementation of non-structural BMPs by the permittees, such as increasing the frequency and efficiency of street sweeping. In their National Menu of Best Management Practices for Stormwater - Phase II, U.S. EPA reports that conventional mechanical street sweepers can reduce non-point source pollution by 5-30% (USEPA, 1999a.) The removal efficiencies of sediment for conventional sweepers are dependent on the size of particles. Conventional sweepers, including mechanical broom sweepers and vacuum-assisted wet sweepers, have removal efficiencies of approximately 15 to 50% for particles less than 500 micrometers and up to approximately 65% for larger particles (Walker and Wong, 1999). U.S. EPA reports that vacuum-assisted dry street sweeping can remove significantly more pollution, including fine sediment and metals, before they are mobilized by rainwater. U.S. EPA reports a 50 - 88 percent overall reduction in annual sediment loading for residential areas by vacuum-assisted dry street sweepers. Sutherland and Jelen (1997) showed a total removal efficiency of 70% for fine particles and up to 96% for larger particles by vacuum–assisted dry sweepers (also known as small-micron surface sweepers.) Upgrading to vacuum-assisted dry sweeping would translate to a significant reduction of metals in the particulate phase.

In their 1999 Preliminary Data Summary of Urban Stormwater Best Management Practices, U.S. EPA estimated cost data for both standard mechanical and vacuum-assisted dry sweepers as shown in Table 7-5.

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[4] Pursuant to a court order, certain cities are presently exempted from compliance with the Los Angeles River Trash TMDL. The Los Angeles River Trash TMDL is also the subject of judicial appeal. Regardless of the outcome of the judicial challenge, there will be a trash TMDL for the Los Angeles River, because a TMDL is compelled under the *Heal the Bay* consent decree. As a result, coordination among the TMDLs will remain a possibility.

Table 7-5. Estimated costs for two types of street sweepers.

Sweeper Type	Life (Years)	Purchase Price ($)	O&M Cost ($/curb mile)
Mechanical	5	75,000	30
Vacuum-assisted	8	150,000	15

Source: USEPA, 1999b

Table 7-5 illustrates that while the purchase price of vacuum-assisted dry sweepers is higher, the operation and maintenance costs are lower than for standard sweepers. Based on this information, U.S. EPA determined the total annualized cost of operating street sweepers per curb mile, for a variety of frequencies (in Table 7-6). In their estimates, U.S. EPA assumed that one sweeper serves 8,160 curb miles during a year and assumed an annual interest rate of 8 percent (USEPA, 1999b). According to Table 7-6, permittees would save money in the long-term by switching to vacuum-assisted dry sweepers.

Table 7-6. Annualized sweeper costs, including purchase price and operation and maintenance costs ($/curb mile/year).

Sweeper Type	Sweeping Frequency					
	Weekly	Bi-weekly	Monthly	Quarterly	Twice per year	Annually
Mechanical	1,680	840	388	129	65	32
Vacuum-Assisted	946	473	218	73	36	18

Under a phased implementation approach, the permittees could monitor compliance using flow-weighted composite sampling of runoff throughout representative storms to determine the effectiveness of this first step of implementing non-structural BMPs. If monitoring showed non-compliance, permittees could adapt their approach by increasing frequency of street sweeping or incorporating other non-structural BMPs.

If compliance could still not be achieved through non-structural BMPs, permittees could incorporate structural BMPs. Two potential structural BMPs were analyzed in this cost analysis:

1. Infiltration trenches
2. Sand filters

These approaches are specifically designed to treat urban runoff and to accommodate high-density areas. They were chosen for this analysis because in addition to addressing metals loadings to the river, they have the additional positive impact of addressing the effects of development and increased impervious surfaces in the watershed. Both approaches can be designed to capture and treat 0.5 to 1 inch of runoff. When flow exceeds the design capacity of each device, untreated runoff is allowed to bypass the device and enter storm drains or the river.

Both infiltration trenches and sand filters must be used in conjunction with some type of pretreatment device such as a biofiltration strip or gross solids removal device to remove sediment and trash in order to increase their efficiency and service life. This combination could be used to achieve compliance with both the Los Angeles River Trash TMDL and the Metals TMDL. The Trash TMDL provided a cost estimate of gross solids removal devices, including structural vortex separation systems and end of pipe nets. This analysis provides an estimate of the additional costs associated with installing sand filters or infiltration trenches.

In addition, both infiltration trenches and sand filters are efficient in removing bacteria and could be used to achieve compliance with the upcoming bacteria TMDL. U.S. EPA reports that sand filters have a 76% removal rate and infiltration trenches have a 90% removal rate for fecal coliform. (U.S. EPA 1999c)

In this cost analysis, it was assumed that 20% of the watershed would be treated by infiltration trenches and 20% of the watershed would be treated by sand filters. Costs were estimated using data provided by U.S. EPA (U.S. EPA, 1999a and 1999c) and the Federal Highway Administration (FHWA, 2003). USEPA cost data were reported in 1997 dollars. FHWA costs were reported in 1996 dollars for infiltration trenches and 1994 dollars for sand filters. Where costs were reported as ranges, the highest reported cost was assumed. These costs were then compared to costs determined by Caltrans in their BMP Retrofit Pilot Program (Caltrans, 2004). Caltrans costs were reported in 1999 dollars. Analysis of costs based on EPA, FHWA estimates and those reported by Caltrans, as well as estimations of sizing constraints are included in Appendix III. An analysis of size constraints for each type of structural BMP considered is also included in Appendix III, which could be used to estimate land acquisition costs. To estimate land acquisition cots for individual projects in this cost analysis would be purely speculative.

Infiltration trenches. Infiltration trenches store and slowly filter runoff through the bottom of rock-filled trenches and then through the soil. Infiltration trenches can be designed to treat any amount of runoff, but are ideal for treating small urban drainage areas less than five to ten acres. Soils and topography are limiting factors in design and siting, as soils must have high percolation rates and groundwater must be of adequate depth. Potential impacts to groundwater by infiltration trenches could be avoided by proper design and siting. Infiltration trenches are reported to achieve 75 to 90% suspended solids removal and 75-90% metals removal by U.S. EPA and FHWA. In their BMP Retrofit Pilot Program, Caltrans assumed that constituent removal was 100 percent for storm events less than the design storm, because all runoff would be infiltrated.

Table 7-7 presents estimated costs for infiltration trenches designed to treat 0.5 inches of runoff over a five-acre drainage area with a runoff coefficient equal to one. Staff determined that 11,955 devices, designed to treat five acres each, would be required to treat 20% of the urbanized portion of the watershed.

Table 7-7. Estimated costs for infiltration trenches.

	Construction Costs ($ million)	Maintenance Costs ($ million/year)
Based on U.S. EPA estimate (1997 dollars)	544	109
Based on FHWA estimate (1996 dollars)	519	Not reported

Sand Filters. Sand filters work by a combination of sedimentation and filtration. Runoff is temporarily stored in a pretreatment chamber or sedimentation basin, then flows by gravity or is pumped into a sand filter chamber. The filtered runoff is then discharged to a storm drain or natural channel. As with infiltration trenches, The costs of two types of sand filters were analyzed: 1) the Delaware sand filter, which is installed underground and suited to treat drainage areas of approximately one acre and 2) the Austin sand filter, which is installed at-grade and suited to larger drainage areas up to 50 acres. The underground sand filter is especially well adapted for applications with limited land area and is independent of soil conditions and depth to groundwater. However, both approaches must consider the imperviousness of the drainage areas in their design.

U.S. EPA estimated a 70% removal of total suspended solids and 45% removal of lead and zinc for both types of sand filters. FHWA reported high sediment, zinc and lead removal, but low copper removal for Austin sand filters and high sediment and moderate to high metals removal for Delaware sand filters. Caltrans reported a 50% reduction in total copper, a 7% reduction in dissolved copper, an 87% reduction in total lead, a 40% reduction in dissolved lead, an 80% reduction in total zinc and a 61% reduction in dissolved zinc by the Austin sand filters they tested. Caltrans reported a 66% reduction in total copper, a 40% reduction in dissolved copper, an 85% reduction in total lead, a 31% reduction in dissolved lead, a 92% reduction in total zinc and a 94% reduction in dissolved zinc by the Delaware sand filter they tested.

U.S. EPA and FHWA reported costs per acre for 0.5 inches of runoff. Total costs were calculated by multiplying the per-acre cost by the total acreage of the urbanized portion of the watershed not addressed through an integrated resources plan or non-structural BMPs. Estimated costs are presented in Table 7-8. There are significant economies of scale for Austin filters. U.S. EPA reported that costs per acre decrease with increasing drainage area. FHWA reported two separate costs based on drainage area served. Economies of scale are not a factor for Delaware filters, as they are limited to drainage areas of about one acre.

Table 7-8. Estimated costs for Austin and Delaware sand filters.

	Austin Sand Filter Construction Costs ($ million)	Austin Sand Filter Maintenance Costs ($ million/year)	Delaware Sand Filter Construction Costs ($ million)	Delaware Sand Filter Maintenance Costs ($ million/year)
Based on U.S. EPA estimate (1997 dollars)	553	28	329	16
Based on FHWA estimate (1994 dollars)*	102	Not reported	418	Not reported

*FHWA cost estimate for Austin filters calculated assuming a drainage area greater than five acres. Total costs would be $478 million for devices designed for a drainage area of less than two acres.

Based on the phased implementation approach, and some assumptions about the efficacy of each stage of the approach, the cost analysis arrived at the total costs for compliance with the Metals TMDL as shown in Table 7-9. The total costs do not include the cost savings associated with switching to vacuum-assisted street sweepers. As stated previously, the costs associated with this approach could be applied towards the cost of compliance with both the Metals TMDL and Bacteria TMDL.

Table 7-9. Total estimated costs of phased implementation approach.

	Total Construction ($ million)	Total Maintenance ($million/year)
Based on U.S. EPA estimate (1997 dollars)	1426	153
Based on FHWA estimate (1994/1996 dollars)	1039	Not reported

7.4.2 Comparison of costs estimates with Caltrans reported costs. Estimated costs for structural BMPs were compared to costs reported by Caltrans in their BMP Retrofit Pilot Program (Caltrans, 2004). Caltrans sited five Austin sand filters and one Delaware sand filter as part of their study. The five Austin sand filters served an average area of two acres and the Delaware sand filter served an area of 0.7 acres. Caltrans sited two infiltration trench/biofiltration strip combinations as part of their study. Each trench and biofiltration strip used in combination served an area of 1.7 acres. Based on these drainage areas, the average adjusted cost of the Austin sand filters in the Caltrans study was $156,600 per acre, the adjusted cost of the Delaware filter was $310,455 per acre and the average adjusted cost of the infiltration trench/biofiltration strips was $85,495 per acre. These costs are approximately an order of magnitude greater than the costs determined using estimates provided by U.S. EPA and FHWA. It should be noted that costs calculated using EPA and FHWA estimates were based on infiltration trench and sand filter designs that would treat 0.5 inches of runoff, while the Caltrans study costs were based on an infiltration trench design that would treat 1 inch of runoff and sand filter designs that would treat 0.56 to 1 inches of runoff. This could explain some of the differences in costs.

The differences in costs can also be explained by a third party review of the Caltrans study, conducted by Holmes & Narver, Inc. and Glenrose Engineering (Caltrans, 2001.) The review compared adjusted Caltrans costs with costs of implementing BMPs by other state transportation agencies and public entities. The adjusted costs exclude costs associated with the unique pilot program and ancillary costs such as improvements to access roads, landscaping or erosion control, and non-BMP related facilities. For the comparison, all costs were adjusted for differences in regional economies. The third party review determined that the median costs reported by Caltrans were higher than the median costs reported by the other agencies for almost every BMP considered, including sand filters and infiltration BMPs. The review attributed the higher Caltrans costs to the small scale and accelerated nature of the pilot program. The third party review then gave recommendations for construction cost reductions based on input from other state agencies. These included simplifying design and material components, combining retrofit work with ongoing construction projects, changing methods used to select and work with construction contractors, allowing for a longer planing horizon, constructing a larger number of BMPs at once, and implementing BMPs over a larger drainage area.

7.4.3 Results of a Region-wide Cost study

In their report entitled "Alternative Approaches to Storm Water Quality Control, Prepared for the Los Angeles Regional Water Quality Board," Devinny et al. estimated the total costs for compliance with Regional Board storm water quality regulations as ranging from $2.8 billion, using entirely non-structural systems, to between $5.7 billion and $7.4 billion, using regional treatment or infiltration systems. The report stated that final costs would likely fall somewhere within this range. Table 7-10 presents the report's estimated costs for the various types of structural and non-structural systems that could be used to achieve compliance with municipal storm water requirements throughout the Region.

Table 7-10 Estimated costs of structural and non-structural compliance measures for the entire Los Angeles Region. (Source: Devinny et al.)

Compliance Approach	Estimated Costs
Enforcement of litter ordinances	$9 million/year
Public Education	$5 million/year
Increased storm drain cleaning	$27 million/year
Installation of catch basin screens, enforcing litter laws, improving street cleaning	$600 million
Low –flow diversion	$28 million
Improved street cleaning	$7.5 million/year
On-site BMPs for individual facilities	$240 million
Structural BMPs – 1st estimation method	$5.7 billion
Structural BMPs – 2nd estimation method	$4.0 billion

The Devinny et al. study calculates costs for the entire Los Angeles Region, which is 3,100 square miles, while the Los Angeles River watershed is 834 square miles. When compared on a per square mile basis, the costs estimated in section 7.4.2 are within the range calculated by Devinny et al. Table 7-11 gives the estimated costs presented per square mile.

Table 7-11 Comparison of costs for storm water compliance on a per mile basis.

	Construction Costs ($ million/square mile)
Based on U.S. EPA estimate	1.71
Based on FHWA estimate	1.25
Maximum cost calculated by Devinny et al.	0.90 – 2.39

The Devinny et al. study also estimated benefits associated with storm water compliance. It was determined that the Region-wide benefits of a non-structural compliance program would equal approximately $5.6 billion while the benefits of non-structural and regional measures would equal approximately $18 billion. Region-wide estimated benefits included:

- Flood control savings due to increased pervious surfaces of about $400 million,
- Property value increase due to additional green space of about $5 billion,
- Additional groundwater supplies due to increased infiltration worth about $7.2 billion,
- Willingness to pay to avoid storm water pollution worth about $2.5 billion,
- Cleaner streets worth about $950 million,
- Improved beach tourism worth about $100 million (not applicable to Los Angeles River),
- Improved nutrient recycling and atmospheric maintenance in coastal zones worth about $2 billion,
- Savings from reduction of sedimentation in Regional harbors equal to about $330 million, and
- Unquantifiable health benefits of reducing exposure to fine particles from streets.

8. MONITORING

There are three objectives of monitoring associated with the TMDL. The first is to collect data (e.g., hardness, flow, and background concentrations) to evaluate the uncertainties and assumptions made in development of the TMDL. The second is to collect data to assess compliance with the waste load allocations. The third is to collect data to evaluate potential management scenarios. To achieve these objectives, a monitoring program will need to be developed for the TMDL that consists of three components: (1) ambient monitoring, (2) compliance assessment monitoring and (3) special studies.

The monitoring program and any required technical reports will be established pursuant to a subsequent order issued by the Executive Officer. As a planning document, the TMDL identifies the type of information necessary to refine and to update the TMDL, and to assess the TMDL's effectiveness. The Executive Officer will comply with any necessary legal requirements in developing the monitoring program, requiring technical reports, and establishing special studies.

8.1 Ambient Monitoring

An ambient monitoring program is necessary to assess water quality throughout the Los Angeles River and its tributaries. The MS4 and caltrans NPDES permittees assigned waste load allocations in each jurisdictional group are jointly responsible for implementing the ambient monitoring program. The responsible agencies shall sample for total recoverable metals, dissolved metals, and hardness once per month at each ambient monitoring location until at least year five when the TMDL is reconsidered. There are eight proposed ambient monitoring points on the Los Angeles River to reflect the reaches and the monitoring stations (Table 8-1). These stations correspond to the City of Los Angeles Watershed Monitoring Stations. The City currently samples for metals at these eight monitoring stations once per month. In early 2004, the City began sampling for hardness with the same frequency. The City plans to extend and modify their program to include metals sampling of the tributaries in the future.

Table 8-1. Ambient monitoring points on the Los Angeles River.

Ambient Monitoring Points	Corresponding Reaches
White Oak Avenue	LA River 6, Aliso Creek, McCoy Creek, Bell Creek
Sepulveda Avenue	LA River 5, Bull Creek
Tujunga Avenue	LA River 4, Tujunga Wash
Colorado Avenue	LA River 3, Burbank Western Channel, Verdugo Wash
Figueroa Street	LA River 3, Arroyo Seco
Washington Boulevard	LA River 2
Rosecrans Avenue	LA River 2, Rio Hondo
Willow Street	LA River 1, Compton Creek

8.2 TMDL Effectiveness Monitoring

TMDL effectiveness monitoring requirements for implementation will be specified in NPDES permits for the Tillman, LA-Glendale, and Burbank POTWs. The permits should specify the monitoring necessary to determine if the expected load reductions are achieved.

For the Tillman, LA-Glendale, and Burbank POTWs, effluent monitoring requirements will be developed to ensure compliance with the daily and monthly limits for metals. Receiving water monitoring requirements in the existing permits to assess impact of the POTWs will not change as a result of this TMDL.

The general industrial storm water permit shall contain a model monitoring and reporting program to evaluate BMP effectiveness. A permittee enrolled under the general industrial permit shall have the choice of conducting individual monitoring based on the model program or participating in a group monitoring effort. A group monitoring effort will not only assess individual compliance, but will assess the effectiveness of chosen BMPs to reduce pollutant loading on an industry-wide or permit category basis. MS4 permittees are encouraged to take the lead in group monitoring efforts for industrial and construction facilities within their jurisdiction because compliance with waste load allocations by these facilities will translate to reductions in metals loads to the MS4 system.

The MS4 and Caltrans storm water NPDES permittees in each jurisdictional group are jointly responsible for assessing progress in reducing pollutant loads to achieve the TMDL. Each jurisdictional group is required to submit for approval by the Executive Officer a coordinated monitoring plan that will demonstrate the effectiveness of the phased implementation schedule for this TMDL which requires that the waste load allocations be met in prescribed percentages of each subwatershed over a 22-year period. The monitoring locations specified for the ambient monitoring program (Table 8-1) may be used as effectiveness monitoring locations.

The storm water NPDES permittees will be found to be effectively meeting the dry-weather waste load allocations if the in-stream pollutant concentration or load at the first downstream effectiveness monitoring location is equal to or less than the corresponding concentration- or load-based waste load allocation. Alternatively, effectiveness of the TMDL may be assessed at the storm drain outlet based on the numeric target for the receiving water. For storm drains that discharge to other storm drains, effectiveness will be based on the waste load allocation for the ultimate receiving water for that storm drain system.

The storm water NPDES permittees will be found to be effectively meeting wet-weather waste load allocations if the loading at the downstream monitoring location is equal to or less then the daily storm volume multiplied by the wet-weather numeric targets as defined in Table 6-12. For practical purposes, this is when the EMC is less than or equal to the numeric target.

8.3 Special Studies

Additional monitoring and special studies may be needed to evaluate the uncertainties and the assumptions made in development of this TMDL.

1. Flow measurements. Better information is needed to define flow in the mainstem of the Los Angeles River and the tributaries where there are no stream gages. The biggest uncertainties are associated with low-flow in some of the listed tributaries. Better information is also needed about contributions of storm drains during low flow, where needed.

2. Water quality measurements. Information on background water quality will help refine the targets. Specifically, studies should be developed to provide a better assessment of background

hardness values in areas where the data are old (lower reaches of Los Angeles River and Rio Hondo) or non-existent (Tujunga, Verdugo Wash, Arroyo Seco). Studies on background concentrations of total suspended solids and organic carbon will help with the refinement of the use of partition coefficients to define metals conversion factors.

3. Effects studies. Special studies may be warranted to evaluate the targets. Los Angeles County Sanitation District and others are testing an approach to use the Biotic Ligand Model in the Los Angeles Region. Measurements of dissolved organic carbon, alkalinity, humic acid, and alkali/alkaline metals would support this effort.

4. Source studies. There is a need for better characterization of the loadings from natural sources to verify the assumptions that the loadings from natural sources for copper, lead and zinc are generally low. A study should also be developed to verify the assumption that selenium concentrations observed in the upper reaches of the Los Angeles River are from natural background sources.

5. Other special studies. Special studies should also be considered to refine some of the assumptions used in the modeling, specifically the relationship between total recoverable and dissolved metals in storm water, the assumption that metals loadings are closely associated with suspended sediments, the accuracy and robustness of the potency factors, and the uncertainties in the understanding sediment washoff and transport. Studies should also be considered to evaluate the potential contribution of aerial deposition to metals loadings and sources of aerial deposition.

6. POTWs that are unable to demonstrate compliance with final waste load allocations must conduct source reduction audits within two years of the effective date of the TMDL.

7. POTWs that will be requesting the Regional Board to extend their implementation schedule to allow for the installation of advanced treatment must prepare work plans with time schedules to allow for the installation and operation of advanced treatment. The work plan must be submitted within four years from the effective date of the TMDL.

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Figure 1. Map of the Los Angeles River watershed and listed reaches.

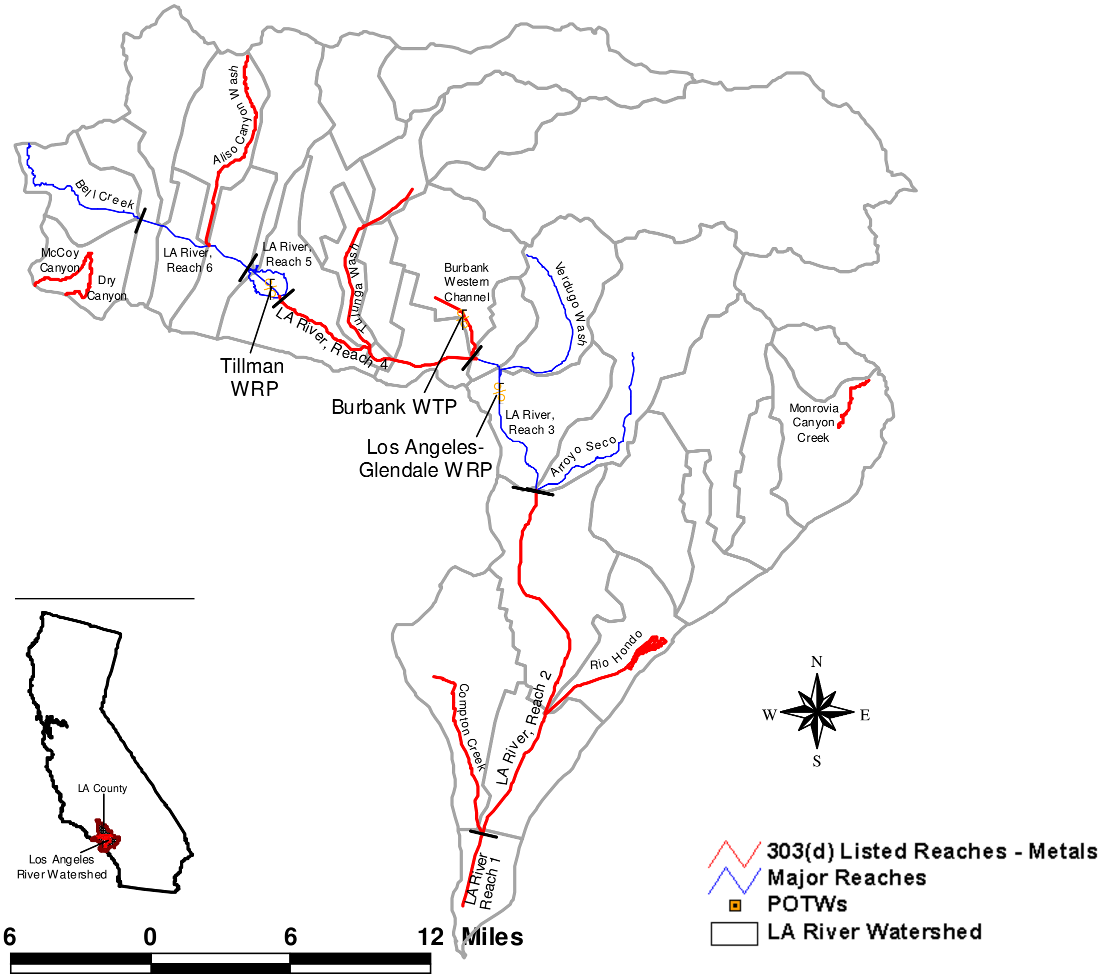


Figure 2. Sampling stations in the Los Angeles River watershed.

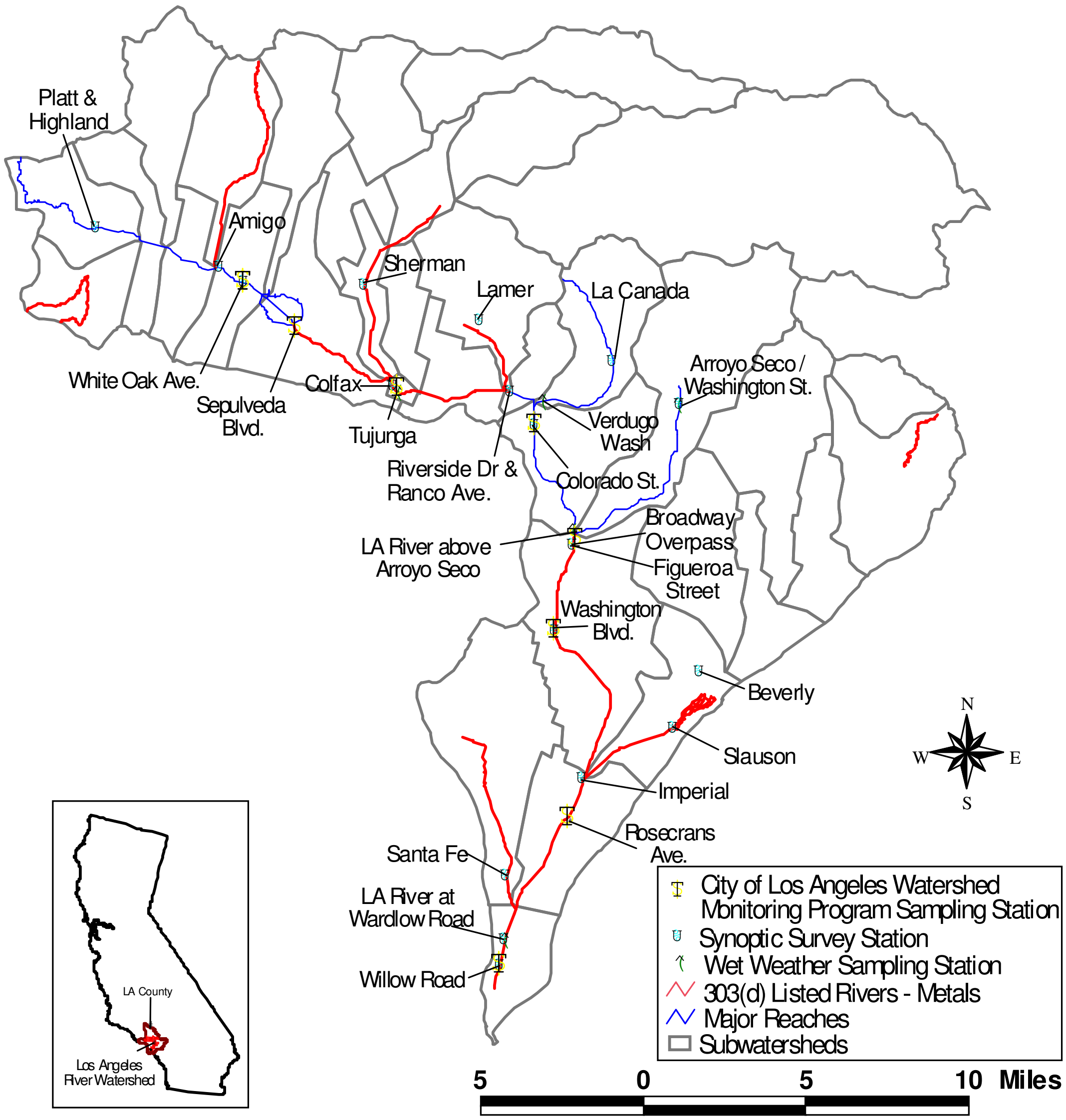


Figure 3. Data collected by the City of Los Angeles Watershed Monitoring Program.

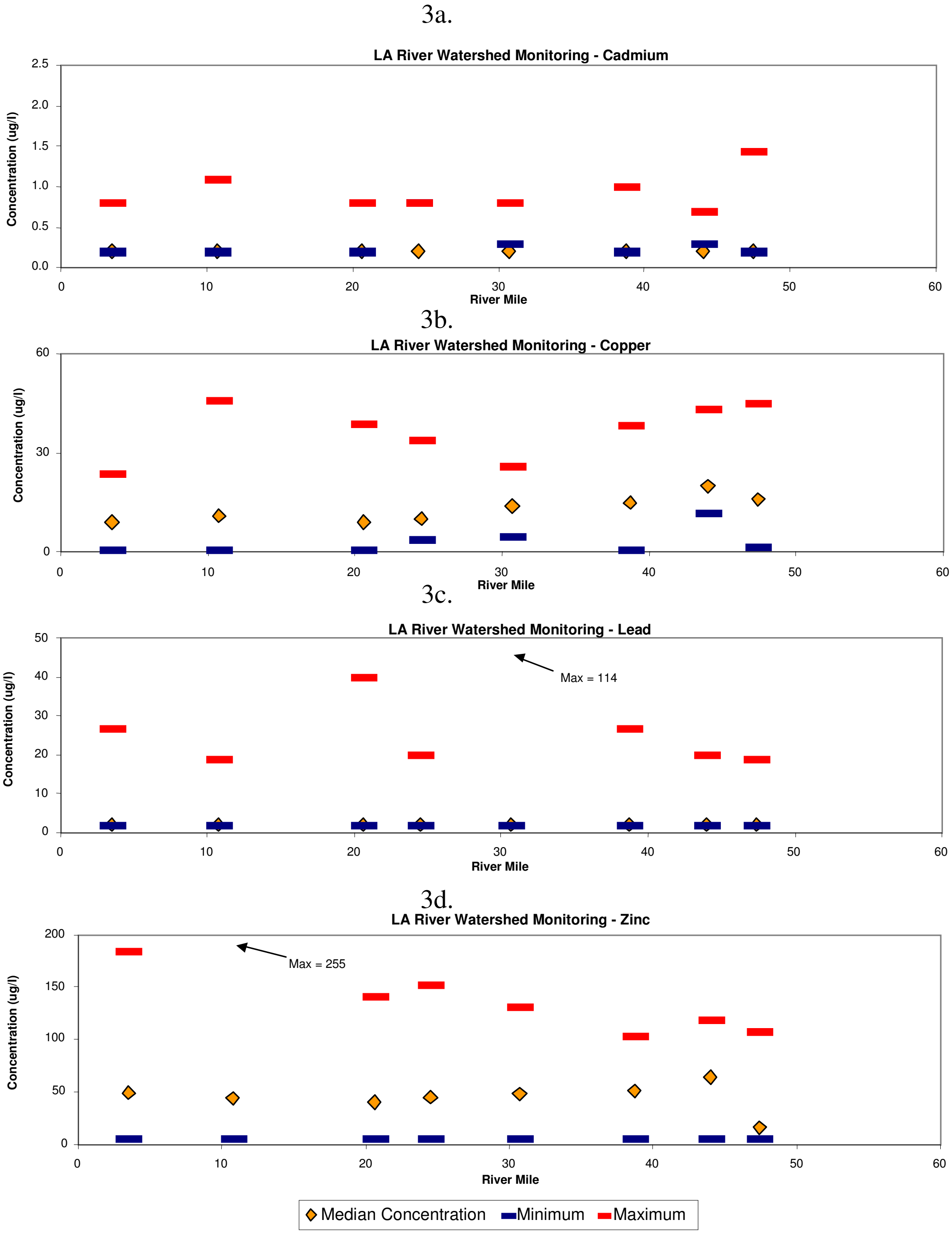


Figure 4. Flows at Wardlow (1998-2000)

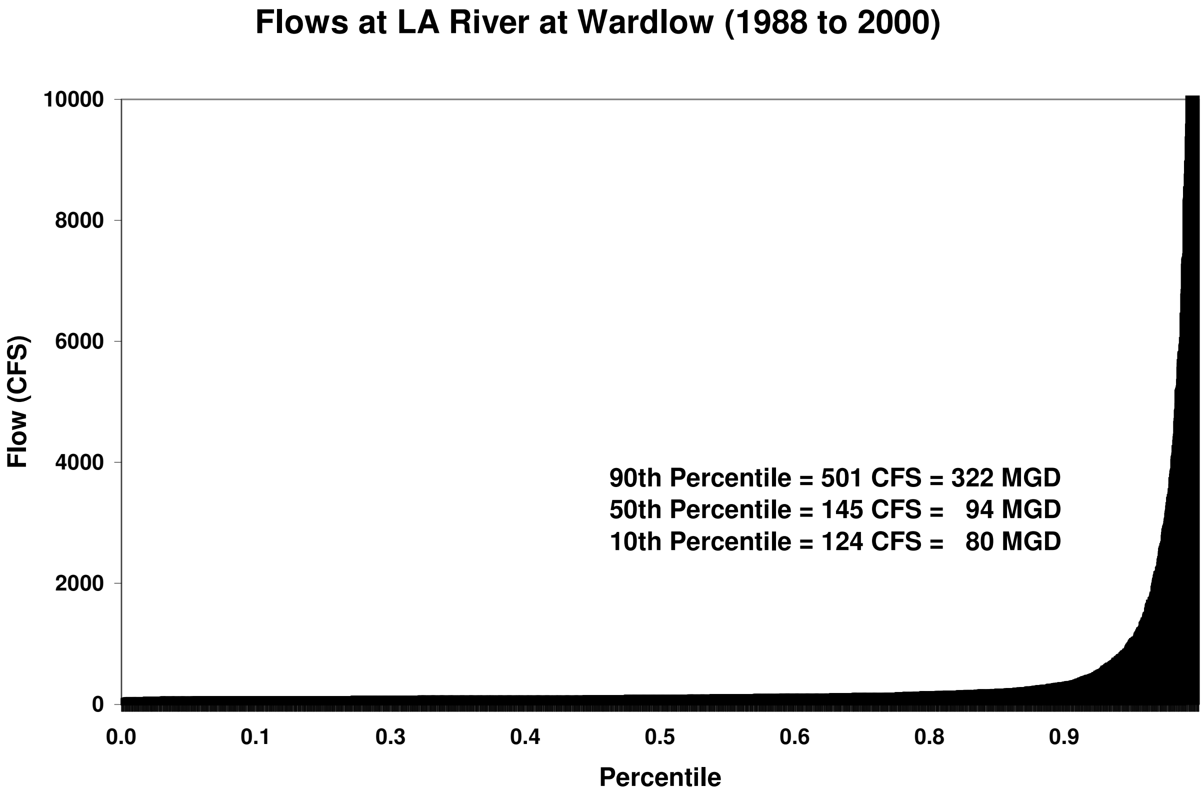


Figure 5. Location of stream gages in the Los Angeles River watershed.

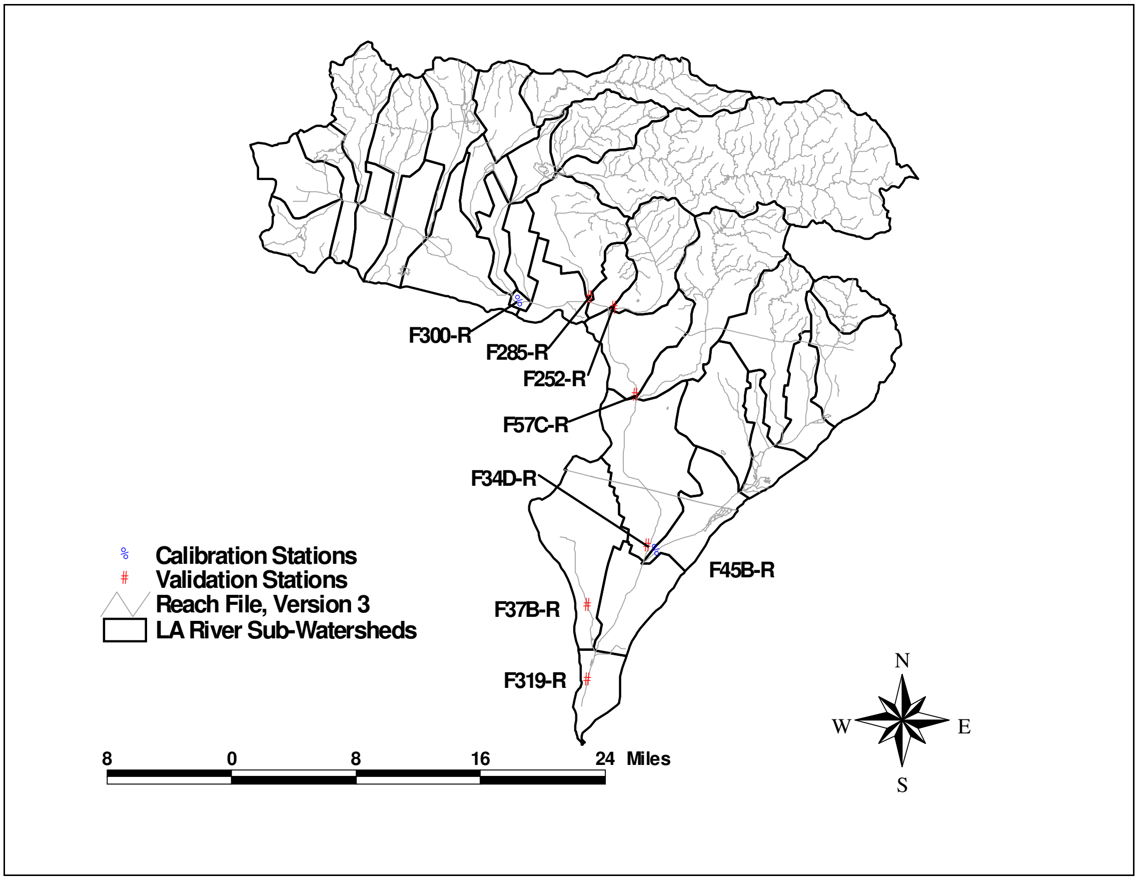


Figure 6. Simulated vs. measured flow during 2000 low flow period.

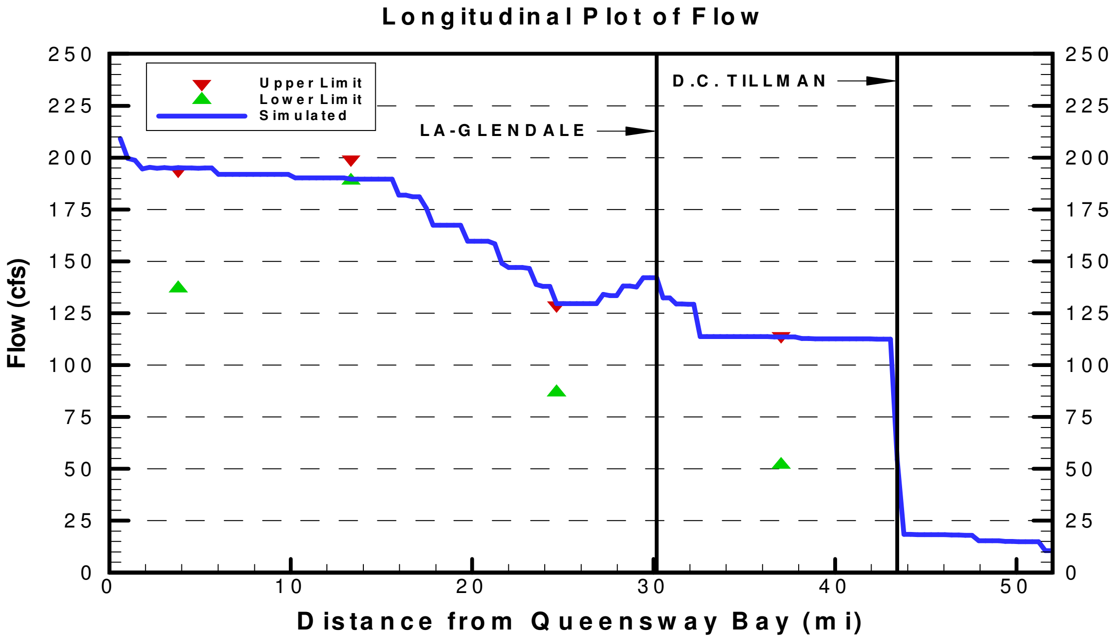
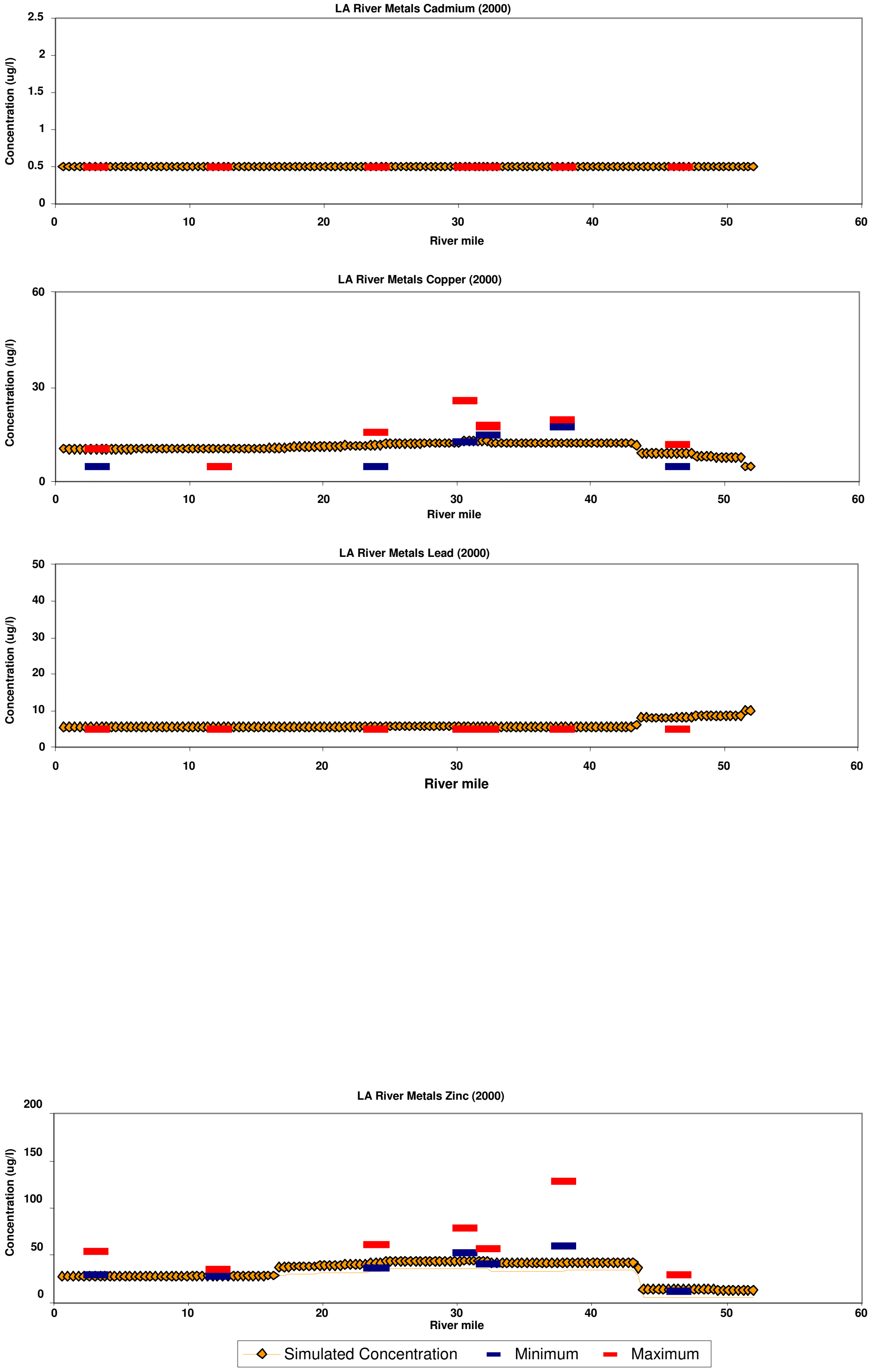
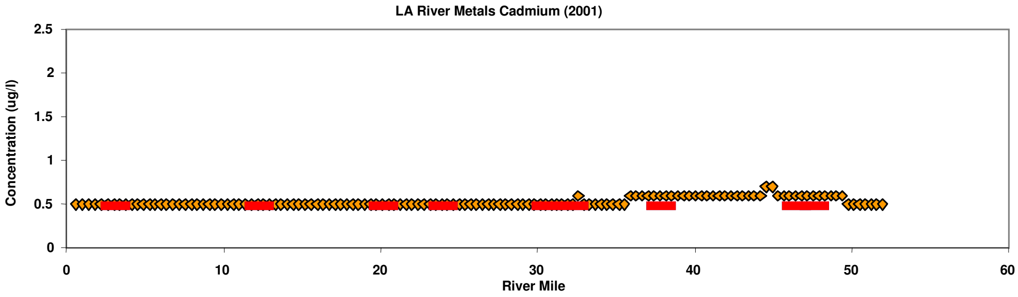
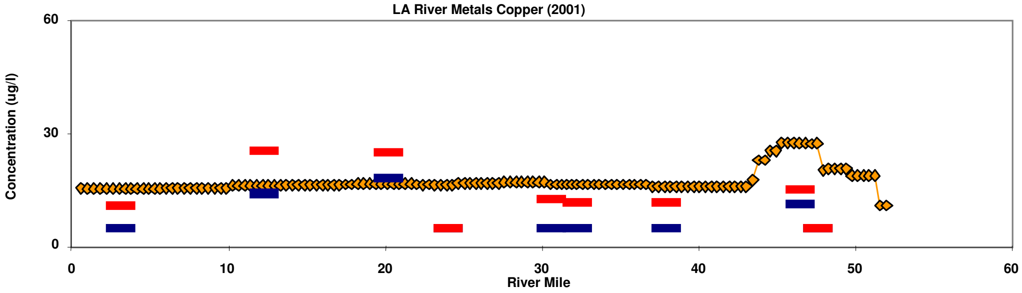
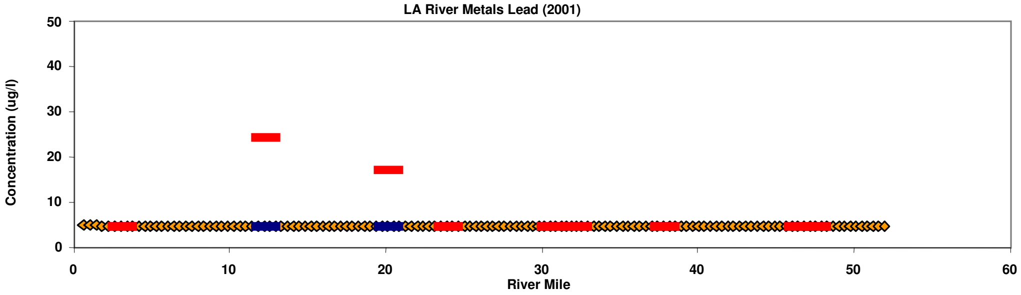


Figure 7. Comparison of the dry-weather water quality model results with observed data.




LA River Metals Cadmium (2001)
Concentration (ug/l)
2.5
2
1.5
1
0.5
0
0
10
20
30
40
50
60
River Mile


LA River Metals Copper (2001)
Concentration (ug/l)
60
30
0
0
10
20
30
40
50
60
River Mile


LA River Metals Lead (2001)
Concentration (ug/l)
50
40
30
20
10
0
0
10
20
30
40
50
60
River Mile

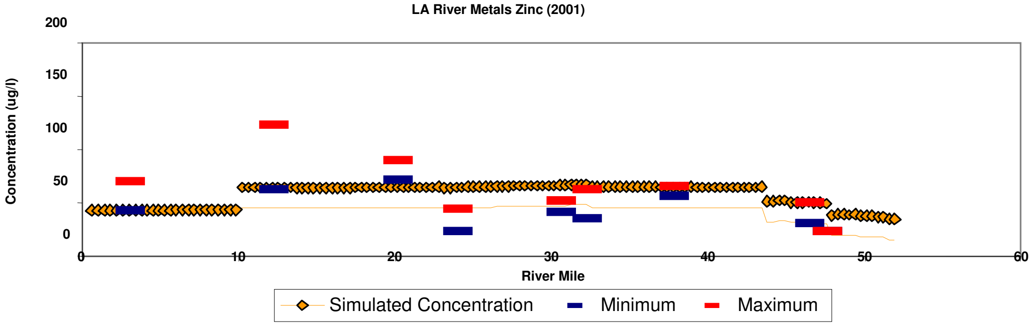

LA River Metals Zinc (2001)
Concentration (ug/l)
200
150
100
50
0
0
10
20
30
40
50
60
River Mile
Simulated Concentration
Minimum
Maximum

Figure 8. Los Angeles River sub-watershed delineation used in wet-weather model.

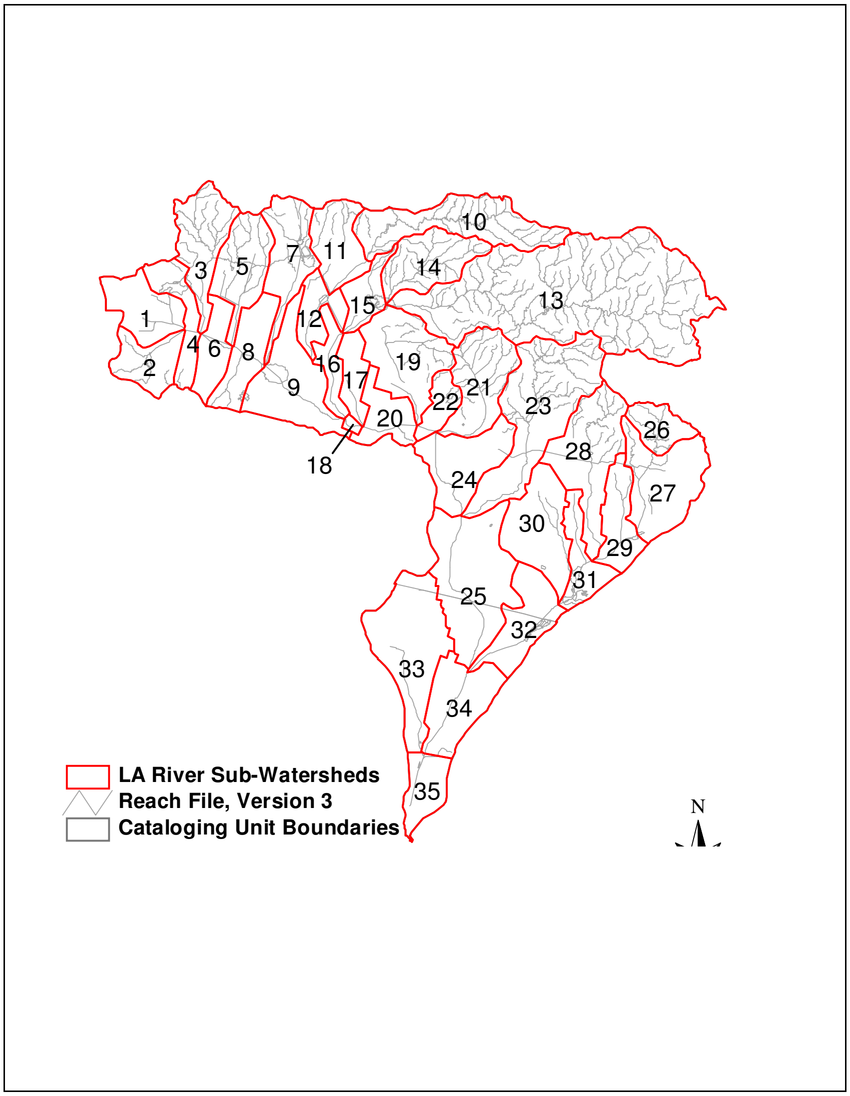


Figure 9. Location of precipitation and meteorological stations used in wet-weather model.

Figure 10a. Validation of wet-weather hydrography. Comparison of daily flows.

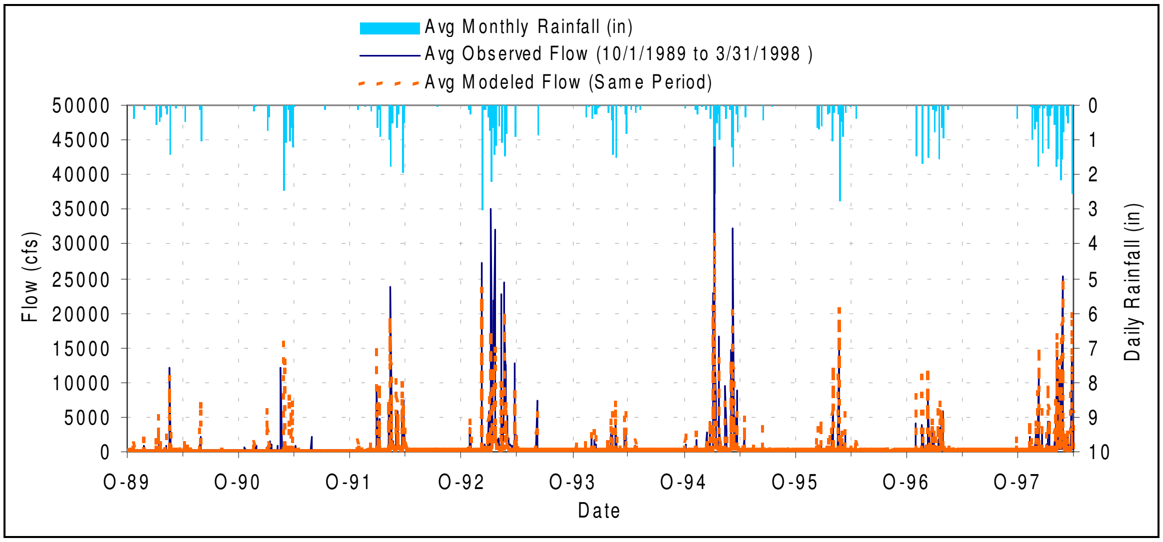


Figure 10b. Validation of wet-weather hydrography. Regression of monthly flows.

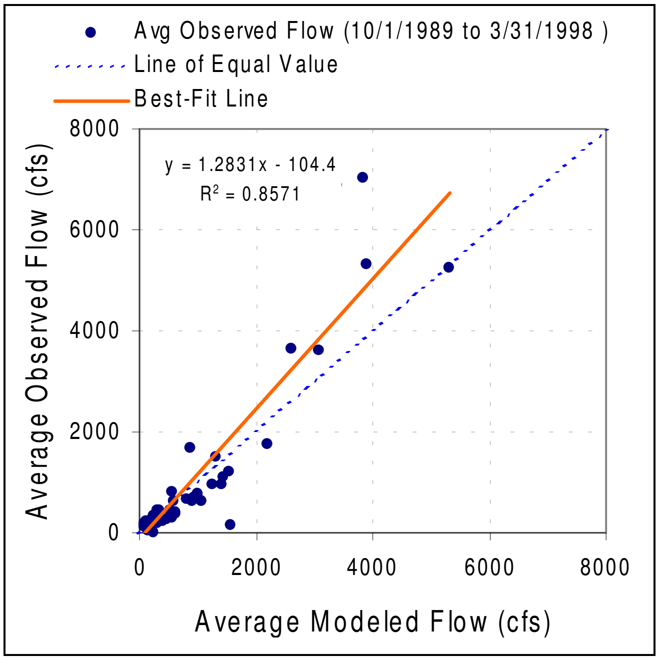


Figure 11. Example Load Duration Curve

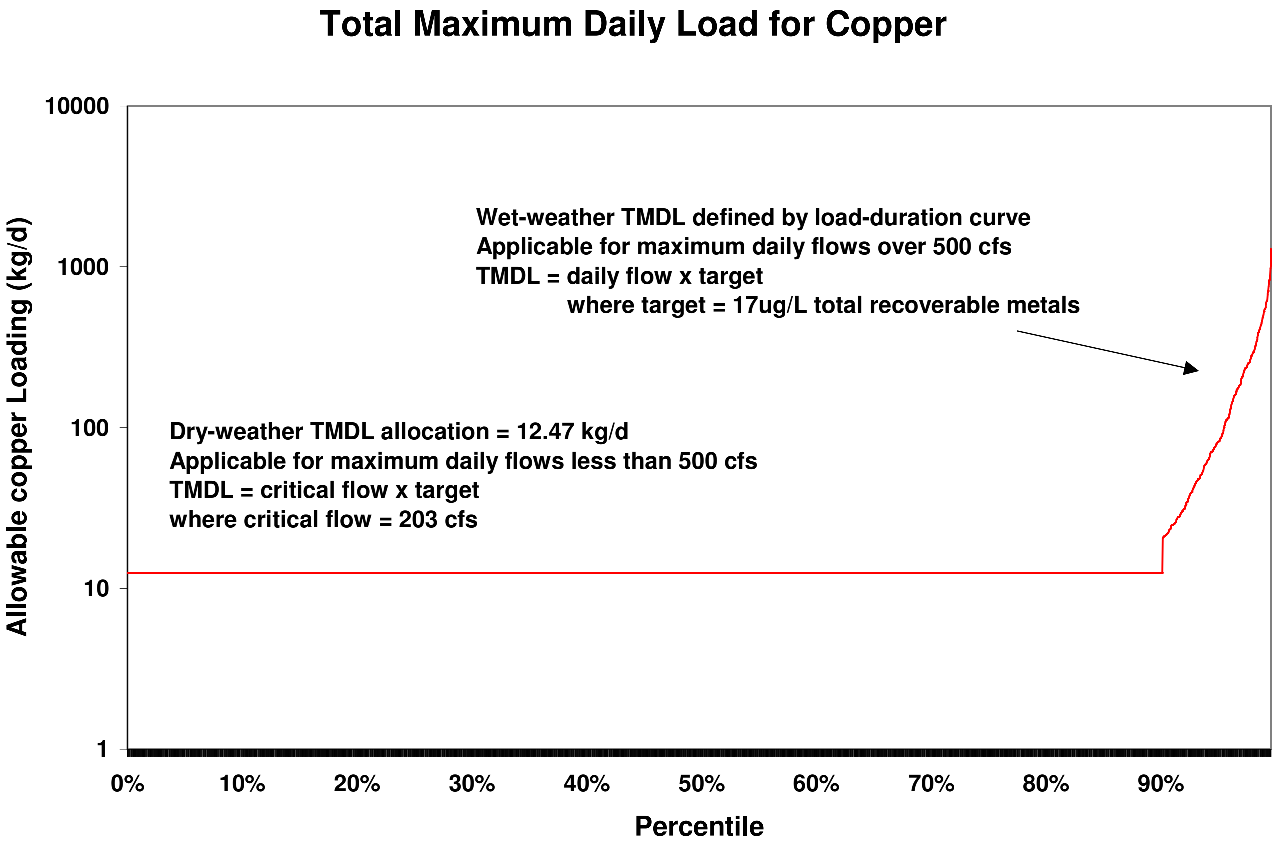
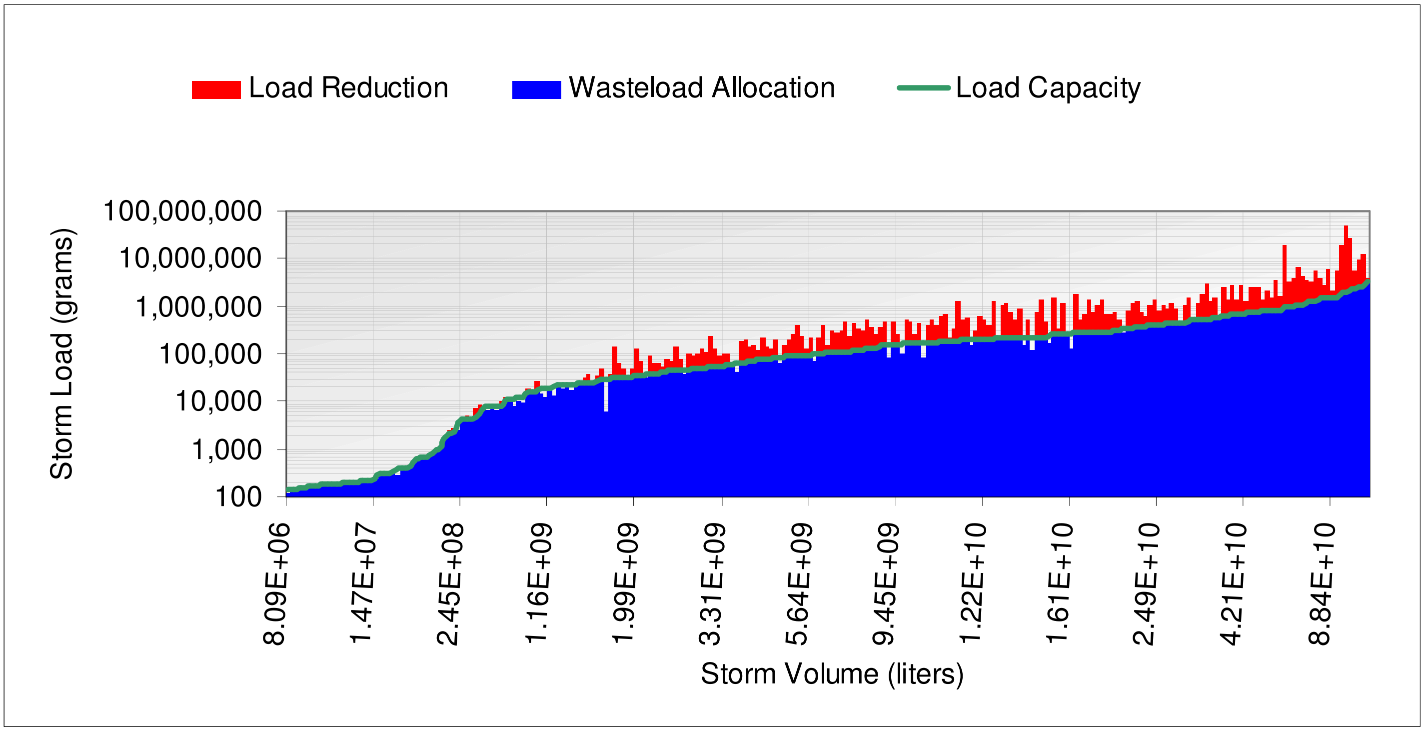


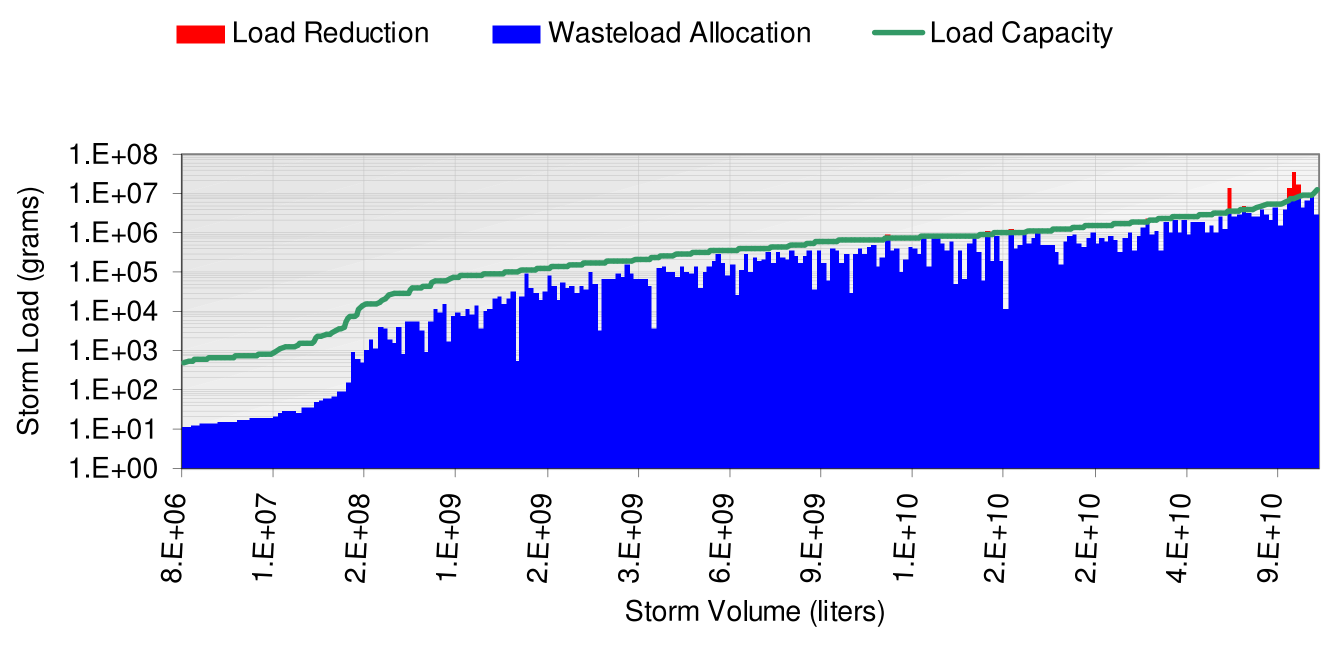
Figure 12a. Load-duration curve for copper



Computed Load Indicators:	Value	Units
Total Storms Over 12-Year Period	249	none
Total Below Load Capacity Curve:	70,590	kg
Existing Condition (Red and Blue)	297,889	kg
Existing Load Below Load Capacity Curve (Blue):	69,706	kg
Existing Load Above Load Capacity Curve (Red):	228,183	kg
Estimated Load Reduction*:	76.6%	none

* Model predictions tend to overestimate loadings. Actual reductions required to meet the waste load allocations as defined by the load capacity curve may be less.

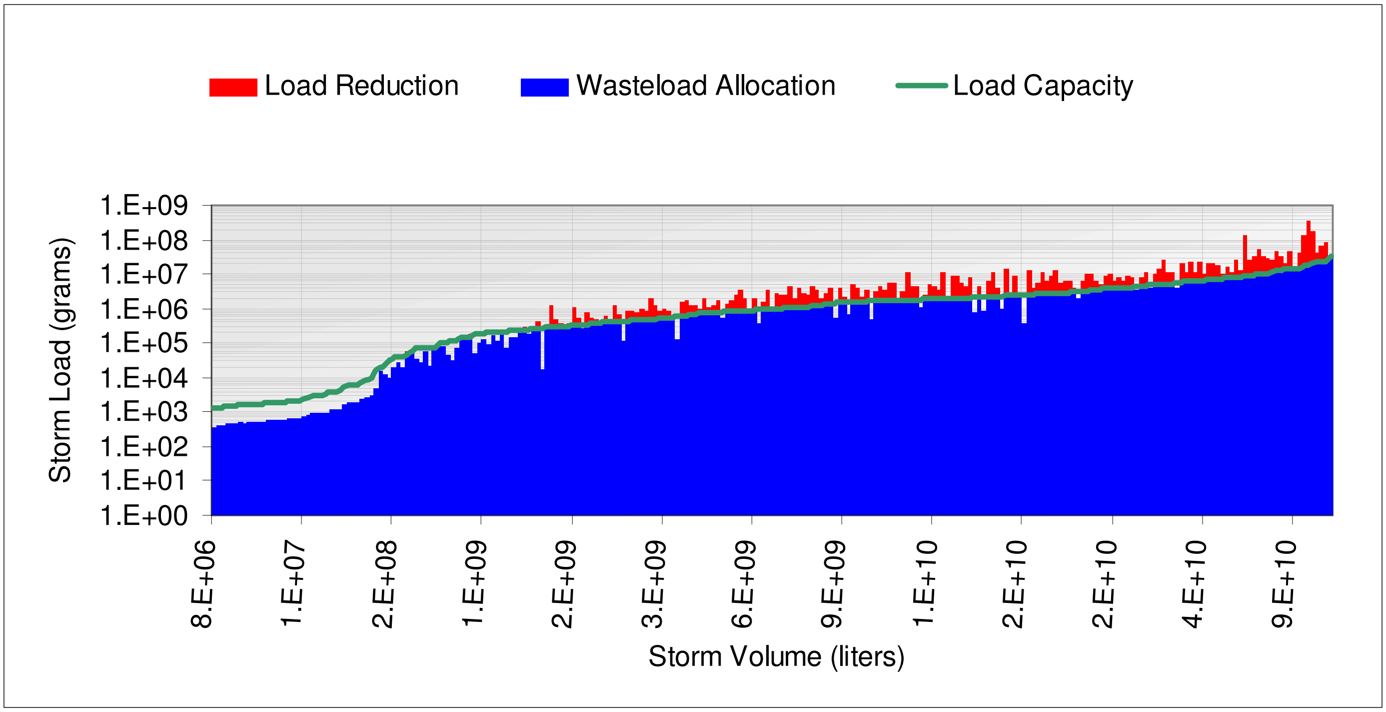
Figure 12b. Load-duration curve for lead



Computed Load Indicators:	Value	Units
Total Storms Over 12-Year Period		none
Total Below Load Capacity Curve:	259,431	kg
Existing Condition (Red and Blue)	211,484	kg
Existing Load Below Load Capacity Curve (Blue):	153,686	kg
Existing Load Above Load Capacity Curve (Red):	57,797	kg
Estimated Load Reduction*:	27.3%	none

* Model predictions tend to overestimate loadings. Actual reductions required to meet the waste load allocations as defined by the load capacity curve may be less.

Figure 12c. Load-duration curve for <u>zinc</u>



Computed Load Indicators:	Value	Units
Total Storms Over 12-Year Period	249	none
Total Below Load Capacity Curve:	663,296	kg
Existing Condition (Red and Blue)	2,208,313	kg
Existing Load Below Load Capacity Curve (Blue):	643,105	kg
Existing Load Above Load Capacity Curve (Red):	1,565,209	kg
Estimated Load Reduction*:	70.9%	none

Figure 12d. Load-duration curve for <u>cadmium</u>

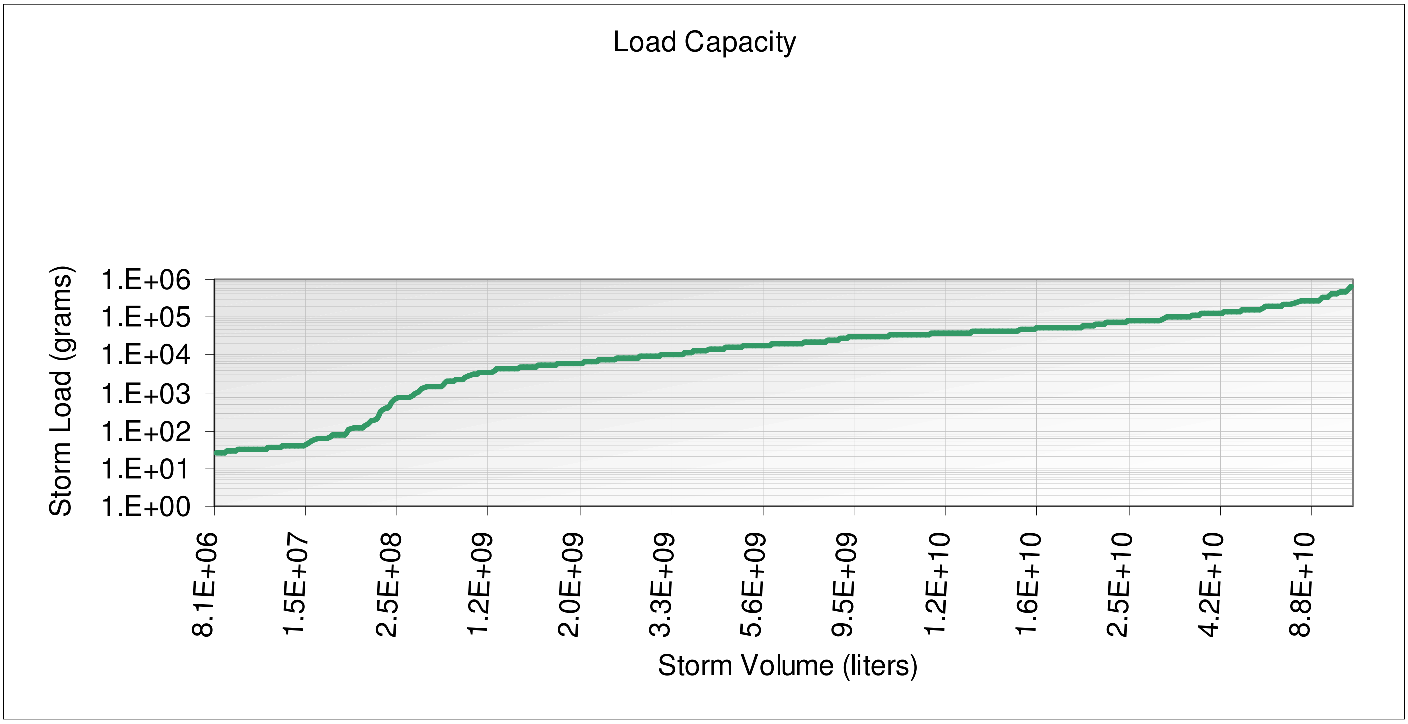
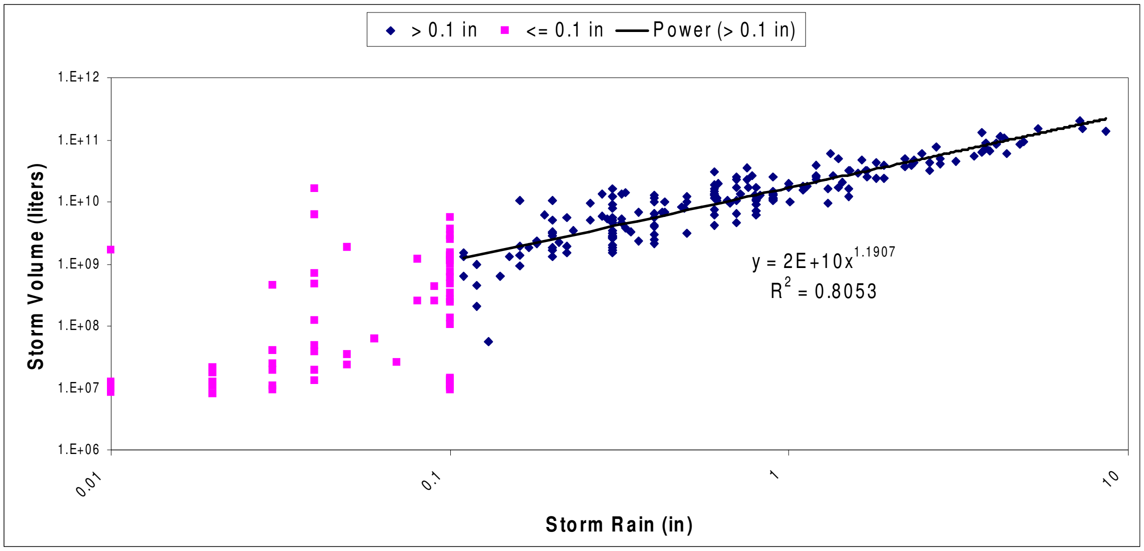


Figure 13. Regression analysis of storm flows verses rainfall for the Los Angeles River (below Wardlow)



ESMR At-A-Glance Report

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General Information

Agency	Facility	Reporting Period	Due Date	Date Received	Certified By
Healdsburg City	Healdsburg City WWTP	04/01/2013 to 04/30/2013	06/01/2013	05/29/2013	Brian Diamantini

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Monitoring Locations

Name	Type	Lat/Long	Associated Discharge Point	Receiving Water	Description(+)
EFF-001	Effluent Monitoring	38.58/122.863333	Healdsburg Discharge Point 001	N/A	Treated wastewater after disinfection and dechlorination but prior to discharge
INF-001	Influent Monitoring	None	None	N/A	Untreated influent wastewater collected at the plant headworks at a representati
INT-001	Internal process monitoring for ELGs	None	None	N/A	Internal monitoring location for the purpose of monitoring treated wastewter ime
INT-002	Internal process monitoring for ELGs	None	None	N/A	Internal monitoring location for the purpose of monitoring disinfected tertiary
REC-001	Effluent Monitoring	None	Healdsburg Discharge Point 002	N/A	Tertiary treated wastewater after disinfection but prior to discharge to 25 MG r
REC-002	Effluent Monitoring	None	Healdsburg Discharge Point 003	N/A	Location where a representative sample of treated wastewater to be reclaimed can
RSW-001	Receiving Water Monitoring	None	None	RUSSIAN RIVER	Downstream RW monitoring location (in Basalt Pond). Samples shall be representa
RSW-002	Receiving Water Monitoring	None	None	RUSSIAN RIVER	Russian River at USGS Gauge No. 11-4640 (Added per July 3, 2012 MRP revision) F
RSW-003	Receiving Water Monitoring	None	None	Dry Creek	Dry Creek at USGS Guage No. 11-4653.50 (flow monitoring station). Added per Jul

Total Monitoring Locations: 9

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No Discharge Dates

Discharge Point Name	Description(+)	Dates of No Discharge	Comments
Healdsburg Discharge Point 001	Healdsburg WWTF - Discharge outfall to Basalt Pond, adjacent to Russian River		None
Healdsburg Discharge Point 002	Healdsburg WWTF - discharge to recycled water storage pond	04/01/2013 - 04/30/2013	All discharge was to Point 001
Healdsburg Discharge Point 003	Healdsburg WWTF - recycled water discharge from recycled water storage pond to r	04/01/2013 - 04/30/2013	All discharge was to Point 001

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Data Summary-Analytical

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	MDL	ML	RL	Comments
EFF-001	Acute Toxicity	Data Unavailable	=	100	% survival	04/17/2013	None	None	None	EPA 600/4-90/027 Acute WET 24-hr comp.
EFF-001	Ammonia, Total (as N)	Data Unavailable	=	0.25	mg/L	04/17/2013	.06	None	.2	SM(20th) 4500NH3C: Ammonia as N
EFF-001	Ammonia, Total (as N)	Data Unavailable	=	0.21	mg/L	04/25/2013	.06	None	.2	SM(20th) 4500NH3C: Ammonia as N
EFF-001	Ammonia, Unionized (as N)	Data Unavailable	=	0.0008	mg/L	04/17/2013	.0002	None	None	Un-ionized ammonia as N look-up table
EFF-001	Ammonia, Unionized (as N)	Data Unavailable	=	0.001	mg/L	04/25/2013	.0002	None	None	Un-ionized ammonia as N look-up table
EFF-001	Biochemical Oxygen Demand (BOD)	Data Unavailable	DNQ	0.87	mg/L	04/02/2013	1	5	5	SM(20th) 5210:Biochemical

	(5-day @ 20 Deg. C)									Oxygen Demand [B5210]
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	1.56	mg/L	04/10/2013	1	5	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	0.76	mg/L	04/18/2013	1	5	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	3.93	mg/L	04/24/2013	1	5	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
EFF-001	Copper, Total	Inductively Coupled Plasma/Mass Spectroscopy	=	4.7	ug/L	04/17/2013	.04	None	.5	EPA 200.8 Copper
EFF-001	Dissolved Oxygen	Data Unavailable	=	3.64	mg/L	04/02/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Dissolved Oxygen	Data Unavailable	=	2.92	mg/L	04/10/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Dissolved Oxygen	Data Unavailable	=	4.91	mg/L	04/17/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Dissolved Oxygen	Data Unavailable	=	4.41	mg/L	04/25/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Hardness, Total (as CaCO3)	Standard Method 2340 C: Hardness by Calc.-EDTA Titrimetric Method	=	154	mg/L	04/17/2013	None	None	None	SM(20th) 2340:Hardness, Total[C2340]
EFF-001	Nitrate, Total (as N)	Inorganic Anions by Ion Chromatography	=	3.6	mg/L	04/17/2013	.05	None	.2	EPA 300.0 Nitrate as N
EFF-001	Nitrate, Total (as N)	Inorganic Anions by Ion Chromatography	=	4.3	mg/L	04/25/2013	.05	None	.2	EPA 300.0 Nitrate as N
EFF-001	Phosphorus, Total (as P)	Inductively Coupled Plasma/Mass Spectroscopy	=	4.8	mg/L	04/17/2013	.02	None	.1	SM(20th)4500-PE: Phosphorous Total
EFF-001	Temperature	Data Unavailable	=	20.26	Degrees C	04/02/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Temperature	Data Unavailable	=	20.31	Degrees C	04/10/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Temperature	Data Unavailable	=	20.42	Degrees C	04/17/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Temperature	Data Unavailable	=	21.75	Degrees C	04/25/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	04/01/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	04/08/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	04/16/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform		ND			04/23/2013	2	None	2	

		Standard Method 9221 B: Total Coliform Fermentation Technique			MPN/100 mL					SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	04/30/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.2	mg/L	04/02/2013	0	0	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.4	mg/L	04/10/2013	0	0	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.3	mg/L	04/18/2013	0	0	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.1	mg/L	04/24/2013	0	0	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	pH	Data Unavailable	=	7.01	SU	04/02/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
EFF-001	pH	Data Unavailable	=	6.99	SU	04/10/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
EFF-001	pH	Data Unavailable	=	6.88	SU	04/17/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
EFF-001	pH	Data Unavailable	=	7.05	SU	04/25/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	248	mg/L	04/02/2013	None	None	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	286	mg/L	04/10/2013	None	None	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	401	mg/L	04/18/2013	None	None	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	286	mg/L	04/24/2013	None	None	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	193	mg/L	04/02/2013	None	None	1	SM(20th) 2540:Total Suspended Solids [D2540]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	283	mg/L	04/10/2013	None	None	1	SM(20th) 2540:Total Suspended Solids [D2540]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	245	mg/L	04/18/2013	None	None	1	SM(20th) 2540:Total Suspended Solids [D2540]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	257	mg/L	04/24/2013	None	None	1	SM(20th) 2540:Total Suspended Solids [D2540]
RSW-001	Ammonia, Total (as N)	Data Unavailable	=	0.21	mg/L	04/17/2013	.06	None	.2	SM(20th) 4500NH3C: Ammonia as N
RSW-001	Ammonia, Total (as N)	Data Unavailable	=	0.25	mg/L	04/25/2013	.06	None	.2	SM(20th) 4500NH3C: Ammonia as N
RSW-001		Data Unavailable	DNQ	4.93	mg/L	04/17/2013	1	5	5	

	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)									SM(20th) 5210:Biochemical Oxygen Demand [B5210]
RSW-001	Dissolved Oxygen	Data Unavailable	=	8.66	mg/L	04/17/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
RSW-001	Dissolved Oxygen	Data Unavailable	=	8.91	mg/L	04/25/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
RSW-001	Hardness, Total (as CaCO3)	Data Unavailable	=	134	mg/L	04/17/2013	None	None	None	SM(20th) 2340:Hardness, Total[C2340]
RSW-001	Nitrate, Total (as N)	Inorganic Anions by Ion Chromatography	=	0.36	mg/L	04/17/2013	.05	None	.2	EPA 300.0 Nitrate as N
RSW-001	Nitrate, Total (as N)	Inorganic Anions by Ion Chromatography	=	0.32	mg/L	04/25/2013	.05	None	.2	EPA 300.0 Nitrate as N
RSW-001	Phosphorus, Total (as P)	Data Unavailable	=	1.2	mg/L	04/17/2013	.02	None	.1	SM(20th)4500-PE: Phosphorous Total
RSW-001	Temperature	Data Unavailable	=	15.69	Degrees C	04/02/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Temperature	Data Unavailable	=	15.36	Degrees C	04/10/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Temperature	Data Unavailable	=	15.83	Degrees C	04/17/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Temperature	Data Unavailable	=	18.89	Degrees C	04/25/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Turbidity	Data Unavailable	=	9.42	NTU	04/17/2013	None	None	None	SM(20th) 2130:Turb, Nephelometric [B2130]
RSW-001	pH	Data Unavailable	=	8.74	SU	04/17/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
RSW-001	pH	Data Unavailable	=	9.19	SU	04/25/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]

Total Analytical Data Points: 59

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Data Summary-Calculated

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	Comments
EFF-001	Acute Toxicity	3-Sample Median	=	100	% survival	04/17/2013	Calculation
EFF-001	BOD5 @ 20 Deg. C, Percent Removal	Percent Reduction	=	99.2	%	04/30/2013	BOD % Removal calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	22	lb/day	04/06/2013	BOD Loading Calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	04/06/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	20	lb/day	04/13/2013	BOD Loading Calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	04/13/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	04/20/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	20	lb/day	04/20/2013	BOD Loading Calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	04/27/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	19	lb/day	04/27/2013	BOD Loading Calculation
EFF-001	Copper, Total		=	17.1	ug/L	04/17/2013	MDEL Look-up Table

		Maximum Daily (MDEL)					
EFF-001	Copper, Total	Average Monthly (AMEL)	=	10.6	ug/L	04/17/2013	AMEL Look-up Table
EFF-001	Flow	Daily Average (Mean)	=	1.02	MGD	04/01/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.98	MGD	04/02/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/03/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	1.24	MGD	04/04/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	1.08	MGD	04/05/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	1.07	MGD	04/06/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	1.04	MGD	04/07/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	1.01	MGD	04/08/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.99	MGD	04/09/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/10/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.95	MGD	04/11/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.94	MGD	04/12/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.98	MGD	04/13/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.97	MGD	04/14/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/15/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.91	MGD	04/16/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/17/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/18/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/19/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.98	MGD	04/20/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.97	MGD	04/21/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/22/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.92	MGD	04/23/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.88	MGD	04/24/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.9	MGD	04/25/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.94	MGD	04/26/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/27/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.99	MGD	04/28/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.98	MGD	04/29/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/30/2013	Online Meter
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	04/01/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	04/08/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	04/16/2013	Calculation

EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	04/23/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	04/30/2013	Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	04/06/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	4	lb/day	04/06/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	4	lb/day	04/13/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	04/13/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	4	lb/day	04/20/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	04/20/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	4	lb/day	04/27/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	04/27/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS), Percent Removal	Percent Reduction	=	99.8	%	04/30/2013	TSS % Removal Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2107	lb/day	04/06/2013	BOD Loading Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2280	lb/day	04/13/2013	BOD Loading Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3086	lb/day	04/20/2013	BOD Loading Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2252	lb/day	04/27/2013	BOD Loading Calculation
INF-001	Flow	Daily Maximum	=	4.52	MGD	04/01/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1.04	MGD	04/01/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1	MGD	04/02/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.41	MGD	04/02/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/03/2013	Online Meter
INF-001	Flow	Daily Maximum	=	4.29	MGD	04/03/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1.15	MGD	04/04/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.8	MGD	04/04/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1	MGD	04/05/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.46	MGD	04/05/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.67	MGD	04/06/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1	MGD	04/06/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.56	MGD	04/07/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.99	MGD	04/07/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.5	MGD	04/08/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.97	MGD	04/08/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/09/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.93	MGD	04/09/2013	Online Meter
INF-001	Flow	Daily Maximum	=	3.31	MGD	04/10/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.95	MGD	04/10/2013	Online Meter
INF-001	Flow	Daily Maximum	=	6.52	MGD	04/11/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.98	MGD	04/11/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.9	MGD	04/12/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.47	MGD	04/12/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.53	MGD	04/13/2013	Online Meter
INF-001	Flow		=	0.94	MGD	04/13/2013	Online Meter

		Daily Average (Mean)					
INF-001	Flow	Daily Maximum	=	1.68	MGD	04/14/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/14/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.79	MGD	04/15/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.89	MGD	04/15/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.43	MGD	04/16/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.89	MGD	04/16/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.9	MGD	04/17/2013	Online Meter
INF-001	Flow	Daily Maximum	=	4.88	MGD	04/17/2013	Online Meter
INF-001	Flow	Daily Maximum	=	5.5	MGD	04/18/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.91	MGD	04/18/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.5	MGD	04/19/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.95	MGD	04/19/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.7	MGD	04/20/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.99	MGD	04/20/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1	MGD	04/21/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.81	MGD	04/21/2013	Online Meter
INF-001	Flow	Daily Maximum	=	5.66	MGD	04/22/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/22/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.5	MGD	04/23/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.91	MGD	04/23/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.47	MGD	04/24/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.91	MGD	04/24/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.44	MGD	04/25/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/25/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.54	MGD	04/26/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/26/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.97	MGD	04/27/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.73	MGD	04/27/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	1	MGD	04/28/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.75	MGD	04/28/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.96	MGD	04/29/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.59	MGD	04/29/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.61	MGD	04/30/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.93	MGD	04/30/2013	Online Meter
INF-001	Rainfall	Other	=	0.03	inches	04/01/2013	Online Meter
INF-001	Rainfall	Other	=	0.97	inches	04/04/2013	Online Meter
INF-001	Rainfall	Other	=	0.02	inches	04/07/2013	Online Meter
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	1640	lb/day	04/06/2013	TSS Loading Calculation
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	2256	lb/day	04/13/2013	TSS Loading Calculation
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	1886	lb/day	04/20/2013	TSS Loading Calculation
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	2024	lb/day	04/27/2013	TSS Loading Calculation
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	04/01/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	04/01/2013	Online Meter

INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/02/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	04/02/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	04/03/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	04/03/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	04/04/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.06	NTU	04/04/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.06	NTU	04/05/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.05	NTU	04/05/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	04/06/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.07	NTU	04/06/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.07	NTU	04/07/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.05	NTU	04/07/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	04/08/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	04/08/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	04/09/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	04/09/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/10/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/10/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/11/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/11/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/12/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/12/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/13/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.07	NTU	04/13/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.07	NTU	04/14/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/14/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/15/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	04/15/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/16/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/16/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	04/17/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/17/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	04/18/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/18/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	04/19/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/19/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/20/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/20/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/21/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	04/21/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/22/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	04/22/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	04/23/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	04/23/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	04/24/2013	Online Meter

INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	04/24/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/25/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.19	NTU	04/25/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	04/26/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/26/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/27/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	04/27/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	04/28/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/28/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.13	NTU	04/29/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	04/29/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	04/30/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.14	NTU	04/30/2013	Online Meter
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/01/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	112.5	mJ/cm2	04/01/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	112	mJ/cm2	04/02/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84.1	mJ/cm2	04/02/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	112.1	mJ/cm2	04/03/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	82.1	mJ/cm2	04/03/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	127.2	mJ/cm2	04/04/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/04/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84.1	mJ/cm2	04/05/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	108.8	mJ/cm2	04/05/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.8	mJ/cm2	04/06/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84.2	mJ/cm2	04/06/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/07/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	113	mJ/cm2	04/07/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	113.8	mJ/cm2	04/08/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/08/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.8	mJ/cm2	04/09/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	83.8	mJ/cm2	04/09/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/10/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	114.8	mJ/cm2	04/10/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	83.7	mJ/cm2	04/11/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	116	mJ/cm2	04/11/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/12/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	118.3	mJ/cm2	04/12/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	80.2	mJ/cm2	04/13/2013	

							UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	107.6	mJ/cm2	04/13/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/14/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	115.5	mJ/cm2	04/14/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	114.4	mJ/cm2	04/15/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	79.5	mJ/cm2	04/15/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	122.4	mJ/cm2	04/16/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84	mJ/cm2	04/16/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	137	mJ/cm2	04/17/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	84.5	mJ/cm2	04/17/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	135.8	mJ/cm2	04/18/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	85.2	mJ/cm2	04/18/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	124.6	mJ/cm2	04/19/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	87.6	mJ/cm2	04/19/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	126.1	mJ/cm2	04/20/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	89.4	mJ/cm2	04/20/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	89.9	mJ/cm2	04/21/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	121.1	mJ/cm2	04/21/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	119.8	mJ/cm2	04/22/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	86	mJ/cm2	04/22/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	89.8	mJ/cm2	04/23/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	121.3	mJ/cm2	04/23/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	116.8	mJ/cm2	04/24/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	04/24/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	04/25/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.8	mJ/cm2	04/25/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	04/26/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.9	mJ/cm2	04/26/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	118.1	mJ/cm2	04/27/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	04/27/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	123.6	mJ/cm2	04/28/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	04/28/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	122.1	mJ/cm2	04/29/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	04/29/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	128.6	mJ/cm2	04/30/2013	UV calculated dosage-Units mJ/cm2

INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	04/30/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/01/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.99	%	04/01/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.43	%	04/02/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/02/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.04	%	04/03/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/03/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/04/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.26	%	04/04/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/05/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	75.24	%	04/05/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/06/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.92	%	04/06/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.35	%	04/07/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/07/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/08/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.34	%	04/08/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/09/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.11	%	04/09/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.71	%	04/10/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/10/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/11/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.09	%	04/11/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.11	%	04/12/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/12/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.75	%	04/13/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/13/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.97	%	04/14/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/14/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/15/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.73	%	04/15/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	75.22	%	04/16/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/16/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/17/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	75.59	%	04/17/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	75.21	%	04/18/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/18/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/19/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.34	%	04/19/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/20/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.93	%	04/20/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/21/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.84	%	04/21/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/22/2013	Online UVT Meter
INT-002	UV Transmittance		=	73.22	%	04/22/2013	Online UVT Meter

		Daily Average (Mean)					
INT-002	UV Transmittance	Daily Average (Mean)	=	72.99	%	04/23/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/23/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/24/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.66	%	04/24/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	74.23	%	04/25/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/25/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.66	%	04/26/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/26/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.23	%	04/27/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/27/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	73.07	%	04/28/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/28/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	72.62	%	04/29/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	04/29/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.73	%	04/30/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	68.8	%	04/30/2013	Online UVT Meter
RSW-001	Dilution Rate	Daily Discharge	=	0.244	% effluent	04/01/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.265	% effluent	04/02/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.264	% effluent	04/03/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.3	% effluent	04/04/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.23	% effluent	04/05/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.25	% effluent	04/06/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.26	% effluent	04/07/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.25	% effluent	04/08/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.25	% effluent	04/09/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.24	% effluent	04/10/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.252	% effluent	04/11/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.256	% effluent	04/12/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.283	% effluent	04/13/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.284	% effluent	04/14/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.277	% effluent	04/15/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.277	% effluent	04/16/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.3	% effluent	04/17/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.308	% effluent	04/18/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.308	% effluent	04/19/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.326	% effluent	04/20/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.326	% effluent	04/21/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.314	% effluent	04/22/2013	

							Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.313	% effluent	04/23/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.302	% effluent	04/24/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.31	% effluent	04/25/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.33	% effluent	04/26/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.33	% effluent	04/27/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.35	% effluent	04/28/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.35	% effluent	04/29/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.34	% effluent	04/30/2013	Dilution rate-% of stream flow
RSW-002	Flow	Daily Average (Mean)	=	295.1	MGD	04/01/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	258.4	MGD	04/02/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	253	MGD	04/03/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	273.2	MGD	04/04/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	342	MGD	04/05/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	318.2	MGD	04/06/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	290.5	MGD	04/07/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	284.1	MGD	04/08/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	287.6	MGD	04/09/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	273.8	MGD	04/10/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	267.1	MGD	04/11/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	261.8	MGD	04/12/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	257.3	MGD	04/13/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	252.2	MGD	04/14/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	249.4	MGD	04/15/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	243	MGD	04/16/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	223.2	MGD	04/17/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	217.5	MGD	04/18/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	216.1	MGD	04/19/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	215.7	MGD	04/20/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	213.5	MGD	04/21/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	211.4	MGD	04/22/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	209.9	MGD	04/23/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	207.3	MGD	04/24/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	206.6	MGD	04/25/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	206.4	MGD	04/26/2013	Russian River Daily Flow Rate

RSW-002	Flow	Daily Average (Mean)	=	204.3	MGD	04/27/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	200.5	MGD	04/28/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	198.2	MGD	04/29/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	197.5	MGD	04/30/2013	Russian River Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	125.2	MGD	04/01/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	111.4	MGD	04/02/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	109.9	MGD	04/03/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	132.8	MGD	04/04/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	122	MGD	04/05/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	117.4	MGD	04/06/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	116	MGD	04/07/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	113.5	MGD	04/08/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	113.9	MGD	04/09/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	111.3	MGD	04/10/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	110.1	MGD	04/11/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	106.5	MGD	04/12/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	91.3	MGD	04/13/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	88.5	MGD	04/14/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	86.6	MGD	04/15/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	85.6	MGD	04/16/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	85.3	MGD	04/17/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	86.2	MGD	04/18/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	85.2	MGD	04/19/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	85.2	MGD	04/20/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	85.3	MGD	04/21/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	85.1	MGD	04/22/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	84.3	MGD	04/23/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	83.8	MGD	04/24/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	83.8	MGD	04/25/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	83.7	MGD	04/26/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	84.1	MGD	04/27/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	83.8	MGD	04/28/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	83.3	MGD	04/29/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	82.1	MGD	04/30/2013	Dry Creek Daily Flow Rate

Total Calculated Data Points: 397

Violations

Violation ID	Violation Date	Violation Type	Description(+)	Corrective Action	Created By	Last Modified By
948703	04/15/2013	Category 1 Pollutant (Effluent Violation for Group 1 Pollutant)	UV Dose Instantaneous Minimum limit is 80 mJ/cm2 and reported value was 79.5 mJ/	The target dose to for the system has been increased from 85mJ/cm2 to 90 mJ/cm2.	Discharger	Discharger

Total Violations: 1

Attachments

File Name	Description	Size
4Apr2013LabData.PDF	None	5.98 MB
4Apr2013NPDES.xlsx	None	34 KB
4Apr2013VisualObs.docx	None	20 KB

Total Attachments: 3

Cover Letter

File Name
4Apr2013CoverLetter.pdf

Total No. of Cover Letter Files: 1 **Cover Leter Text: No**

The current report was generated with data as of: 03/04/2014

ESMR At-A-Glance Report

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General Information

Agency	Facility	Reporting Period	Due Date	Date Received	Certified By
Healdsburg City	Healdsburg City WWTP	12/01/2013 to 12/31/2013	02/01/2014	01/30/2014	Rob Scates

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Monitoring Locations

Name	Type	Lat/Long	Associated Discharge Point	Receiving Water	Description(+)
EFF-001	Effluent Monitoring	38.58/122.863333	Healdsburg Discharge Point 001	N/A	Treated wastewater after disinfection and dechlorination but prior to discharge
INF-001	Influent Monitoring	None	None	N/A	Untreated influent wastewater collected at the plant headworks at a representati
INT-001	Internal process monitoring for ELGs	None	None	N/A	Internal monitoring location for the purpose of monitoring treated wastewter ime
INT-002	Internal process monitoring for ELGs	None	None	N/A	Internal monitoring location for the purpose of monitoring disinfected tertiary
REC-001	Effluent Monitoring	None	Healdsburg Discharge Point 002	N/A	Tertiary treated wastewater after disinfection but prior to discharge to 25 MG r
REC-002	Effluent Monitoring	None	Healdsburg Discharge Point 003	N/A	Location where a representative sample of treated wastewater to be reclaimed can
RSW-001	Receiving Water Monitoring	None	None	RUSSIAN RIVER	Downstream RW monitoring location (in Basalt Pond). Samples shall be representa
RSW-002	Receiving Water Monitoring	None	None	RUSSIAN RIVER	Russian River at USGS Gauge No. 11-4640 (Added per July 3, 2012 MRP revision) F
RSW-003	Receiving Water Monitoring	None	None	Dry Creek	Dry Creek at USGS Guage No. 11-4653.50 (flow monitoring station). Added per Jul

Total Monitoring Locations: 9

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No Discharge Dates

Discharge Point Name	Description(+)	Dates of No Discharge	Comments
Healdsburg Discharge Point 001	Healdsburg WWTF - Discharge outfall to Basalt Pond, adjacent to Russian River		None
Healdsburg Discharge Point 002	Healdsburg WWTF - discharge to recycled water storage pond	12/01/2013 - 12/31/2013	All discharge was to point 001
Healdsburg Discharge Point 003	Healdsburg WWTF - recycled water discharge from recycled water storage pond to r	12/01/2013 - 12/31/2013	All discharge was to point 001

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Data Summary-Analytical

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	MDL	ML	RL	Comments
EFF-001	Ammonia, Total (as N)	Data Unavailable	=	0.28	mg/L	12/03/2013	.06	None	.2	SM(20th) 4500NH3C: Ammonia as N
EFF-001	Ammonia, Unionized (as N)	Data Unavailable	=	0.0017	mg/L	12/03/2013	.0002	None	None	Un-ionized ammonia as N look-up table
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	1.7	mg/L	12/03/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	1.4	mg/L	12/10/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
EFF-001	Biochemical Oxygen	Data Unavailable	DNQ	1.4	mg/L	12/18/2013	.1	.1	5	SM(20th) 5210:Biochemical

	Demand (BOD) (5-day @ 20 Deg. C)									Oxygen Demand [B5210]
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	1.3	mg/L	12/25/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
EFF-001	Copper, Total	Inductively Coupled Plasma/Mass Spectroscopy	=	7	ug/L	12/03/2013	.04	None	.5	EPA 200.8 Copper
EFF-001	Dissolved Oxygen	Data Unavailable	=	3.8	mg/L	12/03/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Dissolved Oxygen	Data Unavailable	=	4.33	mg/L	12/11/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Dissolved Oxygen	Data Unavailable	=	3.24	mg/L	12/17/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Dissolved Oxygen	Data Unavailable	=	4.42	mg/L	12/26/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
EFF-001	Hardness, Total (as CaCO3)	Standard Method 2340 C: Hardness by Calc.-EDTA Titrimetric Method	=	155	mg/L	12/03/2013	None	None	None	SM(20th) 2340:Hardness, Total[C2340]
EFF-001	Nitrate, Total (as N)	Inorganic Anions by Ion Chromatography	=	2.2	mg/L	12/03/2013	.05	None	.2	EPA 300.0 Nitrate as N
EFF-001	Phosphorus, Total (as P)	Inductively Coupled Plasma/Mass Spectroscopy	=	0.64	mg/L	12/03/2013	.02	None	.1	SM(20th)4500-PE: Phosphorous Total
EFF-001	Temperature	Data Unavailable	=	20.75	Degrees C	12/03/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Temperature	Data Unavailable	=	18.26	Degrees C	12/11/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Temperature	Data Unavailable	=	18.75	Degrees C	12/17/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Temperature	Data Unavailable	=	18.59	Degrees C	12/26/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/02/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/09/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/16/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/23/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/30/2013	2	None	2	SM(20th) 9221:Total Coliform MPN [B9221]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.1	mg/L	12/03/2013	.1	None	1	SM(20th) 2540:Total Suspended Solids [D2540]

EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.2	mg/L	12/10/2013	.1	.1	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.2	mg/L	12/18/2013	.1	.1	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	Total Suspended Solids (TSS)	Data Unavailable	DNQ	0.4	mg/L	12/25/2013	.1	.1	1	SM(20th) 2540:Total Suspended Solids [D2540]
EFF-001	pH	Data Unavailable	=	7.16	SU	12/03/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
EFF-001	pH	Data Unavailable	=	7.06	SU	12/11/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
EFF-001	pH	Data Unavailable	=	7	SU	12/17/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
EFF-001	pH	Data Unavailable	=	6.98	SU	12/26/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	415	mg/L	12/03/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	306	mg/L	12/10/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	337	mg/L	12/18/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	=	326	mg/L	12/25/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	259	mg/L	12/03/2013	.1	None	1	SM(20th) 2540:Total Suspended Solids [D2540]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	286	mg/L	12/10/2013	.1	.1	1	SM(20th) 2540:Total Suspended Solids [D2540]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	269	mg/L	12/18/2013	.1	.1	1	SM(20th) 2540:Total Suspended Solids [D2540]
INF-001	Total Suspended Solids (TSS)	Data Unavailable	=	247	mg/L	12/25/2013	.1	.1	1	SM(20th) 2540:Total Suspended Solids [D2540]
RSW-001	Ammonia, Total (as N)	Data Unavailable	=	0.24	mg/L	12/03/2013	.06	None	.2	SM(20th) 4500NH3C: Ammonia as N
RSW-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Data Unavailable	DNQ	3	mg/L	12/03/2013	.1	.1	5	SM(20th) 5210:Biochemical Oxygen Demand [B5210]
RSW-001	Dissolved Oxygen	Data Unavailable	=	9.71	mg/L	12/03/2013	None	None	None	SM(20th) 4500-O:Dissolved Oxygen[C,G4500-O]
RSW-001	Hardness, Total (as CaCO3)	Data Unavailable	=	132	mg/L	12/03/2013	None	None	None	SM(20th) 2340:Hardness, Total[C2340]
RSW-001	Nitrate, Total (as N)	Inorganic Anions by Ion Chromatography	=	0.85	mg/L	12/03/2013	.05	None	.2	EPA 300.0 Nitrate as N
RSW-001	Phosphorus, Total (as P)	Data Unavailable	=	1.2	mg/L	12/03/2013	.02	None	.1	SM(20th)4500-PE: Phosphorous Total
RSW-001	Temperature	Data Unavailable	=	13.49		12/03/2013	None	None	None	

					Degrees C					SM(20th) 2550:Temperature [B2550]
RSW-001	Temperature	Data Unavailable	=	11.38	Degrees C	12/11/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Temperature	Data Unavailable	=	10.55	Degrees C	12/17/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Temperature	Data Unavailable	=	10.43	Degrees C	12/26/2013	None	None	None	SM(20th) 2550:Temperature [B2550]
RSW-001	Turbidity	Data Unavailable	=	9.46	NTU	12/03/2013	None	None	None	SM(20th) 2130:Turb, Nephelometric [B2130]
RSW-001	pH	Data Unavailable	=	7.7	SU	12/03/2013	None	None	None	SM(20th) 4500-H+:pH [B4500-H+]

Total Analytical Data Points: 51

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Data Summary-Calculated

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	Comments
EFF-001	BOD5 @ 20 Deg. C, Percent Removal	Percent Reduction	=	99.3	%	12/31/2013	BOD % Removal calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	17	lb/day	12/07/2013	BOD Loading Calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	12/07/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	12/14/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	17	lb/day	12/14/2013	BOD Loading Calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	16	lb/day	12/21/2013	BOD Loading Calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	12/21/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	175	lb/day	12/28/2013	BOD Mass Limit calculation
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	17	lb/day	12/28/2013	BOD Loading Calculation
EFF-001	Copper, Total	Maximum Daily (MDEL)	=	16.9	ug/L	12/03/2013	MDEL Look-up Table
EFF-001	Copper, Total	Average Monthly (AMEL)	=	10.5	ug/L	12/03/2013	AMEL Look-up Table
EFF-001	Flow	Daily Average (Mean)	=	0.85	MGD	12/01/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/02/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.78	MGD	12/03/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/04/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/05/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/06/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.89	MGD	12/07/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.86	MGD	12/08/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.83	MGD	12/09/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/10/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.83	MGD	12/11/2013	Online Meter
EFF-001	Flow		=	0.81	MGD	12/12/2013	Online Meter

		Daily Average (Mean)					
EFF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/13/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.83	MGD	12/14/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/15/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/16/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.76	MGD	12/17/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.77	MGD	12/18/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.76	MGD	12/19/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.78	MGD	12/20/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/21/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/22/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/23/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/24/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.73	MGD	12/25/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/26/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.83	MGD	12/27/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.83	MGD	12/28/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/29/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.83	MGD	12/30/2013	Online Meter
EFF-001	Flow	Daily Average (Mean)	=	0.85	MGD	12/31/2013	Online Meter
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	12/02/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	12/09/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	12/16/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	12/23/2013	Calculation
EFF-001	Total Coliform	7-Day Median	ND		MPN/100 mL	12/30/2013	Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	12/07/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	3	lb/day	12/07/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	12/14/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	3	lb/day	12/14/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	3	lb/day	12/21/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	12/21/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS)	Daily Discharge	=	3	lb/day	12/28/2013	TSS Loading Calculation
EFF-001	Total Suspended Solids (TSS)	Average Weekly (AWEL)	=	175	lb/day	12/28/2013	TSS MASS Limit calculation
EFF-001	Total Suspended Solids (TSS), Percent Removal	Percent Reduction	=	99.8	%	12/31/2013	TSS % Removal Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2883	lb/day	12/07/2013	BOD Loading Calculation

INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2125	lb/day	12/14/2013	BOD Loading Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2248	lb/day	12/21/2013	BOD Loading Calculation
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	2206	lb/day	12/28/2013	BOD Loading Calculation
INF-001	Flow	Daily Average (Mean)	=	0.86	MGD	12/01/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.79	MGD	12/01/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/02/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.41	MGD	12/02/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/03/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.31	MGD	12/03/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/04/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.65	MGD	12/04/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/05/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.31	MGD	12/05/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.32	MGD	12/06/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.85	MGD	12/06/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.89	MGD	12/07/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.56	MGD	12/07/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.88	MGD	12/08/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.62	MGD	12/08/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/09/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.36	MGD	12/09/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/10/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.43	MGD	12/10/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/11/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.99	MGD	12/11/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.8	MGD	12/12/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.54	MGD	12/12/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/13/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.4	MGD	12/13/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/14/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.5	MGD	12/14/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.58	MGD	12/15/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/15/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.3	MGD	12/16/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/16/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/17/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.35	MGD	12/17/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/18/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.24	MGD	12/18/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.28	MGD	12/19/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.78	MGD	12/19/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.35	MGD	12/20/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.79	MGD	12/20/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/21/2013	Online Meter

INF-001	Flow	Daily Maximum	=	1.5	MGD	12/21/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/22/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.54	MGD	12/22/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.9	MGD	12/23/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.82	MGD	12/23/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.49	MGD	12/24/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.81	MGD	12/24/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.74	MGD	12/25/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.36	MGD	12/25/2013	Online Meter
INF-001	Flow	Daily Maximum	=	2.76	MGD	12/26/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.8	MGD	12/26/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.85	MGD	12/27/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.6	MGD	12/27/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.84	MGD	12/28/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.55	MGD	12/28/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.54	MGD	12/29/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.85	MGD	12/29/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.55	MGD	12/30/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.85	MGD	12/30/2013	Online Meter
INF-001	Flow	Daily Maximum	=	1.53	MGD	12/31/2013	Online Meter
INF-001	Flow	Daily Average (Mean)	=	0.86	MGD	12/31/2013	Online Meter
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	1799	lb/day	12/07/2013	TSS Loading Calculation
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	1987	lb/day	12/14/2013	TSS Loading Calculation
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	1795	lb/day	12/21/2013	TSS Loading Calculation
INF-001	Total Suspended Solids (TSS)	Daily Discharge	=	1672	lb/day	12/28/2013	TSS Loading Calculation
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/01/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	12/01/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/02/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	12/02/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/03/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.13	NTU	12/03/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.14	NTU	12/04/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/04/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.05	NTU	12/05/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/05/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.05	NTU	12/06/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.07	NTU	12/06/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.06	NTU	12/07/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.05	NTU	12/07/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.05	NTU	12/08/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.06	NTU	12/08/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/09/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/09/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/10/2013	Online Meter

INT-001	Turbidity	Daily Maximum	=	0.07	NTU	12/10/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	12/11/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/11/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/12/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/12/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/13/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/13/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.07	NTU	12/14/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/14/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	12/15/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.06	NTU	12/15/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	12/16/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/16/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.2	NTU	12/17/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/17/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.15	NTU	12/18/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/18/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/19/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/19/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/20/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.08	NTU	12/20/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.007	NTU	12/21/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/21/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/22/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.09	NTU	12/22/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	12/23/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	12/23/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.1	NTU	12/24/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	12/24/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.09	NTU	12/25/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	12/25/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	12/26/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.17	NTU	12/26/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.2	NTU	12/27/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	12/27/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	12/28/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.14	NTU	12/28/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.11	NTU	12/29/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.08	NTU	12/29/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.09	NTU	12/30/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.2	NTU	12/30/2013	Online Meter
INT-001	Turbidity	Daily Average (Mean)	=	0.07	NTU	12/31/2013	Online Meter
INT-001	Turbidity	Daily Maximum	=	0.12	NTU	12/31/2013	Online Meter
INT-002	UV Dose	Daily Average (Mean)	=	115	mJ/cm2	12/01/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/01/2013	

							UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	130.5	mJ/cm2	12/02/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/02/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	89	mJ/cm2	12/03/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	115.6	mJ/cm2	12/03/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	128.3	mJ/cm2	12/04/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/04/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	89.5	mJ/cm2	12/05/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	119.8	mJ/cm2	12/05/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	107.2	mJ/cm2	12/06/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	88.3	mJ/cm2	12/06/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	121	mJ/cm2	12/07/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/07/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	117.6	mJ/cm2	12/08/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/08/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	126.5	mJ/cm2	12/09/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/09/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.5	mJ/cm2	12/10/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120	mJ/cm2	12/10/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/11/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120	mJ/cm2	12/11/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.5	mJ/cm2	12/12/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/12/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/13/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	114.5	mJ/cm2	12/13/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/14/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	113.2	mJ/cm2	12/14/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/15/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	116.8	mJ/cm2	12/15/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	82.8	mJ/cm2	12/16/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.2	mJ/cm2	12/16/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	113.4	mJ/cm2	12/17/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/17/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/18/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	120.8	mJ/cm2	12/18/2013	UV calculated dosage-Units mJ/cm2

INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/19/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	111.2	mJ/cm2	12/19/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	114.4	mJ/cm2	12/20/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/20/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/21/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	117.4	mJ/cm2	12/21/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	119.5	mJ/cm2	12/22/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	88.99	mJ/cm2	12/22/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	113.4	mJ/cm2	12/23/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/23/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/24/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	118.8	mJ/cm2	12/24/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	108.8	mJ/cm2	12/25/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/25/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/26/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	129.4	mJ/cm2	12/26/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.3	mJ/cm2	12/27/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	123.5	mJ/cm2	12/27/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/28/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	118	mJ/cm2	12/28/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/29/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	114.8	mJ/cm2	12/29/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	114.6	mJ/cm2	12/30/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90.1	mJ/cm2	12/30/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Average (Mean)	=	118.4	mJ/cm2	12/31/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Dose	Daily Minimum	=	90	mJ/cm2	12/31/2013	UV calculated dosage-Units mJ/cm2
INT-002	UV Transmittance	Daily Average (Mean)	=	71.45	%	12/01/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.9	%	12/01/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.29	%	12/02/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	67.3	%	12/02/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.1	%	12/03/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.72	%	12/03/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.12	%	12/04/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.6	%	12/04/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.4	%	12/05/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	72.27	%	12/05/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	72.55	%	12/06/2013	Online UVT Meter

INT-002	UV Transmittance	Daily Minimum	=	71.2	%	12/06/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71.2	%	12/07/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	72.31	%	12/07/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	72.42	%	12/08/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.8	%	12/08/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	68.6	%	12/09/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.44	%	12/09/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.54	%	12/10/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	75.43	%	12/10/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	71	%	12/11/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71	%	12/11/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.19	%	12/12/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	69.91	%	12/12/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	68.1	%	12/13/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.6	%	12/13/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.69	%	12/14/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	68.9	%	12/14/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.3	%	12/15/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.03	%	12/15/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.5	%	12/16/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.1	%	12/16/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	67.3	%	12/17/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.69	%	12/17/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	68.5	%	12/18/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.07	%	12/18/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.1	%	12/19/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69	%	12/19/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.3	%	12/20/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.1	%	12/20/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.4	%	12/21/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.8	%	12/21/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.8	%	12/22/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.4	%	12/22/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.1	%	12/23/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.3	%	12/23/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70	%	12/24/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.5	%	12/24/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.5	%	12/25/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.3	%	12/25/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.4	%	12/26/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	67.2	%	12/26/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	68.6	%	12/27/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	70.64	%	12/27/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.5	%	12/28/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.2	%	12/28/2013	Online UVT Meter

INT-002	UV Transmittance	Daily Minimum	=	70.5	%	12/29/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.8	%	12/29/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.57	%	12/30/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	69.4	%	12/30/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Average (Mean)	=	71.55	%	12/31/2013	Online UVT Meter
INT-002	UV Transmittance	Daily Minimum	=	70.4	%	12/31/2013	Online UVT Meter
RSW-001	Dilution Rate	Daily Discharge	=	0.581	% effluent	12/01/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.557	% effluent	12/02/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.529	% effluent	12/03/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.542	% effluent	12/04/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.54	% effluent	12/05/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.58	% effluent	12/06/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.58	% effluent	12/07/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.56	% effluent	12/08/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.556	% effluent	12/09/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.55	% effluent	12/10/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.549	% effluent	12/11/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.541	% effluent	12/12/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.551	% effluent	12/13/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.563	% effluent	12/14/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.564	% effluent	12/15/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.586	% effluent	12/16/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.553	% effluent	12/17/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.54	% effluent	12/18/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.55	% effluent	12/19/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.6	% effluent	12/20/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.64	% effluent	12/21/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.63	% effluent	12/22/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.62	% effluent	12/23/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.64	% effluent	12/24/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.57	% effluent	12/25/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.66	% effluent	12/26/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.66	% effluent	12/27/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.68	% effluent	12/28/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.69	% effluent	12/29/2013	Dilution rate-% of stream flow
RSW-001	Dilution Rate	Daily Discharge	=	0.69	% effluent	12/30/2013	Dilution rate-% of stream flow

RSW-001	Dilution Rate	Daily Discharge	=	0.71	% effluent	12/31/2013	Dilution rate-% of stream flow
RSW-002	Flow	Daily Average (Mean)	=	70.7	MGD	12/01/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	71	MGD	12/02/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	71.2	MGD	12/03/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	70.2	MGD	12/04/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	70.24	MGD	12/05/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	72.22	MGD	12/06/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	75.25	MGD	12/07/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	75.25	MGD	12/08/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	73.1	MGD	12/09/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	75.43	MGD	12/10/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	75.5	MGD	12/11/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	75.5	MGD	12/12/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	76	MGD	12/13/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	75.2	MGD	12/14/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	72.1	MGD	12/15/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	69.5	MGD	12/16/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	69.8	MGD	12/17/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	70	MGD	12/18/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	68.1	MGD	12/19/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	63.7	MGD	12/20/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	62.2	MGD	12/21/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	61.4	MGD	12/22/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	60.4	MGD	12/23/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	60.3	MGD	12/24/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	59.9	MGD	12/25/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	60.3	MGD	12/26/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	59.5	MGD	12/27/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	56.3	MGD	12/28/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	55	MGD	12/29/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	54.7	MGD	12/30/2013	Russian River Daily Flow Rate
RSW-002	Flow	Daily Average (Mean)	=	53.9	MGD	12/31/2013	Russian River Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.3	MGD	12/01/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.1	MGD	12/02/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.5	MGD	12/03/2013	Dry Creek Daily Flow Rate

RSW-003	Flow	Daily Average (Mean)	=	76.2	MGD	12/04/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.21	MGD	12/05/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.72	MGD	12/06/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	77.06	MGD	12/07/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	77.06	MGD	12/08/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.1	MGD	12/09/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	76.73	MGD	12/10/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	75.2	MGD	12/11/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	74.5	MGD	12/12/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	71.9	MGD	12/13/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	71.7	MGD	12/14/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	71.3	MGD	12/15/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	68.9	MGD	12/16/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	67.5	MGD	12/17/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	70.8	MGD	12/18/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	70.4	MGD	12/19/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	67.3	MGD	12/20/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66.8	MGD	12/21/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66.4	MGD	12/22/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66.4	MGD	12/23/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	67.3	MGD	12/24/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	67	MGD	12/25/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66.8	MGD	12/26/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	67	MGD	12/27/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	67	MGD	12/28/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66.4	MGD	12/29/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66	MGD	12/30/2013	Dry Creek Daily Flow Rate
RSW-003	Flow	Daily Average (Mean)	=	66.6	MGD	12/31/2013	Dry Creek Daily Flow Rate

Total Calculated Data Points: 405

⊟

Violations

Violation ID	Violation Date	Violation Type	Description(+)	Corrective Action	Created By	Last Modified By

Total Violations: 0

⊟

Attachments

File Name	Description	Size
12Dec2013NPDES.xlsx	None	34 KB

12December2013LabDataandVisualObservations.pdf	None	4.97 MB

Total Attachments: 2

⊟

Cover Letter

File Name

12Dec2013CoverLetter.pdf

Total No. of Cover Letter Files: 1 **Cover Leter Text: No**

The current report was generated with data as of: 03/04/2014

ESMR At-A-Glance Report

General Information

Agency	Facility	Reporting Period	Due Date	Date Received	Certified By
Sacramento Regional CSD	Sacramento Regional WWTP	12/01/2013 to 12/31/2013	02/01/2014	01/30/2014	Michael Berklich

Monitoring Locations

Name	Type	Lat/Long	Associated Discharge Point	Receiving Water	Description(+)
CAP-001	Groundwater Monitoring	None	None	N/A	Groundwater Corrective Action Program (CAP) Discharge Monitoring
EFF-001	Effluent Monitoring	38.454167/121.5	001	N/A	Location where a representative sample of the facility's effluent can be obtaine
ESB (A-E)	Internal process monitoring for ELGs	None	None	N/A	Emergency Storage Basins A through E
INF-001	Influent Monitoring	None	None	N/A	Location where a representative sample of the facility's influent can be obtaine
RSWD-003	Receiving Water Monitoring	None	None	Sacramento River-1	Sacramento River 4200 feet downstream of Discharge Point No. 001 at Cliff's Mari
RSWD-004	Receiving Water Monitoring	None	None	Sacramento River-1	Sacramento River at River Mile 44
RSWD-005	Receiving Water Monitoring	None	None	Sacramento River-1	Sacramento River at River Mile 43
RSWU-001	Receiving Water Monitoring	None	None	Sacramento River-1	Sacramento River at Freeport Bridge
SPL-001	Internal process monitoring for ELGs	None	None	N/A	Municipal Water Supply

Total Monitoring Locations: 9

No Discharge Dates

Discharge Point Name	Description(+)	Dates of No Discharge	Comments

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Data Summary-Analytical

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	MDL	ML	RL	Comments
EFF-001	Acute Toxicity	Data Unavailable	=	95	% survival	12/02/2013	None	None	None	EPA 2019.0 test method
EFF-001	Acute Toxicity	Data Unavailable	=	100	% survival	12/09/2013	None	None	None	EPA 2019.0 test method
EFF-001	Acute Toxicity	Data Unavailable	=	100	% survival	12/16/2013	None	None	None	EPA 2019.0 test method
EFF-001	Acute Toxicity	Data Unavailable	=	95	% survival	12/23/2013	None	None	None	EPA 2019.0 test method
EFF-001	Acute Toxicity	Data Unavailable	=	100	% survival	12/30/2013	None	None	None	EPA 2019.0 test method
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	170	mg/L	12/03/2013	None	None	None	None
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	180	mg/L	12/09/2013	None	None	None	None

EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	190	mg/L	12/10/2013	None	None	None	None
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	180	mg/L	12/10/2013	None	None	None	None
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	180	mg/L	12/11/2013	None	None	None	None
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	160	mg/L	12/17/2013	None	None	None	None
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	150	mg/L	12/24/2013	None	None	None	None
EFF-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	160	mg/L	12/31/2013	None	None	None	None
EFF-001	Aluminum, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	12	ug/L	12/09/2013	None	None	None	None
EFF-001	Aluminum, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	12	ug/L	12/10/2013	None	None	None	None
EFF-001	Aluminum, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	12	ug/L	12/11/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	34	mg/L	12/01/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	31	mg/L	12/02/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	30	mg/L	12/03/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	31	mg/L	12/04/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	31	mg/L	12/05/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	37	mg/L	12/06/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	35	mg/L	12/07/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	32	mg/L	12/08/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	33	mg/L	12/09/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	35	mg/L	12/10/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	36	mg/L	12/11/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	33	mg/L	12/12/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	35	mg/L	12/13/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	34	mg/L	12/14/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	35	mg/L	12/15/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	34	mg/L	12/16/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	33	mg/L	12/17/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	34	mg/L	12/18/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	37	mg/L	12/19/2013	None	None	None	None

EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	37	mg/L	12/20/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	36	mg/L	12/21/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	36	mg/L	12/22/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	36	mg/L	12/23/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	32	mg/L	12/24/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	29	mg/L	12/25/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	32	mg/L	12/26/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	36	mg/L	12/27/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	40	mg/L	12/28/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	40	mg/L	12/29/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	37	mg/L	12/30/2013	None	None	None	None
EFF-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	33	mg/L	12/31/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	3	mg/L	12/01/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	4	mg/L	12/02/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	4	mg/L	12/03/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/04/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/05/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	4	mg/L	12/06/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/07/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/08/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/09/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/10/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/11/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/12/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/13/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/14/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/15/2013	None	None	None	None
EFF-001			=	7	mg/L	12/16/2013	None	None	None	None

	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test								
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/17/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/18/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	5	mg/L	12/19/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/20/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/21/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/22/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/23/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	7	mg/L	12/24/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	7	mg/L	12/25/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	6	mg/L	12/26/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	8	mg/L	12/27/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	9	mg/L	12/28/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	11	mg/L	12/29/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	9	mg/L	12/30/2013	None	None	None	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	8	mg/L	12/31/2013	None	None	None	None
EFF-001	Bis (2-Ethylhexyl) Phthalate	Extractable Priority Pollutants	DNQ	1.2	ug/L	12/09/2013	.01	5	5	None
EFF-001	Bis (2-Ethylhexyl) Phthalate	Extractable Priority Pollutants	DNQ	1.1	ug/L	12/10/2013	.01	5	5	None
EFF-001	Bis (2-Ethylhexyl) Phthalate	Extractable Priority Pollutants	DNQ	1.3	ug/L	12/11/2013	.01	5	5	None
EFF-001	Carbon Tetrachloride	Volatile Organic Compounds EPA Method 624	ND		ug/L	12/10/2013	.16	None	None	None
EFF-001	Chlorpyrifos	Organophosphorus Compounds by Gas Chromatography	ND		ug/L	12/10/2013	.003	None	None	None
EFF-001	Copper, Dissolved	Inductively Coupled Plasma/Mass Spectroscopy	=	4.2	ug/L	12/09/2013	None	None	None	None
EFF-001	Copper, Dissolved	Inductively Coupled Plasma/Mass Spectroscopy	=	3.9	ug/L	12/10/2013	None	None	None	None
EFF-001	Copper, Dissolved	Inductively Coupled Plasma/Mass Spectroscopy	=	4.3	ug/L	12/11/2013	None	None	None	None
EFF-001	Copper, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	4.1	ug/L	12/09/2013	None	None	None	None

EFF-001	Copper, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	3.7	ug/L	12/10/2013	None	None	None	None
EFF-001	Copper, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	4	ug/L	12/11/2013	None	None	None	None
EFF-001	Cyanide, Total (as CN)	Total Cyanide by Semi-automated Colorimetry	DNQ	3.1	ug/L	12/10/2013	1	5	5	est conc
EFF-001	Cyanide, Total (as CN)	Total Cyanide by Semi-automated Colorimetry	DNQ	3.7	ug/L	12/10/2013	1	5	5	est conc
EFF-001	Diazinon	Organophosphorus Compounds by Gas Chromatography	ND		ug/L	12/10/2013	.004	None	None	None
EFF-001	Dibenzo(a,h)anthracene	Extractable Priority Pollutants	ND		ug/L	12/09/2013	.001	None	None	None
EFF-001	Dibenzo(a,h)anthracene	Extractable Priority Pollutants	ND		ug/L	12/10/2013	.001	None	None	None
EFF-001	Dibenzo(a,h)anthracene	Extractable Priority Pollutants	ND		ug/L	12/11/2013	.001	None	None	None
EFF-001	Dibromochloromethane	Volatile Organic Compounds EPA Method 624	ND		ug/L	12/10/2013	.16	None	None	None
EFF-001	Dichlorobromomethane	Volatile Organic Compounds EPA Method 624	=	0.9	ug/L	12/10/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	840	umhos/cm	12/02/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	410	umhos/cm	12/02/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	890	umhos/cm	12/04/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	800	umhos/cm	12/09/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	900	umhos/cm	12/11/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	850	umhos/cm	12/16/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	820	umhos/cm	12/23/2013	None	None	None	None
EFF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	940	umhos/cm	12/30/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	120.8	MGD	12/01/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	100.9	MGD	12/02/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	92.2	MGD	12/03/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	113.4	MGD	12/04/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	112.2	MGD	12/05/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	117	MGD	12/06/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	139	MGD	12/07/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	119.8	MGD	12/08/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	132.8	MGD	12/09/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	81.7	MGD	12/10/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	90.6	MGD	12/11/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	111.1	MGD	12/12/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	38.9	MGD	12/13/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	142.6	MGD	12/14/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	86.8	MGD	12/15/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	110.2	MGD	12/16/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	112.8	MGD	12/17/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	135.1	MGD	12/18/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	177	MGD	12/19/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	140.7	MGD	12/20/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	136.2	MGD	12/21/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	124.1	MGD	12/22/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	115.6	MGD	12/23/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	120.5	MGD	12/24/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	108.4	MGD	12/25/2013	None	None	None	None

EFF-001	Flow	Data Unavailable	=	111.3	MGD	12/26/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	105.1	MGD	12/27/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	120.5	MGD	12/28/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	112.1	MGD	12/29/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	112.9	MGD	12/30/2013	None	None	None	None
EFF-001	Flow	Data Unavailable	=	109.6	MGD	12/31/2013	None	None	None	None
EFF-001	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	110	mg/L	12/09/2013	None	None	None	None
EFF-001	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	110	mg/L	12/10/2013	None	None	None	None
EFF-001	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	110	mg/L	12/11/2013	None	None	None	None
EFF-001	Manganese, Dissolved	Inductively Coupled Plasma/Mass Spectroscopy	=	56	ug/L	12/09/2013	None	None	None	None
EFF-001	Manganese, Dissolved	Inductively Coupled Plasma/Mass Spectroscopy	=	78	ug/L	12/10/2013	None	None	None	None
EFF-001	Manganese, Dissolved	Inductively Coupled Plasma/Mass Spectroscopy	=	70	ug/L	12/11/2013	None	None	None	None
EFF-001	Manganese, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	60	ug/L	12/09/2013	None	None	None	None
EFF-001	Manganese, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	80	ug/L	12/10/2013	None	None	None	None
EFF-001	Manganese, Total Recoverable	Inductively Coupled Plasma/Mass Spectroscopy	=	72	ug/L	12/11/2013	None	None	None	None
EFF-001	Mercury, Total	Mercury in Water by Oxidation, P&T, and Cold Vapor	=	2.9	ng/L	12/09/2013	None	None	None	None
EFF-001	Mercury, Total	Mercury in Water by Oxidation, P&T, and Cold Vapor	=	2.5	ng/L	12/10/2013	None	None	None	None
EFF-001	Mercury, Total	Mercury in Water by Oxidation, P&T, and Cold Vapor	=	3.3	ng/L	12/11/2013	None	None	None	None
EFF-001	Methyl Mercury	Methyl Mercury in Water by Distillation	=	0.21	ng/L	12/10/2013	None	None	None	None
EFF-001	Methyl Mercury	Methyl Mercury in Water by Distillation	=	0.16	ng/L	12/10/2013	None	None	None	None
EFF-001	Methyl Tert-butyl Ether (MTBE)	Volatile Organic Compounds EPA Method 624	ND		ug/L	12/10/2013	.15	None	None	None
EFF-001	Methylene Chloride	Volatile Organic Compounds EPA Method 624	DNQ	0.3	ug/L	12/10/2013	.2	.5	.5	est conc
EFF-001	Nitrate, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/03/2013	.0026	None	None	None
EFF-001	Nitrate, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	=	0.13	mg/L	12/10/2013	None	None	None	None
EFF-001	Nitrate, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/17/2013	.0026	None	None	None
EFF-001	Nitrate, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/24/2013	.0026	None	None	None
EFF-001	Nitrate, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/31/2013	.0026	None	None	None
EFF-001	Nitrite, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/03/2013	.0042	None	None	None
EFF-001	Nitrite, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/10/2013	.0042	None	None	None
EFF-001	Nitrite, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/17/2013	.0042	None	None	None
EFF-001	Nitrite, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND		mg/L	12/24/2013	.0042	None	None	None

EFF-001	Nitrite, Total (as N)	Nitrogen, Nitrate-Nitrate Modified	ND	mg/L	12/31/2013	.0042	None	None	None
EFF-001	Oil and Grease	HEM and SGT-HEM by Extraction and Gravimetry, Rev. A	ND	mg/L	12/03/2013	5.5	None	None	None
EFF-001	Pentachlorophenol	Extractable Priority Pollutants	ND	ug/L	12/09/2013	.005	None	None	None
EFF-001	Pentachlorophenol	Extractable Priority Pollutants	ND	ug/L	12/10/2013	.005	None	None	None
EFF-001	Pentachlorophenol	Extractable Priority Pollutants	ND	ug/L	12/11/2013	.005	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/01/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/02/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/03/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/04/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/05/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/06/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/07/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/08/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/09/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/10/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/11/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/12/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/13/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/14/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/15/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/16/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/17/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/18/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/19/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND	ml/L	12/20/2013	.1	None	None	None
EFF-001	Settleable Solids		ND	ml/L	12/21/2013	.1	None	None	None

		Standard Method (19th) 2540 F: Settleable Solids								
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/22/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/23/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/24/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/25/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/26/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/27/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/28/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/29/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/30/2013	.1	None	None	None
EFF-001	Settleable Solids	Standard Method (19th) 2540 F: Settleable Solids	ND		ml/L	12/31/2013	.1	None	None	None
EFF-001	Tetrachloroethene	Volatile Organic Compounds EPA Method 624	ND		ug/L	12/10/2013	.19	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/01/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/02/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	5	MPN/100 mL	12/03/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/04/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/05/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/06/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/07/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total	=	2	MPN/100 mL	12/08/2013	None	None	None	None

		Coliform Fermentation Technique								
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/09/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/10/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	23	MPN/100 mL	12/11/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/12/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	5	MPN/100 mL	12/13/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/14/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/15/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	350	MPN/100 mL	12/16/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	540	MPN/100 mL	12/17/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/18/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/19/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/20/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/21/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	49	MPN/100 mL	12/22/2013	None	None	None	None
EFF-001	Total Coliform		=	2		12/23/2013	None	None	None	None

		Standard Method 9221 B: Total Coliform Fermentation Technique			MPN/100 mL					
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/24/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	5	MPN/100 mL	12/25/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/26/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	ND		MPN/100 mL	12/27/2013	1.8	1.8	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	2	MPN/100 mL	12/28/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	17	MPN/100 mL	12/29/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	8	MPN/100 mL	12/30/2013	None	None	None	None
EFF-001	Total Coliform	Standard Method 9221 B: Total Coliform Fermentation Technique	=	5	MPN/100 mL	12/31/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	850	mg/L	12/02/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	410	mg/L	12/02/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	400	mg/L	12/04/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	370	mg/L	12/09/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	420	mg/L	12/11/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	370	mg/L	12/16/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	410	mg/L	12/18/2013	None	None	None	None
EFF-001			=	440	mg/L	12/23/2013	None	None	None	None

	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.								
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	360	mg/L	12/25/2013	None	None	None	None
EFF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	430	mg/L	12/30/2013	None	None	None	None
EFF-001	Total Kjeldahl Nitrogen (TKN) (as N)	Nitrogen, Kjeldahl, Total	=	32	mg/L	12/03/2013	None	None	None	None
EFF-001	Total Kjeldahl Nitrogen (TKN) (as N)	Nitrogen, Kjeldahl, Total	=	40	mg/L	12/10/2013	None	None	None	None
EFF-001	Total Kjeldahl Nitrogen (TKN) (as N)	Nitrogen, Kjeldahl, Total	=	32	mg/L	12/17/2013	None	None	None	None
EFF-001	Total Kjeldahl Nitrogen (TKN) (as N)	Nitrogen, Kjeldahl, Total	=	35	mg/L	12/24/2013	None	None	None	None
EFF-001	Total Kjeldahl Nitrogen (TKN) (as N)	Nitrogen, Kjeldahl, Total	=	34	mg/L	12/31/2013	None	None	None	None
EFF-001	Total Organic Carbon (TOC)	Standard Method (19th) 5310 B: TOC by Combustion-Infrared	=	26	mg/L	12/10/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	2.8	mg/L	12/01/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.2	mg/L	12/02/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3	mg/L	12/03/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.7	mg/L	12/04/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.8	mg/L	12/05/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	2.8	mg/L	12/06/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	2.7	mg/L	12/07/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.5	mg/L	12/08/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.8	mg/L	12/09/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4	mg/L	12/10/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.4	mg/L	12/11/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot.	=	3.4	mg/L	12/12/2013	None	None	None	None

		Sus. Solids Dried 103-105C								
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.3	mg/L	12/13/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.4	mg/L	12/14/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.1	mg/L	12/15/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.4	mg/L	12/16/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.7	mg/L	12/17/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.4	mg/L	12/18/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.6	mg/L	12/19/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.7	mg/L	12/20/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	3.8	mg/L	12/21/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	5	mg/L	12/22/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.1	mg/L	12/23/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	4.6	mg/L	12/24/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	5.2	mg/L	12/25/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	5	mg/L	12/26/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	5.8	mg/L	12/27/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	7.7	mg/L	12/28/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	7.8	mg/L	12/29/2013	None	None	None	None
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot.	=	7.7	mg/L	12/30/2013	None	None	None	None

		Sus. Solids Dried 103-105C								
EFF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	7.6	mg/L	12/31/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	230	mg/L	12/01/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	260	mg/L	12/02/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	250	mg/L	12/03/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	280	mg/L	12/04/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	260	mg/L	12/05/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	240	mg/L	12/06/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	270	mg/L	12/07/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	260	mg/L	12/08/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	280	mg/L	12/09/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	280	mg/L	12/10/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	260	mg/L	12/11/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	280	mg/L	12/12/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	240	mg/L	12/13/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	280	mg/L	12/14/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	220	mg/L	12/15/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	220	mg/L	12/16/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	240	mg/L	12/17/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	240	mg/L	12/18/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	220	mg/L	12/19/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	210	mg/L	12/20/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	290	mg/L	12/21/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	300	mg/L	12/22/2013	None	None	None	None

INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	270	mg/L	12/23/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	320	mg/L	12/24/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	290	mg/L	12/25/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	300	mg/L	12/26/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	310	mg/L	12/27/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	300	mg/L	12/28/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	330	mg/L	12/29/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	300	mg/L	12/30/2013	None	None	None	None
INF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Standard Method (18th & 19th) 5210 B: 5-Day BOD Test	=	270	mg/L	12/31/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	850	umhos/cm	12/02/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	860	umhos/cm	12/03/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	840	umhos/cm	12/04/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	790	umhos/cm	12/09/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	870	umhos/cm	12/10/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	920	umhos/cm	12/11/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	820	umhos/cm	12/16/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	880	umhos/cm	12/17/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	930	umhos/cm	12/18/2013	None	None	None	None
INF-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	790	umhos/cm	12/23/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	135.6	MGD	12/01/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	137.8	MGD	12/02/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	134.5	MGD	12/03/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	137.4	MGD	12/04/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	132.9	MGD	12/05/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	138.5	MGD	12/06/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	161.4	MGD	12/07/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	144.6	MGD	12/08/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	138.1	MGD	12/09/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	137.9	MGD	12/10/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	147.4	MGD	12/11/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	165.8	MGD	12/12/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	156.9	MGD	12/13/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	148.4	MGD	12/14/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	160.5	MGD	12/15/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	163.4	MGD	12/16/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	168.3	MGD	12/17/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	160.5	MGD	12/18/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	173.6	MGD	12/19/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	168.1	MGD	12/20/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	147.2	MGD	12/21/2013	None	None	None	None

INF-001	Flow	Data Unavailable	=	138.4	MGD	12/22/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	136.1	MGD	12/23/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	142.2	MGD	12/24/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	128.7	MGD	12/25/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	131	MGD	12/26/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	131.4	MGD	12/27/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	136.2	MGD	12/28/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	133.3	MGD	12/29/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	134.3	MGD	12/30/2013	None	None	None	None
INF-001	Flow	Data Unavailable	=	134.4	MGD	12/31/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	440	mg/L	12/02/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	410	mg/L	12/04/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	380	mg/L	12/09/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	460	mg/L	12/11/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	400	mg/L	12/16/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	450	mg/L	12/18/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	390	mg/L	12/23/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	400	mg/L	12/25/2013	None	None	None	None
INF-001	Total Dissolved Solids (TDS)	Standard Method (19th) 2540 C: Total Diss. Solids at 180 deg.	=	450	mg/L	12/30/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	260	mg/L	12/01/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	270	mg/L	12/02/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	300	mg/L	12/03/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	250	mg/L	12/04/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	300	mg/L	12/05/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	240	mg/L	12/06/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot.	=	280	mg/L	12/07/2013	None	None	None	None

		Sus. Solids Dried 103-105C								
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	200	mg/L	12/08/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	240	mg/L	12/09/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	260	mg/L	12/10/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	260	mg/L	12/11/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	230	mg/L	12/12/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	210	mg/L	12/13/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	230	mg/L	12/14/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	210	mg/L	12/15/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	200	mg/L	12/16/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	230	mg/L	12/17/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	230	mg/L	12/18/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	200	mg/L	12/19/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	200	mg/L	12/20/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	260	mg/L	12/21/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	250	mg/L	12/22/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	160	mg/L	12/23/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	260	mg/L	12/24/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot.	=	200	mg/L	12/25/2013	None	None	None	None

		Sus. Solids Dried 103-105C								
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	190	mg/L	12/26/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	280	mg/L	12/27/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	240	mg/L	12/28/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	140	mg/L	12/29/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	230	mg/L	12/30/2013	None	None	None	None
INF-001	Total Suspended Solids (TSS)	Standard Method (19th) 2540 D: Tot. Sus. Solids Dried 103-105C	=	240	mg/L	12/31/2013	None	None	None	None
RSWD-003	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	80	mg/L	12/12/2013	None	None	None	None
RSWD-003	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.38	mg/L	12/04/2013	None	None	None	None
RSWD-003	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.9	mg/L	12/12/2013	None	None	None	None
RSWD-003	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	1.7	mg/L	12/18/2013	None	None	None	None
RSWD-003	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.53	mg/L	12/27/2013	None	None	None	Calc
RSWD-003	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.47	mg/L	12/31/2013	None	None	None	Calc
RSWD-003	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	10.4	mg/L	12/04/2013	None	None	None	None
RSWD-003	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	12	mg/L	12/12/2013	None	None	None	None
RSWD-003	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.5	mg/L	12/18/2013	None	None	None	None
RSWD-003	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.7	mg/L	12/27/2013	None	None	None	None
RSWD-003	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.2	mg/L	12/31/2013	None	None	None	None
RSWD-003	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	196	umhos/cm	12/04/2013	None	None	None	None
RSWD-003	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	209	umhos/cm	12/12/2013	None	None	None	None
RSWD-003	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	225	umhos/cm	12/18/2013	None	None	None	None
RSWD-003	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	194	umhos/cm	12/27/2013	None	None	None	None

RSWD-003	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	188	umhos/cm	12/31/2013	None	None	None	None
RSWD-003	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	68	mg/L	12/12/2013	None	None	None	None
RSWD-003	Nitrogen, Total (as N)	Data Unavailable	<=	1.05	mg/L	12/04/2013	None	None	None	Calc
RSWD-003	Nitrogen, Total (as N)	Data Unavailable	<=	1.7	mg/L	12/12/2013	None	None	None	Calc
RSWD-003	Nitrogen, Total (as N)	Data Unavailable	<=	2.1	mg/L	12/18/2013	None	None	None	Calc
RSWD-003	Nitrogen, Total (as N)	Data Unavailable	<=	0.94	mg/L	12/27/2013	None	None	None	None
RSWD-003	Nitrogen, Total (as N)	Data Unavailable	<=	1.03	mg/L	12/31/2013	None	None	None	None
RSWD-003	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	51.4	Degrees F	12/04/2013	None	None	None	None
RSWD-003	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	43.2	Degrees F	12/12/2013	None	None	None	None
RSWD-003	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.2	Degrees F	12/18/2013	None	None	None	None
RSWD-003	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.3	Degrees F	12/27/2013	None	None	None	None
RSWD-003	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.3	Degrees F	12/31/2013	None	None	None	None
RSWD-003	Turbidity	Turbidity (Nephelometric)	=	4.1	NTU	12/04/2013	None	None	None	None
RSWD-003	Turbidity	Turbidity (Nephelometric)	=	6.3	NTU	12/12/2013	None	None	None	None
RSWD-003	Turbidity	Turbidity (Nephelometric)	=	6.8	NTU	12/18/2013	None	None	None	None
RSWD-003	Turbidity	Turbidity (Nephelometric)	=	6.1	NTU	12/27/2013	None	None	None	None
RSWD-003	Turbidity	Turbidity (Nephelometric)	=	5.4	NTU	12/31/2013	None	None	None	None
RSWD-003	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.5	SU	12/04/2013	None	None	None	None
RSWD-003	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	6.8	SU	12/12/2013	None	None	None	None
RSWD-003	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.3	SU	12/18/2013	None	None	None	None
RSWD-003	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/27/2013	None	None	None	None
RSWD-003	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.1	SU	12/31/2013	None	None	None	None
RSWD-004	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	80	mg/L	12/12/2013	None	None	None	None
RSWD-004	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.63	mg/L	12/04/2013	None	None	None	None
RSWD-004	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.74	mg/L	12/12/2013	None	None	None	None
RSWD-004	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.51	mg/L	12/18/2013	None	None	None	None
RSWD-004	Ammonia, Total (as N)		=	0.6	mg/L	12/27/2013	None	None	None	Calc

		Nitrogen, Ammonia (as N)								
RSWD-004	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.69	mg/L	12/31/2013	None	None	None	Calc
RSWD-004	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	10.3	mg/L	12/04/2013	None	None	None	None
RSWD-004	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.9	mg/L	12/12/2013	None	None	None	None
RSWD-004	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.6	mg/L	12/18/2013	None	None	None	None
RSWD-004	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.6	mg/L	12/27/2013	None	None	None	None
RSWD-004	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.2	mg/L	12/31/2013	None	None	None	None
RSWD-004	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	206	umhos/cm	12/04/2013	None	None	None	None
RSWD-004	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	202	umhos/cm	12/12/2013	None	None	None	None
RSWD-004	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	201	umhos/cm	12/18/2013	None	None	None	None
RSWD-004	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	195	umhos/cm	12/27/2013	None	None	None	None
RSWD-004	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	196	umhos/cm	12/31/2013	None	None	None	None
RSWD-004	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	66	mg/L	12/12/2013	None	None	None	None
RSWD-004	Nitrogen, Total (as N)	Data Unavailable	<=	1.19	mg/L	12/04/2013	None	None	None	Calc
RSWD-004	Nitrogen, Total (as N)	Data Unavailable	<=	1.3	mg/L	12/12/2013	None	None	None	Calc
RSWD-004	Nitrogen, Total (as N)	Data Unavailable	<=	1.12	mg/L	12/18/2013	None	None	None	Calc
RSWD-004	Nitrogen, Total (as N)	Data Unavailable	<=	0.97	mg/L	12/27/2013	None	None	None	None
RSWD-004	Nitrogen, Total (as N)	Data Unavailable	<=	1.12	mg/L	12/31/2013	None	None	None	None
RSWD-004	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	51.6	Degrees F	12/04/2013	None	None	None	None
RSWD-004	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	43.1	Degrees F	12/12/2013	None	None	None	None
RSWD-004	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	46.7	Degrees F	12/18/2013	None	None	None	None
RSWD-004	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.3	Degrees F	12/27/2013	None	None	None	None
RSWD-004	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.5	Degrees F	12/31/2013	None	None	None	None
RSWD-004	Turbidity	Turbidity (Nephelometric)	=	3.9	NTU	12/04/2013	None	None	None	None
RSWD-004	Turbidity	Turbidity (Nephelometric)	=	7.8	NTU	12/12/2013	None	None	None	None
RSWD-004	Turbidity		=	6.5	NTU	12/18/2013	None	None	None	None

		Turbidity (Nephelometric)								
RSWD-004	Turbidity	Turbidity (Nephelometric)	=	8.3	NTU	12/27/2013	None	None	None	None
RSWD-004	Turbidity	Turbidity (Nephelometric)	=	5.5	NTU	12/31/2013	None	None	None	None
RSWD-004	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.5	SU	12/04/2013	None	None	None	None
RSWD-004	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7	SU	12/12/2013	None	None	None	None
RSWD-004	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/18/2013	None	None	None	None
RSWD-004	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/27/2013	None	None	None	None
RSWD-004	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.2	SU	12/31/2013	None	None	None	None
RSWD-005	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	72	mg/L	12/12/2013	None	None	None	None
RSWD-005	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.72	mg/L	12/04/2013	None	None	None	None
RSWD-005	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.55	mg/L	12/12/2013	None	None	None	None
RSWD-005	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.72	mg/L	12/18/2013	None	None	None	None
RSWD-005	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.54	mg/L	12/27/2013	None	None	None	Calc
RSWD-005	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.97	mg/L	12/31/2013	None	None	None	Calc
RSWD-005	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	10.2	mg/L	12/04/2013	None	None	None	None
RSWD-005	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.8	mg/L	12/12/2013	None	None	None	None
RSWD-005	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.6	mg/L	12/18/2013	None	None	None	None
RSWD-005	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.6	mg/L	12/27/2013	None	None	None	None
RSWD-005	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11	mg/L	12/31/2013	None	None	None	None
RSWD-005	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	210	umhos/cm	12/04/2013	None	None	None	None
RSWD-005	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	200	umhos/cm	12/12/2013	None	None	None	None
RSWD-005	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	200	umhos/cm	12/18/2013	None	None	None	None
RSWD-005			=	190	umhos/cm	12/27/2013	None	None	None	None

	Electrical Conductivity @ 25 Deg. C	Specific Conductance								
RSWD-005	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	200	umhos/cm	12/31/2013	None	None	None	None
RSWD-005	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	68	mg/L	12/12/2013	None	None	None	None
RSWD-005	Nitrogen, Total (as N)	Data Unavailable	<=	1.2	mg/L	12/04/2013	None	None	None	Calc
RSWD-005	Nitrogen, Total (as N)	Data Unavailable	<=	1.18	mg/L	12/12/2013	None	None	None	Calc
RSWD-005	Nitrogen, Total (as N)	Data Unavailable	<=	1.4	mg/L	12/18/2013	None	None	None	Calc
RSWD-005	Nitrogen, Total (as N)	Data Unavailable	<=	1.08	mg/L	12/27/2013	None	None	None	None
RSWD-005	Nitrogen, Total (as N)	Data Unavailable	<=	1.4	mg/L	12/31/2013	None	None	None	None
RSWD-005	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	51.6	Degrees F	12/04/2013	None	None	None	None
RSWD-005	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	43.2	Degrees F	12/12/2013	None	None	None	None
RSWD-005	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	46.7	Degrees F	12/18/2013	None	None	None	None
RSWD-005	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.4	Degrees F	12/27/2013	None	None	None	None
RSWD-005	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47.6	Degrees F	12/31/2013	None	None	None	None
RSWD-005	Turbidity	Turbidity (Nephelometric)	=	4.1	NTU	12/04/2013	None	None	None	None
RSWD-005	Turbidity	Turbidity (Nephelometric)	=	6.1	NTU	12/12/2013	None	None	None	None
RSWD-005	Turbidity	Turbidity (Nephelometric)	=	5.2	NTU	12/18/2013	None	None	None	None
RSWD-005	Turbidity	Turbidity (Nephelometric)	=	5.5	NTU	12/27/2013	None	None	None	None
RSWD-005	Turbidity	Turbidity (Nephelometric)	=	6	NTU	12/31/2013	None	None	None	None
RSWD-005	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.5	SU	12/04/2013	None	None	None	None
RSWD-005	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.2	SU	12/12/2013	None	None	None	None
RSWD-005	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/18/2013	None	None	None	None
RSWD-005	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/27/2013	None	None	None	None
RSWD-005	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.3	SU	12/31/2013	None	None	None	None
RSWU-001	Alkalinity, Total (as CaCO3)	Standard Method (18th & 19th) 2320 B: Alkalinity by Titration	=	62	mg/L	12/12/2013	None	None	None	None
RSWU-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	ND		mg/L	12/04/2013	.04	None	None	None
RSWU-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	ND		mg/L	12/12/2013	.04	None	None	None
RSWU-001	Ammonia, Total (as N)		=	0.23	mg/L	12/18/2013	None	None	None	None

		Nitrogen, Ammonia (as N)								
RSWU-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	ND		mg/L	12/27/2013	.04	None	None	Calc
RSWU-001	Ammonia, Total (as N)	Nitrogen, Ammonia (as N)	=	0.2	mg/L	12/31/2013	None	None	None	Calc
RSWU-001	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	10.4	mg/L	12/04/2013	None	None	None	None
RSWU-001	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	12.2	mg/L	12/12/2013	None	None	None	None
RSWU-001	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.7	mg/L	12/18/2013	None	None	None	None
RSWU-001	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.8	mg/L	12/27/2013	None	None	None	None
RSWU-001	Dissolved Oxygen	Standard Method (19th) 4500-O G:Diss. O by Membrane Electrode	=	11.3	mg/L	12/31/2013	None	None	None	None
RSWU-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	196	umhos/cm	12/04/2013	None	None	None	None
RSWU-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	180	umhos/cm	12/12/2013	None	None	None	None
RSWU-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	185	umhos/cm	12/18/2013	None	None	None	None
RSWU-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	181	umhos/cm	12/27/2013	None	None	None	None
RSWU-001	Electrical Conductivity @ 25 Deg. C	Specific Conductance	=	175	umhos/cm	12/31/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8020	cfs	12/01/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7720	cfs	12/02/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7880	cfs	12/03/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8230	cfs	12/04/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8070	cfs	12/05/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7900	cfs	12/06/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8420	cfs	12/07/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8750	cfs	12/08/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8750	cfs	12/09/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8580	cfs	12/10/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8370	cfs	12/11/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8170	cfs	12/12/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8190	cfs	12/13/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8220	cfs	12/14/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8130	cfs	12/15/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8140	cfs	12/16/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8090	cfs	12/17/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7950	cfs	12/18/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8890	cfs	12/19/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8100	cfs	12/20/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8440	cfs	12/21/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8590	cfs	12/22/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8430	cfs	12/23/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8390	cfs	12/24/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8470	cfs	12/25/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8300	cfs	12/26/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	8160	cfs	12/27/2013	None	None	None	None

RSWU-001	Flow	Data Unavailable	=	7890	cfs	12/28/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7910	cfs	12/29/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7630	cfs	12/30/2013	None	None	None	None
RSWU-001	Flow	Data Unavailable	=	7640	cfs	12/31/2013	None	None	None	None
RSWU-001	Hardness, Total (as CaCO3)	Standard Method 2340 B: Hardness by Calculation	=	64	mg/L	12/12/2013	None	None	None	None
RSWU-001	Nitrogen, Total (as N)	Data Unavailable	<=	0.41	mg/L	12/04/2013	None	None	None	Calc
RSWU-001	Nitrogen, Total (as N)	Data Unavailable	<=	0.62	mg/L	12/12/2013	None	None	None	Calc
RSWU-001	Nitrogen, Total (as N)	Data Unavailable	<=	0.48	mg/L	12/18/2013	None	None	None	Calc
RSWU-001	Nitrogen, Total (as N)	Data Unavailable	<=	0.37	mg/L	12/27/2013	None	None	None	None
RSWU-001	Nitrogen, Total (as N)	Data Unavailable	<=	0.33	mg/L	12/31/2013	None	None	None	None
RSWU-001	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	51.1	Degrees F	12/04/2013	None	None	None	None
RSWU-001	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	42.6	Degrees F	12/12/2013	None	None	None	None
RSWU-001	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	46.4	Degrees F	12/18/2013	None	None	None	None
RSWU-001	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	47	Degrees F	12/27/2013	None	None	None	None
RSWU-001	Temperature	Standard Method (19th) 2550 B: Temperature, Lab and Field Methods	=	46.9	Degrees F	12/31/2013	None	None	None	None
RSWU-001	Turbidity	Turbidity (Nephelometric)	=	6.2	NTU	12/04/2013	None	None	None	None
RSWU-001	Turbidity	Turbidity (Nephelometric)	=	7.2	NTU	12/12/2013	None	None	None	None
RSWU-001	Turbidity	Turbidity (Nephelometric)	=	6.7	NTU	12/18/2013	None	None	None	None
RSWU-001	Turbidity	Turbidity (Nephelometric)	=	5.7	NTU	12/27/2013	None	None	None	None
RSWU-001	Turbidity	Turbidity (Nephelometric)	=	4.7	NTU	12/31/2013	None	None	None	None
RSWU-001	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/04/2013	None	None	None	None
RSWU-001	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	6.6	SU	12/12/2013	None	None	None	None
RSWU-001	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.4	SU	12/18/2013	None	None	None	None
RSWU-001	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.3	SU	12/27/2013	None	None	None	None
RSWU-001	pH	Standard Method (19th) 4500-H+ B: pH by Electrometric Method	=	7.1	SU	12/31/2013	None	None	None	None

Total Analytical Data Points: 567

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Data Summary-Calculated

Monitoring Point	Parameter	Analytical Method	Qualifier	Result	Units	Sample Date	Comments
EFF-001	Acute Toxicity	3-Sample Median	=	100	% survival	12/02/2013	None
EFF-001	Acute Toxicity	3-Sample Median	=	100	% survival	12/09/2013	None

EFF-001	Acute Toxicity	3-Sample Median	=	100	% survival	12/16/2013	None
EFF-001	Acute Toxicity	3-Sample Median	=	100	% survival	12/23/2013	None
EFF-001	Acute Toxicity	3-Sample Median	=	100	% survival	12/30/2013	None
EFF-001	Aluminum, Total Recoverable	Average Monthly (AMEL)	=	12	ug/L	12/31/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	34254	lb/day	12/01/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	26087	lb/day	12/02/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	23068	lb/day	12/03/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	29318	lb/day	12/04/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	29008	lb/day	12/05/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	36104	lb/day	12/06/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	40574	lb/day	12/07/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	31006	lb/day	12/07/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	33	mg/L	12/07/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	31972	lb/day	12/08/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	36549	lb/day	12/09/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	23848	lb/day	12/10/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	27202	lb/day	12/11/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	30577	lb/day	12/12/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	11355	lb/day	12/13/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	40436	lb/day	12/14/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	29065	lb/day	12/14/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	34	mg/L	12/14/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	25337	lb/day	12/15/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	31248	lb/day	12/16/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	31045	lb/day	12/17/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	38309	lb/day	12/18/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	54619	lb/day	12/19/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	43417	lb/day	12/20/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	40893	lb/day	12/21/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	35	mg/L	12/21/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	37633	lb/day	12/21/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	37260	lb/day	12/22/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	34708	lb/day	12/23/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	32159	lb/day	12/24/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	26218	lb/day	12/25/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	29704	lb/day	12/26/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	31555	lb/day	12/27/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	40199	lb/day	12/28/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	34	mg/L	12/28/2013	None
EFF-001	Ammonia, Total (as N)	Average Weekly (AWEL)	=	33041	lb/day	12/28/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	37397	lb/day	12/29/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	34839	lb/day	12/30/2013	None
EFF-001	Ammonia, Total (as N)	Daily Discharge	=	30164	lb/day	12/31/2013	None
EFF-001	Ammonia, Total (as N)	Average Monthly (AMEL)	=	34	mg/L	12/31/2013	None
EFF-001	Ammonia, Total (as N)	Average Monthly (AMEL)	=	32885	lb/day	12/31/2013	None
EFF-001	BOD5 @ 20 Deg. C, Percent Removal	Average Monthly (AMEL)	=	98	%	12/31/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3022	lb/day	12/01/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3366	lb/day	12/02/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3076	lb/day	12/03/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	4729	lb/day	12/04/2013	None

EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	4679	lb/day	12/05/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3903	lb/day	12/06/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	4	mg/L	12/07/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	5796	lb/day	12/07/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	4062	lb/day	12/07/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	4996	lb/day	12/08/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	5538	lb/day	12/09/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3407	lb/day	12/10/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	3778	lb/day	12/11/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	5559	lb/day	12/12/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	1622	lb/day	12/13/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	5946	lb/day	12/14/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	5	mg/L	12/14/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	4396	lb/day	12/14/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	4343	lb/day	12/15/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	6433	lb/day	12/16/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	4704	lb/day	12/17/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	6760	lb/day	12/18/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	7381	lb/day	12/19/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	7041	lb/day	12/20/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	6815	lb/day	12/21/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	6	mg/L	12/21/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	6272	lb/day	12/21/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	6210	lb/day	12/22/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	5785	lb/day	12/23/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	7035	lb/day	12/24/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	6328	lb/day	12/25/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	5569	lb/day	12/26/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	7012	lb/day	12/27/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	6718	lb/day	12/28/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Weekly (AWEL)	=	7	mg/L	12/28/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	9045	lb/day	12/28/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	10284	lb/day	12/29/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	8474	lb/day	12/30/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Monthly (AMEL)	=	6	mg/L	12/31/2013	None

EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Daily Discharge	=	7313	lb/day	12/31/2013	None
EFF-001	Biochemical Oxygen Demand (BOD) (5-day @ 20 Deg. C)	Average Monthly (AMEL)	=	5676	lb/day	12/31/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/01/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/01/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/01/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/02/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/02/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/02/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/03/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/03/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/03/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/04/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/04/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/04/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/05/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/05/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/05/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/06/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/06/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/06/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/07/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/07/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/07/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/08/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/08/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/08/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/09/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/09/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/09/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/10/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/10/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/10/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/11/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/11/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/11/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/12/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/12/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/12/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/13/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/13/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/13/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/14/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/14/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/14/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/15/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/15/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/15/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/16/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/16/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/16/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/17/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/17/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/17/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/18/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/18/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/18/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/19/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/19/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/19/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/20/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/20/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/20/2013	None

EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/21/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/21/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/21/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/22/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/22/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/22/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/23/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/23/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/23/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/24/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/24/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/24/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/25/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/25/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/25/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/26/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/26/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/26/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/27/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/27/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/27/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/28/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/28/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/28/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/29/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/29/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/29/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/30/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/30/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/30/2013	None
EFF-001	Chlorine, Total Residual	Daily Average (Mean)	=	0	mg/L	12/31/2013	None
EFF-001	Chlorine, Total Residual	Average Monthly (AMEL)	=	0	mg/L	12/31/2013	None
EFF-001	Chlorine, Total Residual	Daily Maximum	=	0	mg/L	12/31/2013	None
EFF-001	Chlorine, Total Residual	Daily Minimum	=	0	mg/L	12/31/2013	None
EFF-001	Copper, Total Recoverable	Average Monthly (AMEL)	=	3.9	ug/L	12/10/2013	est conc
EFF-001	Dibenzo(a,h)anthracene	Average Monthly (AMEL)	ND		ug/L	12/31/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2	mg/L	12/01/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	4.6	mg/L	12/01/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0	mg/L	12/01/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.1	mg/L	12/02/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.2	mg/L	12/02/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.5	mg/L	12/02/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	4.7	mg/L	12/03/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.2	mg/L	12/03/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.6	mg/L	12/03/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	2.2	mg/L	12/04/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.9	mg/L	12/04/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.7	mg/L	12/04/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6	mg/L	12/05/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.4	mg/L	12/05/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.9	mg/L	12/05/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3	mg/L	12/06/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.5	mg/L	12/06/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6.3	mg/L	12/06/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.4	mg/L	12/07/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.7	mg/L	12/07/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.4	mg/L	12/07/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6.2	mg/L	12/08/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.6	mg/L	12/08/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.3	mg/L	12/08/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	4.9	mg/L	12/09/2013	None

EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.4	mg/L	12/09/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.7	mg/L	12/09/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.3	mg/L	12/10/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.5	mg/L	12/10/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	7.2	mg/L	12/10/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.6	mg/L	12/11/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6.6	mg/L	12/11/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	3.4	mg/L	12/11/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.9	mg/L	12/12/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.1	mg/L	12/12/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.8	mg/L	12/12/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.5	mg/L	12/13/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.3	mg/L	12/13/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.1	mg/L	12/13/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	7	mg/L	12/14/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	2.8	mg/L	12/14/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.5	mg/L	12/14/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5	mg/L	12/15/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.3	mg/L	12/15/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.8	mg/L	12/15/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.1	mg/L	12/16/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.9	mg/L	12/16/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.4	mg/L	12/16/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.8	mg/L	12/17/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5	mg/L	12/17/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.36	mg/L	12/17/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	2.4	mg/L	12/18/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6.4	mg/L	12/18/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.6	mg/L	12/18/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.3	mg/L	12/19/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.1	mg/L	12/19/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6.2	mg/L	12/19/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	2.3	mg/L	12/20/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6.7	mg/L	12/20/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	4.9	mg/L	12/20/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	3.3	mg/L	12/21/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	5	mg/L	12/21/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	6	mg/L	12/21/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.7	mg/L	12/22/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.9	mg/L	12/22/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.8	mg/L	12/22/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	4	mg/L	12/23/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.7	mg/L	12/23/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0	mg/L	12/23/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.2	mg/L	12/24/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.4	mg/L	12/24/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	2.3	mg/L	12/24/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	3.8	mg/L	12/25/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.9	mg/L	12/25/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	1.1	mg/L	12/25/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	2.9	mg/L	12/26/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	1.9	mg/L	12/26/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0	mg/L	12/26/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5	mg/L	12/27/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2	mg/L	12/27/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.1	mg/L	12/27/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	3.3	mg/L	12/28/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	2.4	mg/L	12/28/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.3	mg/L	12/28/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.8	mg/L	12/29/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.7	mg/L	12/29/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	4.5	mg/L	12/29/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0	mg/L	12/30/2013	None

EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.7	mg/L	12/30/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	4.8	mg/L	12/30/2013	None
EFF-001	Dissolved Oxygen	Daily Minimum	=	0.6	mg/L	12/31/2013	None
EFF-001	Dissolved Oxygen	Daily Average (Mean)	=	2.9	mg/L	12/31/2013	None
EFF-001	Dissolved Oxygen	Daily Maximum	=	5.5	mg/L	12/31/2013	None
EFF-001	Methylene Chloride	Average Monthly (AMEL)	DNQ	0.3	ug/L	12/10/2013	None
EFF-001	Nitrate, Total (as N)	Average Monthly (AMEL)	ND		mg/L	12/31/2013	None
EFF-001	Settleable Solids	Average Monthly (AMEL)	ND		ml/L	12/31/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/01/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.7	mg/L	12/01/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.8	mg/L	12/01/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.5	mg/L	12/02/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	6	mg/L	12/02/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/02/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	6.8	mg/L	12/03/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.9	mg/L	12/03/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/03/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/04/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.4	mg/L	12/04/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.7	mg/L	12/04/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.9	mg/L	12/05/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.2	mg/L	12/05/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/05/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/06/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	8.3	mg/L	12/06/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	0.9	mg/L	12/06/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.8	mg/L	12/07/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/07/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.5	mg/L	12/07/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/08/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.4	mg/L	12/08/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.7	mg/L	12/08/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	6	mg/L	12/09/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.8	mg/L	12/09/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/09/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.4	mg/L	12/10/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/10/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.4	mg/L	12/10/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/11/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.2	mg/L	12/11/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.8	mg/L	12/11/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/12/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.2	mg/L	12/12/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	0.5	mg/L	12/12/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	4	mg/L	12/13/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/13/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	3.7	mg/L	12/13/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.9	mg/L	12/14/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	3.2	mg/L	12/14/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/14/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.3	mg/L	12/15/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	3.1	mg/L	12/15/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/15/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.4	mg/L	12/16/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/16/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.9	mg/L	12/16/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.1	mg/L	12/17/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/17/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.3	mg/L	12/17/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/18/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.6	mg/L	12/18/2013	None

EFF-001	Sulfur Dioxide	Daily Minimum	=	1.9	mg/L	12/18/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/19/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.7	mg/L	12/19/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.6	mg/L	12/19/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	0.7	mg/L	12/20/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/20/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.9	mg/L	12/20/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.7	mg/L	12/21/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7	mg/L	12/21/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/21/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.9	mg/L	12/22/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.7	mg/L	12/22/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/22/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/23/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.5	mg/L	12/23/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.5	mg/L	12/23/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	6.6	mg/L	12/24/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/24/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.7	mg/L	12/24/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/25/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.5	mg/L	12/25/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.9	mg/L	12/25/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.5	mg/L	12/26/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.5	mg/L	12/26/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/26/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.6	mg/L	12/27/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/27/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	6	mg/L	12/27/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/28/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	1.5	mg/L	12/28/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	6.7	mg/L	12/28/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	7.7	mg/L	12/29/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.7	mg/L	12/29/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/29/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/30/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.6	mg/L	12/30/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.1	mg/L	12/30/2013	None
EFF-001	Sulfur Dioxide	Daily Average (Mean)	=	5.6	mg/L	12/31/2013	None
EFF-001	Sulfur Dioxide	Daily Maximum	>=	20	mg/L	12/31/2013	None
EFF-001	Sulfur Dioxide	Daily Minimum	=	2.3	mg/L	12/31/2013	None
EFF-001	Temperature	Daily Minimum	=	71.1	Degrees F	12/01/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	73	Degrees F	12/01/2013	None
EFF-001	Temperature	Daily Maximum	=	73.7	Degrees F	12/01/2013	None
EFF-001	Temperature	Daily Minimum	=	71.7	Degrees F	12/02/2013	None
EFF-001	Temperature	Daily Maximum	=	73.6	Degrees F	12/02/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	73	Degrees F	12/02/2013	None
EFF-001	Temperature	Daily Maximum	=	73.4	Degrees F	12/03/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	72.7	Degrees F	12/03/2013	None
EFF-001	Temperature	Daily Minimum	=	66.1	Degrees F	12/03/2013	None
EFF-001	Temperature	Daily Minimum	=	70	Degrees F	12/04/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	71.8	Degrees F	12/04/2013	None
EFF-001	Temperature	Daily Maximum	=	72.8	Degrees F	12/04/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	71.3	Degrees F	12/05/2013	None
EFF-001	Temperature	Daily Minimum	=	68.8	Degrees F	12/05/2013	None
EFF-001	Temperature	Daily Maximum	=	72.4	Degrees F	12/05/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	71.3	Degrees F	12/06/2013	None
EFF-001	Temperature	Daily Maximum	=	72.3	Degrees F	12/06/2013	None
EFF-001	Temperature	Daily Minimum	=	68.3	Degrees F	12/06/2013	None
EFF-001	Temperature	Daily Minimum	=	67.3	Degrees F	12/07/2013	None
EFF-001	Temperature	Daily Maximum	=	71.3	Degrees F	12/07/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.3	Degrees F	12/07/2013	None
EFF-001	Temperature	Daily Minimum	=	66.8	Degrees F	12/08/2013	None
EFF-001	Temperature	Daily Maximum	=	70.7	Degrees F	12/08/2013	None

EFF-001	Temperature	Daily Average (Mean)	=	69.4	Degrees F	12/08/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69	Degrees F	12/09/2013	None
EFF-001	Temperature	Daily Maximum	=	71.4	Degrees F	12/09/2013	None
EFF-001	Temperature	Daily Minimum	=	66.9	Degrees F	12/09/2013	None
EFF-001	Temperature	Daily Minimum	=	68.2	Degrees F	12/10/2013	None
EFF-001	Temperature	Daily Maximum	=	71.7	Degrees F	12/10/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	68.9	Degrees F	12/10/2013	None
EFF-001	Temperature	Daily Minimum	=	68	Degrees F	12/11/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.3	Degrees F	12/11/2013	None
EFF-001	Temperature	Daily Maximum	=	71.1	Degrees F	12/11/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69	Degrees F	12/12/2013	None
EFF-001	Temperature	Daily Minimum	=	67.6	Degrees F	12/12/2013	None
EFF-001	Temperature	Daily Maximum	=	71.2	Degrees F	12/12/2013	None
EFF-001	Temperature	Daily Maximum	=	71.4	Degrees F	12/13/2013	None
EFF-001	Temperature	Daily Minimum	=	68.7	Degrees F	12/13/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.6	Degrees F	12/13/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.4	Degrees F	12/14/2013	None
EFF-001	Temperature	Daily Minimum	=	68	Degrees F	12/14/2013	None
EFF-001	Temperature	Daily Maximum	=	71.5	Degrees F	12/14/2013	None
EFF-001	Temperature	Daily Minimum	=	69.2	Degrees F	12/15/2013	None
EFF-001	Temperature	Daily Maximum	=	70.7	Degrees F	12/15/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.8	Degrees F	12/15/2013	None
EFF-001	Temperature	Daily Maximum	=	70.8	Degrees F	12/16/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.7	Degrees F	12/16/2013	None
EFF-001	Temperature	Daily Minimum	=	69.3	Degrees F	12/16/2013	None
EFF-001	Temperature	Daily Minimum	=	68.7	Degrees F	12/17/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.2	Degrees F	12/17/2013	None
EFF-001	Temperature	Daily Maximum	=	70.9	Degrees F	12/17/2013	None
EFF-001	Temperature	Daily Minimum	=	67.7	Degrees F	12/18/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	68.7	Degrees F	12/18/2013	None
EFF-001	Temperature	Daily Maximum	=	69.5	Degrees F	12/18/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	68.2	Degrees F	12/19/2013	None
EFF-001	Temperature	Daily Minimum	=	66.1	Degrees F	12/19/2013	None
EFF-001	Temperature	Daily Maximum	=	69.8	Degrees F	12/19/2013	None
EFF-001	Temperature	Daily Minimum	=	65	Degrees F	12/20/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	66.4	Degrees F	12/20/2013	None
EFF-001	Temperature	Daily Maximum	=	67.6	Degrees F	12/20/2013	None
EFF-001	Temperature	Daily Maximum	=	69.1	Degrees F	12/21/2013	None
EFF-001	Temperature	Daily Minimum	=	64.2	Degrees F	12/21/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	66.9	Degrees F	12/21/2013	None
EFF-001	Temperature	Daily Maximum	=	70.5	Degrees F	12/22/2013	None
EFF-001	Temperature	Daily Minimum	=	67.7	Degrees F	12/22/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.2	Degrees F	12/22/2013	None
EFF-001	Temperature	Daily Minimum	=	69.4	Degrees F	12/23/2013	None
EFF-001	Temperature	Daily Maximum	=	70.8	Degrees F	12/23/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	70.2	Degrees F	12/23/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	70.2	Degrees F	12/24/2013	None
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EFF-001	Temperature	Daily Maximum	=	70.6	Degrees F	12/25/2013	None
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EFF-001	Temperature	Daily Maximum	=	70	Degrees F	12/31/2013	None
EFF-001	Temperature	Daily Average (Mean)	=	69.6	Degrees F	12/31/2013	None
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EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.5	SU	12/19/2013	None
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EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.6	SU	12/20/2013	None
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EFF-001	pH	Instantaneous Minimum (IMIN)	=	6.2	SU	12/20/2013	None
EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.6	SU	12/21/2013	None
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EFF-001	pH	Daily Average (Mean)	=	6.4	SU	12/21/2013	None
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EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.4	SU	12/24/2013	None
EFF-001	pH	Daily Average (Mean)	=	6.3	SU	12/24/2013	None
EFF-001	pH	Instantaneous Minimum (IMIN)	=	6.2	SU	12/25/2013	None
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EFF-001	pH	Daily Average (Mean)	=	6.4	SU	12/26/2013	None
EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.5	SU	12/26/2013	None
EFF-001	pH	Instantaneous Minimum (IMIN)	=	6.3	SU	12/27/2013	None
EFF-001	pH	Daily Average (Mean)	=	6.4	SU	12/27/2013	None
EFF-001	pH		=	6.5	SU	12/27/2013	None

		Instantaneous Maximum (IMAX)					
EFF-001	pH	Daily Average (Mean)	=	6.5	SU	12/28/2013	None
EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.5	SU	12/28/2013	None
EFF-001	pH	Instantaneous Minimum (IMIN)	=	6.3	SU	12/28/2013	None
EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.5	SU	12/29/2013	None
EFF-001	pH	Instantaneous Minimum (IMIN)	=	6.3	SU	12/29/2013	None
EFF-001	pH	Daily Average (Mean)	=	6.4	SU	12/29/2013	None
EFF-001	pH	Daily Average (Mean)	=	6.4	SU	12/30/2013	None
EFF-001	pH	Instantaneous Minimum (IMIN)	=	6.3	SU	12/30/2013	None
EFF-001	pH	Instantaneous Maximum (IMAX)	=	6.5	SU	12/30/2013	None
EFF-001	pH	Daily Average (Mean)	=	6.4	SU	12/31/2013	None

Reconsideration of Certain Technical Matters of the Ballona Creek Estuary Toxics TMDL and Ballona Creek Metals TMDL

STAFF REPORT

California Regional Water Quality Control Board
Los Angeles Region
320 West Fourth Street, Suite 200
Los Angeles, California 90013

Revised November 2013

Acronyms

303(d) list	State of California Clean Water Act Section 303(d) List of Water Quality Limited Segments
BMP	Best Management Practice
$CaCO^3$	calcium carbonate
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CMP	Coordinated Monitoring Plan
CTR	California Toxics Rule
CWA	Clean Water Act
ERL	Effects Range Low
FCG	Fish Contaminant Goal
g/day	grams per day
g/day/ac	gram per day per acre
g/yr	gram per year
kg/yr	kilogram per year
LA	Load Allocation
LACFCD	Los Angeles County Flood Control District
m^3/year	cubic meters per year
mg/L	milligrams per liter
mg/kg	milligram per kilogram
ml	milliliter
MLOE	Multiple Lines of Evidence
mt/m^3	metric ton per cubic meter
MTRLs	Maximum Tissue Residual Levels
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollution Discharge Elimination System
OAL	Office of Administrative Law
OEHHA	Office of Environmental Health Hazard Assessment
p-value	Probability of Rejecting the Null Hypothesis
R^2	Coefficient of Determination
RL	Reporting Limit
SCCWRP	Southern California Coastal Water Research Project
SIP	State Implementation Policy
SQO	Sediment Quality Objectives
SWRCB	State Water Resources Control Board
TIE	Toxicity Identification Evaluation
TMDL	Total Maximum Daily Load
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
WLA	Waste Load Allocation

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1. Introduction

This staff report presents technical analyses in support of recommendations to reconsider aspects of two TMDLs in the Ballona Creek watershed, which were previously established by the Los Angeles Regional Water Quality Control Board (Regional Board). The two TMDLs to be re-considered in this action are the Ballona Creek Estuary Toxics TMDL and the Ballona Creek Metals TMDL. The regulatory background, beneficial uses to be protected, geographical extent and complete TMDL elements along with supporting analysis are described in the respective staff reports and amendments to the Los Angeles Region Water Quality Control Plan (Basin Plan) (LARWQCB, 2005a and LARWQCB, 2005b) at (http://www.waterboards.ca.gov/losangeles/water_issues/programs/tmdl/tmdl_list.shtml) and are not repeated, herein.

While the Regional Board can amend the Basin Plan to adjust a TMDL at any time, implementation plans for TMDLs in the Los Angeles Region have often included scheduled "reconsiderations" by the Regional Board at a specific point during implementation. Specific reconsiderations have been included so that aspects of the TMDL, or the TMDL implementation schedule, could be adjusted based on anticipated new information or methods. This approach has allowed the Regional Board to establish TMDLs with all the required elements, including numeric targets, allocations, and implementation schedules, so that responsible parties could begin implementing the TMDL to improve water quality, while acknowledging the potential benefit to refining certain technical elements of the TMDL or the implementation schedule after additional study and data collection were completed.

2. Background

2.1 History of the TMDLs

Both the Ballona Creek Estuary Toxics TMDL (2006 Toxics TMDL) and the Ballona Creek Metals TMDL (2008 Metals TMDL) were developed and adopted by the Regional Board at the same time. Subsequent litigation delayed the final effective date of the 2008 Metals TMDL, however the final compliance dates remained the same.

The 2006 Toxics TMDL was adopted by the Regional Board on July 7, 2005 (Resolution No. R05-008), approved by the State Water Resources Control Board (State Board) on October 20, 2005 (Resolution No. 2005-0076), and approved by the United States Environmental Protection Agency (USEPA) on December 22, 2005. The effective date of the TMDL is January 11, 2006 upon the filing of the no effect determination with the California Department of Fish and Wildlife.

The 2006 Toxics TMDL addressed impairments due to toxic pollutants in sediment and fish tissue in Ballona Creek and Ballona Creek Estuary including cadmium, copper, lead, silver, zinc, chlordane, DDT, PCBs, and PAHs.

The TMDL set numeric sediment targets based on effects range-low (ERLs) values, which are sediment quality guidelines compiled by the National Oceanic and Atmospheric Administration.

The loading capacity of the sediments was estimated from the annual average net deposition of fine-grained material at the mouth of the Ballona Creek Estuary. This was translated into pollutant specific numbers using the sediment targets and an estimate of bulk sediment density of the fine-grained deposits. This provided a pollutant-specific estimate of the maximum load that could be deposited to the sediments on an annual basis.

The 2008 Metals TMDL was adopted by the Regional Board on July 7, 2005 and approved by USEPA on December 22, 2005.

On February 16, 2006, several cities in Los Angeles County filed a petition for a writ of mandate challenging many aspects of the Los Angeles River and the Ballona Creek Metals TMDLs. On May 24, 2007, the Los Angeles County Superior Court adopted the third of three rulings that collectively denied all of the Cities' challenges to the TMDLs, except for one CEQA claim. Accordingly, the Court directed the Regional Board to consider alternatives to the project before re-adopting the Los Angeles River and Ballona Creek Metals TMDLs. The writ was limited to these issues, and the TMDLs were affirmed in all other respects.

The Regional Board re-adopted the Metals TMDL with a new alternatives analysis on September 6, 2007 (Resolution No. R07-015). The TMDL was approved by the State Board on June 17, 2008 (Resolution No. 2008-0045) and by USEPA on October 29, 2008. The effective date of the TMDL is October 29, 2008, upon USEPA approval.

The 2008 Ballona Creek Metals TMDL addressed impairments in the water column in Ballona Creek for copper, lead, selenium, and zinc. Additionally, the TMDL addressed lead in the water column in Sepulveda Canyon Channel, a tributary to Ballona Creek. The TMDL set numeric targets based on the numeric water quality criteria contained in the California Toxics Rule (CTR).

A Coordinated Monitoring Plan (CMP) was submitted to the Regional Board by the responsible parties and approved on June 25, 2009. Minor revisions have been made since. Subsequently, four annual monitoring reports have been submitted to the Regional Board.

The responsible parties have submitted two separate implementation plans: one plan from the County of Los Angeles and one plan from the City of Los Angeles, Beverly Hills, Culver City, Inglewood, Santa Monica, West Hollywood, and the California Department of Transportation. One recommended study has been completed: Toxicity Identification Evaluation of Sediment (Sediment TIE) in Ballona Creek Estuary (December, 2010).

CMP data (2009 to 2012) show exceedances of the current TMDL numeric targets in water, occurring mostly in wet-weather.

Dry-weather exceedances were observed only for copper both in the total recoverable and dissolved fraction and at all the monitoring stations during the early years (2009 and 2010) of CMP monitoring but were not observed during later years (2010 to 2012).

Both copper and zinc frequently exceeded the current TMDL wet-weather numeric targets at all the monitoring stations. For copper, exceedances in the total fraction were observed almost twice as often as in the dissolved fraction. For zinc, exceedances in the total fraction were observed almost seven times more often than in the dissolved fraction. Lead exceedances occurred exclusively in the total fraction and seldom in the later years. See Appendix D for a thorough summary of CMP water data.

The CMP data also showed exceedances of the TMDL DDT sediment target. The other bioaccumulatives (i.e. PCBs and chlordane) rarely exceeded sediment targets or were not detected. The metals exceedances were more frequent in the earlier years of CMP sediment monitoring (2007 to 2009). In later years (2009 to 2011) exceedances of metals in sediment have not been observed. Sediment toxicity, as measured by amphipod survival tests, continued to be observed. Fish tissues samples from CMP monitoring were available for one year (2012) and were mostly non-detect for metals and most of the organics except DDT. See Appendix D for a thorough summary of the CMP sediment data.

2.2 Required Elements

This reconsideration is not a general reconsideration of *all* the elements of the TMDLs but a re-examination of certain technical issues, which may warrant revision based upon further data collection and analysis, study or experience or which warrant revision due to newly adopted regulations, such as the State's Sediment Quality Objectives (SWRCB, 2009). Table 2-1 shows the reconsideration language from the two TMDLs that is included in the Basin Plan.

Table 2-1 Summary of Reconsideration Elements Specified in the TMDLs

TMDL Due Date	Regional Board Action
2006 Ballona Creek Estuary Toxics TMDL January 11, 2012	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.
2008 Ballona Creek Metals TMDL January 11, 2011	The Regional Board shall reconsider this TMDL to re-evaluate the waste load allocations and the implementation schedule.

2.3 Special Studies

In both the 2006 Toxics TMDLs and 2008 Metals TMDLs, the implementation schedule "*allows time for special studies that may serve to refine the estimated of loading capacity, waste load* *and/or load allocations, and other studies that may serve to optimize implementation efforts*" (LARWQCB, 2007).

2.3.1 Metals TMDL 2008

The 2008 Ballona Creek Metals TMDL identified certain studies, which could be useful in a reconsideration of the TMDL (LARWQCB, 2005b):

- Refinement of hydrologic and water quality model
- Additional source assessment
- Refinement of potency factors correlation between total suspended solids and metals loadings during dry and wet weather
- Correlation between short-term rainfall intensity and metals loadings for use in sizing in-line structural BMPs
- Correlation between storm volume and total recoverable metals loading for use in sizing storm water retention facilities
- Refined estimates of metals partitioning coefficients, conversion factors, and site-specific toxicity
- Evaluation of potential contribution of aerial deposition and sources of aerial deposition

Stakeholders have yet to conduct any of the studies identified in the TMDL.

2.3.2 2006 Toxics TMDL

The Ballona Creek Toxics TMDL allowed time for certain studies named in the TMDL to be conducted to help inform the Regional Board's re-consideration of the TMDL. These studies include:

- Evaluation and use of low detection level techniques to evaluate water quality concentrations for those contaminants where standard detection limits cannot be used to assess compliance for CTR criteria or are not sufficient for estimating source loadings from tributaries and storm water;
- Developing and implementing a monitoring program to collect the data necessary to apply a multiple lines of evidence approach;
- Evaluate partitioning coefficients between water column and sediment to assess the contribution of water column discharges to sediment concentrations in the Estuary;
- Evaluation and use of sediment TIEs to evaluate causes of any recurring sediment toxicity;
- Studies to refine relationship between pollutants and suspended solids aimed at better understanding of the delivery of pollutants to the watershed;
- Studies to understand transport of sediments to the estuary, including the relationship between storm flows, sediment loadings to the estuary, and sediment deposition patterns within the estuary; and,
- Studies to evaluate effectiveness of BMPs to address pollutants and/or sediments

Of the studies listed above, stakeholders have thus far completed a Toxicity Identification Evaluation for sediment in the Ballona Creek Estuary in 2010 (Bay et al., 2010). The purpose of the study was to determine the extent of chemical contamination within the estuary and identify the likely causes of toxicity.

Some of the findings of the studies are listed below.

1. Chemical contamination of Ballona Creek Estuary sediments is widespread and causing toxicity to sediment-dwelling organisms.
2. Sediment quality in Ballona Creek Estuary shows high seasonal and spatial variability.
3. Pyrethroids, and possibly other current use pesticides, are the principal cause of sediment toxicity in Ballona Creek Estuary.
4. The contaminants currently listed in the Ballona Creek Estuary TMDL are minor contributors to the toxicity

More detailed discussion of the findings can be found in section 3.2.2.

2.3.3 BMP Effectiveness

Both the Toxic Pollutants TMDL and the Metals TMDL required the construction industry to submit the results of wet-weather BMP effectiveness studies to the Regional Board for consideration by January 11, 2013. The purpose of the studies was for the Regional Board to approve BMPs that would result in attainment of wet-weather waste load allocations to be included in the construction stormwater permit. The Building Industry Association initiated a BMP effectiveness study and published the results (Wu, 2010). The study investigated the concentrations of cadmium, copper, lead, and zinc as well as the potential leachability of these metals from a first flush of 18 different BMPs. BMPs with the highest heavy metal concentration did not necessarily have the highest potential to release heavy metals as percentage of the total amount of metals. The study suggests that the release of heavy metals from soil erosion and sedimentation control BMPs can contribute to pollutant loading. However, the findings do not provide the necessary justification for the approval of BMPs that would result in the attainment of wet-weather waste load allocations. No other studies were done that identified or quantified BMPs effectiveness in the removal of metals in wet-weather to attain final WLAs.

3. Technical Matters to be Considered

In this Section, data has been reviewed to update the Ballona Creek Metals TMDLs as follows:

- Section 3.1.1: Additional flow data and updated definitions of wet weather and dry weather based on flow;
- Section 3.1.2: Additional water hardness data used in the calculations of the numeric targets and allocations, as set forth in the California Toxic Rule;
- Section 3.1.3: A re-examination of the selenium data; and

- Section 3.1.4: Additional dissolved and total metals data and the resulting conversion factors used in the calculations of the numeric targets and allocations, as set forth in the California Toxic Rule.

In this Section, data has been reviewed to update the Ballona Creek Estuary Toxics TMDL including updating the TMDL in consideration of the following:

- Section 3.2.2: The Toxicity Identification Evaluation (TIE);
- Section 3.2.1: The State's Sediment Quality Objectives which were adopted after the TMDL; and
- Section 3.2.3: Fish tissue targets.

3.1 2008 METALS TMDL

3.1.1 Flow Characteristics

Under the 2008 Metals TMDL, copper, lead, selenium and zinc have separate dry weather and wet weather targets and allocations. Flow in Ballona Creek was used in the TMDL to determine when wet weather or dry weather targets and allocations applied. Additionally, flow was used to set the critical dry weather flow for calculation of allocations (for allocations in wet weather, load duration curves were used instead of a single critical flow).

While several Los Angeles Region TMDLs define 'wet weather' by the amount of rainfall, the Ballona Creek Metals TMDL defines 'wet weather' by flow. The TMDL defines wet weather as "*any day when the maximum daily flow is equal to or greater than 40 cubic feet per second (cfs) based on the 90th percentile of flow measured at Sawtelle Boulevard over a 10-year period (1987 to 1998).*" In addition, the TMDL determined the median flow rate "*at 14 cubic feet per second (cfs),*" and determined that rate to be the critical dry weather flow.

The Metals TMDL used historic flow data from 1987 to 1998 at Sawtelle Avenue to characterize flow in Ballona Creek and to calculate wet weather flow and dry weather flow.

In this reconsideration, staff has updated the flow calculations and the definitions of 'wet-weather' and 'dry-weather' by including an additional 14 years of flow data.

Table 3-1 presents a summary of daily average flow from the Sawtelle flow gage from 1987 to 2012 and Table 3-2 shows the monthly average flows at the Sawtelle flow gage.

Figure 3-1 is a continuous distribution function graph of the daily average flow percentages and Figure 3-2 shows the monthly average flows.

Table 3-1 Daily Average Flow at Sawtelle Station: 1987 to 2012

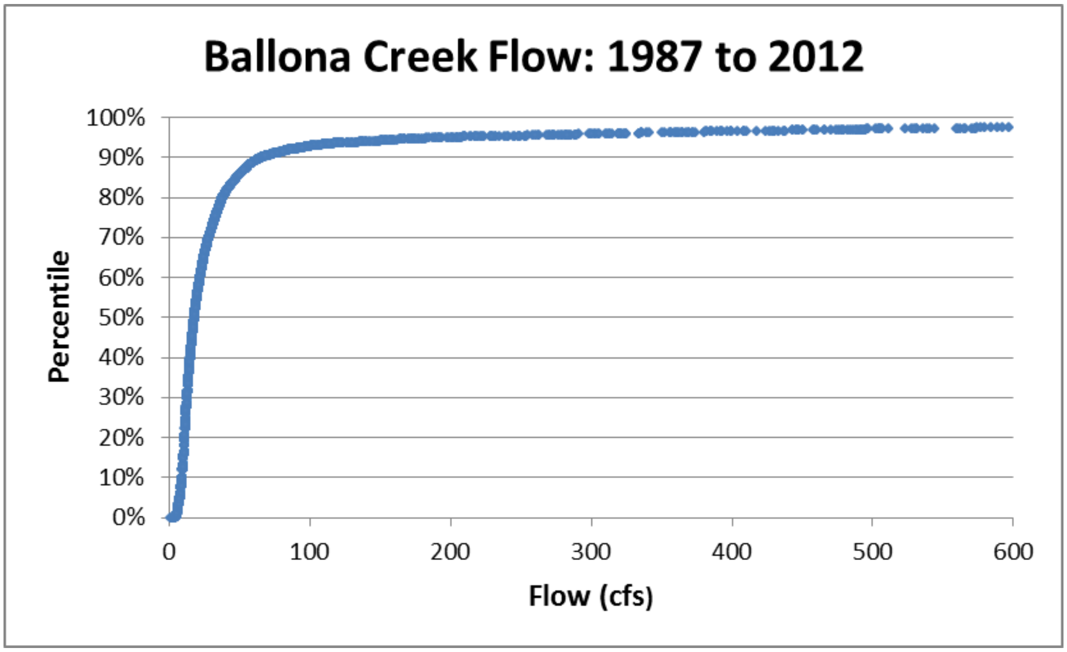
	Daily Average Flow (Oct 1987 - June 2012)		
	Non-Summer (cfs)**	**Summer* (cfs)**	**Year Round (cfs)**
Minimum	1.060	4.013	1.060
25th percentile	11.90	10.60	11.20
50th percentile	18.40	15.10	**17.00**
Average	16.78	14.11	15.47
75th percentile	35.00	25.10	31.70
90th percentile	90.45	41.94	**63.98**
Maximum	5230.00	571.00	5230.00

*Summer months are defined as June through August

**Non summer months are months excluding June through August

17.0 cfs is the 50th percentile for all flows. **64.0** cfs is the 90th percentile flow.

Figure 3-1 Ballona Creek Daily Average Flow Cumulative Percentages

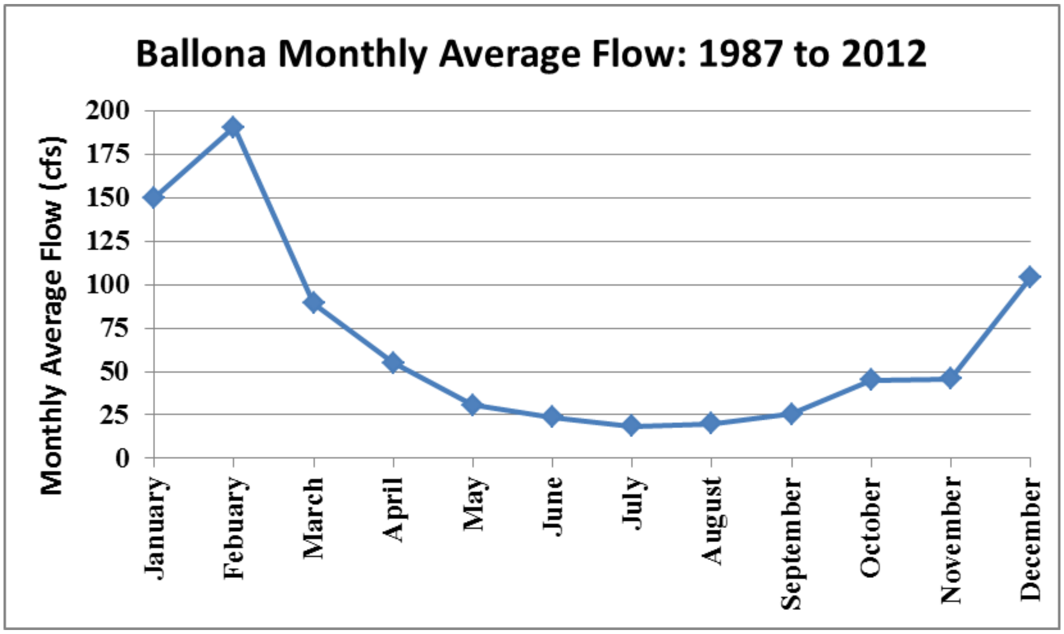


90th percentile flow is **64.0 cfs**.

Table 3-2 Monthly Average Flow at Sawtelle Station: 1987 to 2012

Month	Minimum	Median	Average	Maximum	Standard Deviation
January	19.30	69.85	150.23	569.52	168.15
February	16.70	149.59	190.73	657.55	161.25
March	13.38	66.08	89.47	283.01	70.61
April	8.58	45.34	55.03	193.73	47.14
May	6.65	24.72	30.69	90.03	20.65
June	8.27	15.51	23.82	68.58	16.53
July	6.15	15.79	18.71	49.37	10.73
August	6.75	16.34	20.20	47.44	11.42
September	6.43	19.18	25.45	74.00	20.53
October	10.49	26.24	45.15	178.91	45.54
November	7.59	40.71	45.87	117.92	29.37
December	8.67	66.73	104.31	406.02	97.39

Figure 3-2 Ballona Creek Monthly Average Flows



Stream and flow conditions were not found to be very different from conditions as assessed in the 2008 Metals TMDL. The winter months along with March are the high flow months, based on the 1987-2012 dataset at the Sawtelle station, while the other months are significantly lower. This tendency follows the precipitation patterns in Southern California with the wet months occurring typically in the winter time.

Based on an analysis of the flow data (1987 to 2012), the 90th percentile of flow at Sawtelle Boulevard is 64.0 cfs. The 50th percentile or median of flow at Sawtelle Boulevard is 17.0 cfs.

3.1.1.1 Recommendation Flow

Based on the analysis of data over the roughly 24 year period including the flow data for the 2008 Ballona Creek Metals TMDL as well as newer flow data, staff recommends adjusting the wet weather definition to 64.0 cfs. This represents an increase from 40 cfs as established in the 2008 Ballona Metals TMDL.

Additionally, staff recommends adjusting the critical dry-weather flow in Ballona Creek from 14.0 cfs to 17.0 cfs based 50th percentile or median of flow measured at Sawtelle Boulevard over the roughly 24 year period.

These recommendations use the same method as the 2008 TMDL (i.e. 90th percentile, 50th percentile) but are based on a lengthier dataset which more accurately describes the current follow characteristics.

3.1.2 Hardness

The toxicity of metals in the water column varies with the water hardness. Metals are less toxic in harder water. Hardness generally represents the concentration of calcium carbonate. Water quality criteria to protect aquatic life are therefore calculated at different concentrations of hardness measured in milligrams per liter (mg/L) calcium carbonate ($CaCO^3$).

The 2008 Ballona Creek Metals TMDL evaluated Los Angeles County Flood Control District (LACFCD) data from 1996 to 2002 for the Municipal Separate Storm Sewer System monitoring to calculate median hardness for wet-weather and evaluated Southern California Coastal Water Research Project data (SCCWRP, 2004) to calculate median hardness for dry-weather. As result, a median hardness of 77 mg/L and 300 mg/L were determined for wet and dry-weather respectively.

As part of the reconsideration, staff has considered additional, more recent hardness data in addition to the hardness data considered in the 2008 TMDL. The additional hardness data includes more recent LACFCD data, Ballona Creek Metals and Toxics TMDL CMP data, and City of Los Angeles status and trends data. These calculations used the recommended flow of 64.0 cfs as the definition of wet weather. The results are summarized in Tables 3-3 and 3-4 and Figure 3-3 and Figure 3-4.

Table 3-3 Ballona Creek Wet-Weather Hardness

Wet Weather Hardness (mg/L CaCO^3)			
	(Dec 1996 - Mar 2000)	(Aug 2000 - June 2012)	(Dec 1996 - June 2012)
Median	70	107	**82**
90th Percentile	225	400	315

Figure 3-3 Ballona Creek Wet-Weather Hardness (mg/L CaCO^3)

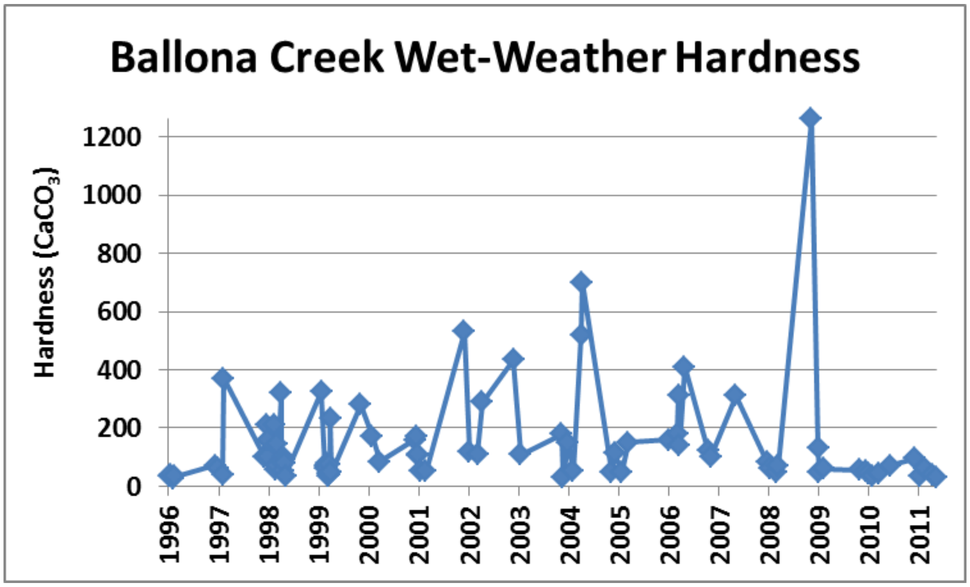


Figure 3-4 Ballona Creek Dry-Weather Hardness (mg/L CaCO^3)

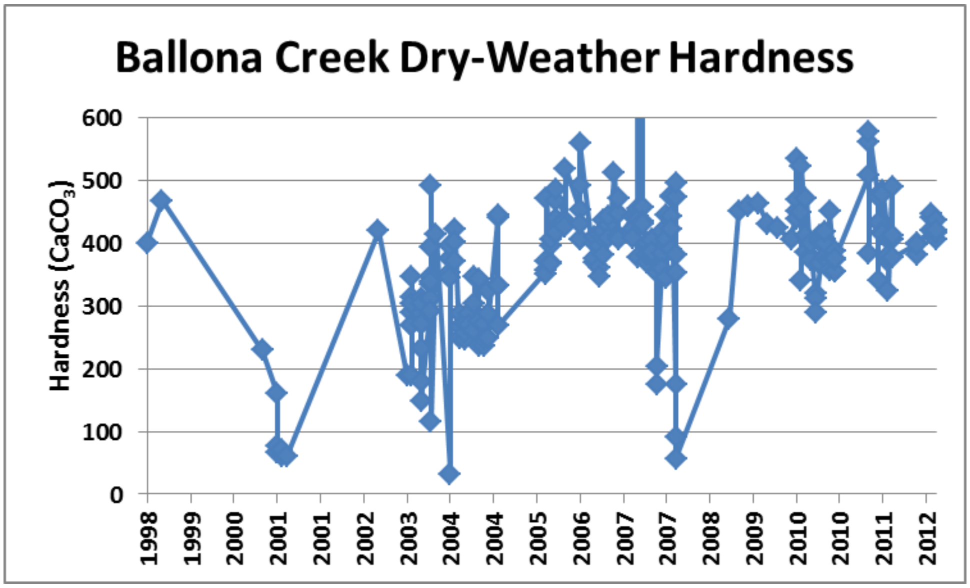


Table 3-4 Ballona Creek Dry-Weather Hardness

Dry Weather Hardness (Oct 1998 - June 2012) (mg/L CaCO3)				
Percentile	**All Reaches***	**Reach 1**	**Reach 2**	**Sepulveda**
Median	**396**	368	382	419
90th Percentile	470	474	443	517

*The “All reaches” column includes hardness data from Reach 1, Reach 2, and Sepulveda Channel.

The median wet-weather hardness, 82 mg/L CaCO^3, was higher than the 2008 Metals TMDL wet weather hardness of 77 mg/L. The dry-weather median hardness, 396 mg/L, was higher than the 2008 Metals TMDL of 300 mg/L.

3.1.2.1 Recommendation Hardness

Staff recommends adjusting dry-weather hardness value to 396 mg/L and the wet-weather hardness to 82 mg/L based on 50th percentile or median of hardness as measured within the Ballona Creek watershed for the calculation of targets and allocations as described by the California Toxics Rule. These recommendations use the same method as the 2008 TMDL (i.e. 90th percentile, 50th percentile) but are based a more robust dataset and more accurately characterizes the hardness in Ballona Creek Watershed compared to the original TMDL.

3.1.3 Selenium

The 2008 Metals TMDL examined the available selenium data from Ballona Creek collected by LACFCD and SCCWRP and found that there were no exceedances of the selenium criteria in either of the dry-weather datasets. However, in both cases the detection limits were greater than the chronic criterion. Selenium was measured twice in storm water at concentrations that exceeded the chronic criterion. Therefore, the 2008 metals TMDL found that the data were insufficient to conclude that there was no selenium impairment (and insufficient to remove the selenium impairment from the State's CWA 303(d) list). Accordingly, targets and allocations were developed for selenium in Ballona Creek.

As part of this reconsideration, staff has considered more recent selenium data in addition to the data considered in the 2008 metals TMDL. The additional data includes more recent LACFCD data and Ballona Creek Metals and Toxics TMDL CMP data. This evaluation did not include SCCWRP data because the SCCWRP data had reporting limits (RL) as high as 10-100 μg/L, well above the TMDL target of 5 μg/L. The results are summarized in Table 3-5.

Table 3-5 Ballona Creek Water Quality: Selenium

Selenium (in total recoverable selenium): 1996 to 2011			
Weather	**TMDL Target**	**Above Target**	**Total Samples**
All	5 μg/L	**9**	**130**
Wet	5 μg/L	4	101
Dry	5 μg/L	5	29

Selenium was originally listed on the 2002 Clean Water Act 303(d) List of Water Quality Limited Segments (303(d) List) due to selenium exceedances in three out of 24 water samples. This selenium listing was specifically for the 6.5 mile portion of Ballona Creek, Reach 2.

Since the adoption of the 2002 303(d) List, the State Water Resources Control Board adopted the Water Control Policy for Developing California's Clean Water Act Section 303(d) List, 2004 (Listing Policy). The Listing Policy uses a weight of evidence approach to evaluate whether to place waters on, or remove waters from, the 303(d) List (SWRCB, 2004).

The re-examined data, described above, satisfies the data quality requirements of sections 6.1.4 and 6.1.5 of the Listing Policy and the frequency of exceedance, 9 exceedances out of 130 samples, does not exceed the allowable frequency listed in Table 4.1 of the Listing Policy. Table 4.1 is the "Maximum Number of Measured Exceedances Allowed to Remove a Water Segment from the Section 303(d) List for Toxicants." The data quality and the limited exceedances of the criteria would allow selenium to be delisted based on Table 4.1.

Analysis of selenium data from Sepulveda Channel, Reach 1, and Centinela Creek does not suggest water quality impairments in the other portions of the watershed.

3.1.3.1 Recommendation

Staff recommends removing Selenium from the TMDL, including the Waste Load Allocations (WLAs) and Load Allocations (LAs). However, staff does not recommend removing all the monitoring requirements for selenium to ensure the watershed does not become impaired due to selenium again in the future. Monitoring for selenium should be consistent with monitoring requirements required in the MS4 permit integrated monitoring program or coordinated integrated monitoring program. Staff will recommend removing selenium from the State's CWA 303(d) list at the next listing opportunity should additional collected data continue to support delisting.

3.1.4 Conversion Factors

Metals in the water column may be present in a dissolved form or may be present adhered to particles. The California Toxics Rule expresses metals criteria in *dissolved* metal concentrations because this is the bioavailable form. However, NPDES permit limits (40 CFR section 122.45(c)), must be expressed as *total recoverable* metal concentrations. TMDLs and waste load allocations (WLA) are expressed in total recoverable metals because the WLA go into NPDES permits. Conversion factors or translators are necessary to convert the dissolved criteria into total recoverable limits.

Conversion factors are unitless values ranging from zero to one and represent the ratio of the concentration of dissolved metals to total metals. The most conservative conversion factor has a value of one, signifying that all metals are in the dissolved form. The CTR provides default conversion factors, less than one, unless a site-specific conversion factor is developed.

As discussed in section 3.1.2, the Ballona Creek Metals TMDL was developed with data from LACFCD and SCCWRP. The TMDL did not develop site-specific conversion factors for dry-weather due to insufficient data, except for lead. To develop site-specific conversion factors for wet-weather, the 2008 TMDL regressed dissolved metals against total recoverable metals and used the slope of the regression as conversion factors for copper and zinc.

As part of the reconsideration, staff has considered more recent metals data in addition to the data considered in the 2008 TMDL. The data includes more recent LACFCD data and Ballona Creek Metals and Toxics TMDL CMP data.

Staff found that the dissolved to total metal ratios in Ballona Creek were too variable to use the slope of the regression as conversion factors as was done in the 2008 TMDL. Using the regression method, the data yielded very low coefficient of determination (R^2) values. The slopes, R^2, and the probability of rejecting the null hypothesis (p-values) are included in Appendix A.

However, staff did observe that the dissolved to total metal ratios in Ballona Creek were generally less than the CTR default conversion factors.

Therefore, staff developed site-specific conversion factors using the 90th percentile of the dissolved to total metal ratios. This method is in accordance with the 2005 California State Policy for the Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Policy or SIP) and the 1996 USEPA metals translator guidance (USEPA, 1996) and is a conservative method (while not as conservative as the CTR default).

The analyses of dissolved to total metal ratios in Ballona Creek are summarized in Tables 3-6 and 3-7. A comparison between the default CTR conversion factors, original 2008 TMDL conversion factors, and 90th percentile ratios are listed in Table 3-8.

Table 3-6 Ballona Creek Dry-Weather Metals Total to Dissolved Ratio

Dry-Weather			
Percentile	**Copper**	**Lead**	**Zinc**
25 Percentile	0.37512376	0.1203102	0.2842562
Average	0.52140837	0.2657982	0.5203868
Median	0.50797117	0.2014493	0.500000
75 Percentile	0.68525202	0.3256068	0.7442393
90 Percentile	0.81623216	0.5512821	0.8490741

Table 3-7 Ballona Creek Wet-Weather Metals Total to Dissolved Ratio

Wet-Weather			
Percentile	**Copper**	**Lead**	**Zinc**
25 Percentile	0.21694915	0.0223356	0.1660623
Average	0.40231061	0.1990569	0.4470274
Median	0.34829523	0.0445161	0.2861613
75 Percentile	0.59952349	0.2827723	0.7647569
90 Percentile	0.81356053	0.6774701	0.9453686

Table 3-8 Comparison of Wet and Dry Weather Conversion Factors: CTR, 2008 Metals TMDL, and 90th Percentile

Constituent	CTR Default Translators	2008 TMDL Translators	90%
Cu Dry	0.96	0.96	**0.816**
Cu Wet	0.96	0.62	**0.814**
Pb Dry	0.590[1]	0.631[3]	**0.551**
Pb Wet	0.820[2]	0.829[4]	**0.677**
Zn Dry	0.986	0.986	**0.849**
Zn Wet	0.978	0.79	**0.945**

[1] Conversion factor is hardness dependent and was based on a hardness of 396 mg/L
[2] Conversion factor is hardness dependent and was based on a hardness of 82 mg/L
[3] Conversion factor is hardness dependent and was based on a hardness of 300 mg/L
[4] Conversion factor is hardness dependent and was based on a hardness of 77 mg/L

3.1.4.1 Recommendation Conversion factors

Staff recommends the 90th percentile values of the dissolved to total metal ratios for the conversation factors.

3.1.5 Summary of Adjusted Targets and Allocations for the Metals TMDL

The recommended adjustments to flow rate, hardness, and conversion factors compel revision of the dry and wet-weather targets as well WLAs for metals.

3.1.5.1 Numeric Targets

Based on the recommendations made in sections 3.1.1, 3.1.2, and 3.1.4, the numeric targets were adjusted. As with the 2008 Metals TMDL, the chronic criteria were the most limiting values for copper, lead, and zinc and were the basis for the dry-weather numeric targets. For wet-weather, the acute criteria were the most limiting values and the basis of the wet-weather targets. The targets are shown in Table 3-9 and 3-10.

The freshwater aquatic life criteria for metals in the CTR are expressed as a function of hardness of the receiving water. The targets in Table 3-9 and Table 3-10 were evaluated based on a median hardness value of 396 mg/L for wet weather and 82 mg/L for dry weather, which is consistent with other previously adopted metals TMDLs in the region including the Calleguas Creek Watershed Metals TMDL, the San Gabriel River Metals and Selenium TMDL, and the Los Angeles Metals TMDL.

Calculation of targets also requires the conversion factors. The conversion factors in Table 3-8 were used.

The water quality targets in the TMDL are expressed as the water quality criteria from the federal California Toxics Rule (CTR). CTR criteria include a numerical threshold (developed, as above, considering hardness and conversion factors) multiplied by a water-effect ratio (WER). The WER has a default value of 1.0 unless a site-specific WER is approved. To use a WER other than the default of 1.0, a study must be conducted consistent with USEPA's WER. At this time, there are no WERs established for Ballona Creek, so the WER = 1.0..

If the Regional Board approves site-specific WERs in these waterbodies, the TMDL targets will be modified in accordance with all legal and regulatory requirements, and adopted by the Regional Board through the state's basin plan amendment process.

Table 3-9 Dry-Weather Numeric Targets

Metal	Target* (µg/L) Dissolved	Conversion Factor	Target* (µg/L) Total
Copper	24.68*WER	0.816	35.56*WER
Lead	10.11*WER	0.551	19.65*WER
Zinc	326.50*WER	0.849	446.55*WER

*Targets based on a hardness of 396 mg/L

Table 3-10 Wet-Weather Numeric Targets

Metal	Target* (µg/L) Dissolved	Conversion Factor	Target* (µg/L) Total
Copper	9.45*WER	0.814	13.70*WER
Lead	42.96*WER	0.677	76.75*WER
Zinc	95.74*WER	0.945	104.77*WER

*Targets based on a hardness of 82 mg/L

3.1.5.2 Loading Capacity

The dry-weather loading capacity of Ballona Creek and Sepulveda Canyon Channel for each metal was derived by multiplying the revised hardness-adjusted dry-weather numeric targets expressed as total recoverable (Table 3-9) by the critical flow assigned to these two waterbodies. The loading capacities are presented as total recoverable metals for quantification of total recoverable metals loads.

As discussed in section 3.1.2, the median flow measured in Ballona Creek based on historic flow data is 17 cfs. This flow was used to define the critical dry-weather flow for Ballona Creek at Sawtelle Boulevard (upstream of Sepulveda Canyon Channel). For Sepulveda Canyon Channel, the assumed flow value of 6.3 cfs was used (no change from 2008 Metals TMDL). Table 3-11 shows the revised dry-weather loading capacities for Ballona Creek and Sepulveda Canyon Channel.

Table 3-11 Dry-Weather Loading Capacity Expressed as Total Recoverable Metals in (grams/day)

Waterbody	Flow (cfs)	Copper	Lead	Zinc
Ballona Creek	17	1,479.2	817.2	18,573.1
Sepulveda Channel	6.3	548.2	302.9	6,883.0
Total	23.3	2,027.4	1,120.1	25,456.1

The wet-weather loading capacities were calculated by multiplying the daily storm volume by the numeric target expressed as total recoverable (Table 3-10). The wet-weather loading capacity applies to any day when the maximum daily flow measured at a location downstream of Sepulveda Canyon Channel, such as Inglewood Boulevard is equal to or greater than 64 cfs, which represents the 90th percentile flow. The loading capacities for copper, lead, and zinc in wet-weather are listed in Table 3-12.

Table 3-12 Wet-Weather Loading Capacity Expressed as Total Recoverable Metals

Metal	Loading Capacity
Copper	13.70 µg/L x Daily Storm Volume
Lead	76.75 µg/L x Daily Storm Volume
Zinc	104.77 µg/L x Daily Storm Volume

3.1.5.3 Waste Load Allocations

Allocations were assigned to point and nonpoint sources throughout the watershed in order to meet the TMDLs for Ballona Creek and Sepulveda Canyon Channel. Mass-based LAs were developed for direct atmospheric deposition in the 2008 Metals TMDL and are unchanged.

A grouped mass-based waste load allocation (WLA) was developed for storm water permittees (Los Angeles County MS4, Caltrans, General Industrial and General Construction) for both dry weather and wet weather by subtracting the mass-based WLAs and LAs from the total loading capacity illustrated in the equation listed below. The WLAs are listed in Table 3-13 and Table 3-14.

Combined Storm Water Sources = Critical Flow x Target - Direct Air Deposition

Table 3-13 Dry-Weather Combined Mass-Based Waste Load Allocations for Caltrans and MS4 permittees as Total Recoverable Metals

Waterbody	Cu (g/day)	Pb (g/day)	Zinc (g/day)
Ballona Creek	1477.2	815.9	18566.3
Sepulveda	547.9	302.7	6882.0
Total	2025.1	1118.5	25448.3

Table 3-14 Wet-Weather Combined Mass-Based Waste Load Allocations

Metal	Combined Storm Water Permittees (g/day)
Copper	1.136×10^{-5} x Daily Storm Volume
Lead	7.630×10^{-5} x Daily Storm Volume
Zinc	1.042×10^{-4} x Daily Storm Volume

WLAs are further separated between the separate MS4 permittees and Caltrans in dry-weather and separate storm water permittees in wet-weather and are presented in Table 3-15 and Table 3-16.

Table 3-15 Dry-Weather Mass-Based Waste Load Allocations for Caltrans and MS4 permittees as Total Recoverable Metals

Permittee	Cu (g/day)	Pb (g/day)	Zinc (g/day)
Ballona Creek			
MS4 Permittees	1457.6	805.0	18320.1
Caltrans	19.6	10.8	246.2
Sepulveda Channel			
MS4 Permittees	540.6	298.7	6790.8
Caltrans	7.3	4.0	91.3

Table 3-16 Wet-Weather Mass-Based Waste Load Allocations

Metal	General Construction Stormwater (g/day)	General Industrial Stormwater (g/day)	Caltrans (g/day)	MS4 Permittees (g/day)
Copper	3.763×10^{-7} x Daily Storm Volume	9.433×10^{-8} x Daily Storm Volume	1.806×10^{-7} x Daily Storm Volume	1.297×10^{-5} x Daily Storm Volume
Lead	2.108×10^{-6} x Daily Storm Volume	5.284×10^{-7} x Daily Storm Volume	1.012×10^{-6} x Daily Storm Volume	7.265×10^{-5} x Daily Storm Volume
Zinc	2.878×10^{-6} x Daily Storm Volume	7.213×10^{-7} x Daily Storm Volume	1.381×10^{-6} x Daily Storm Volume	9.917×10^{-5} x Daily Storm Volume

Each storm water permittee enrolled under the general construction or industrial storm water permits received individual WLAs on a per acre basis, based on the acreage of their facility listed in Table 3-17.

Table 3-17 Wet-Weather Waste Load Allocation for an Individual General Construction or Industrial Storm Water Permittee

Metal	Individual General Construction or Individual General Industrial Permittee (g/day/ac)
Copper	1.673×10^{-10} x Daily Storm Volume
Lead	9.369×10^{-10} x Daily Storm Volume
Zinc	1.279×10^{-9} x Daily Storm Volume

Concentration-based WLAs were established for the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries to ensure that these do not contribute to exceedances of the CTR criteria. The concentration-based WLAs for dry-weather and wet-weather are equal to the revised numeric targets expressed as total recoverable metals listed in Table 3-9 and Table 3-10.

3.2 2006 Toxics TMDL

3.2.1 Sediment Quality Objectives (SQOs)

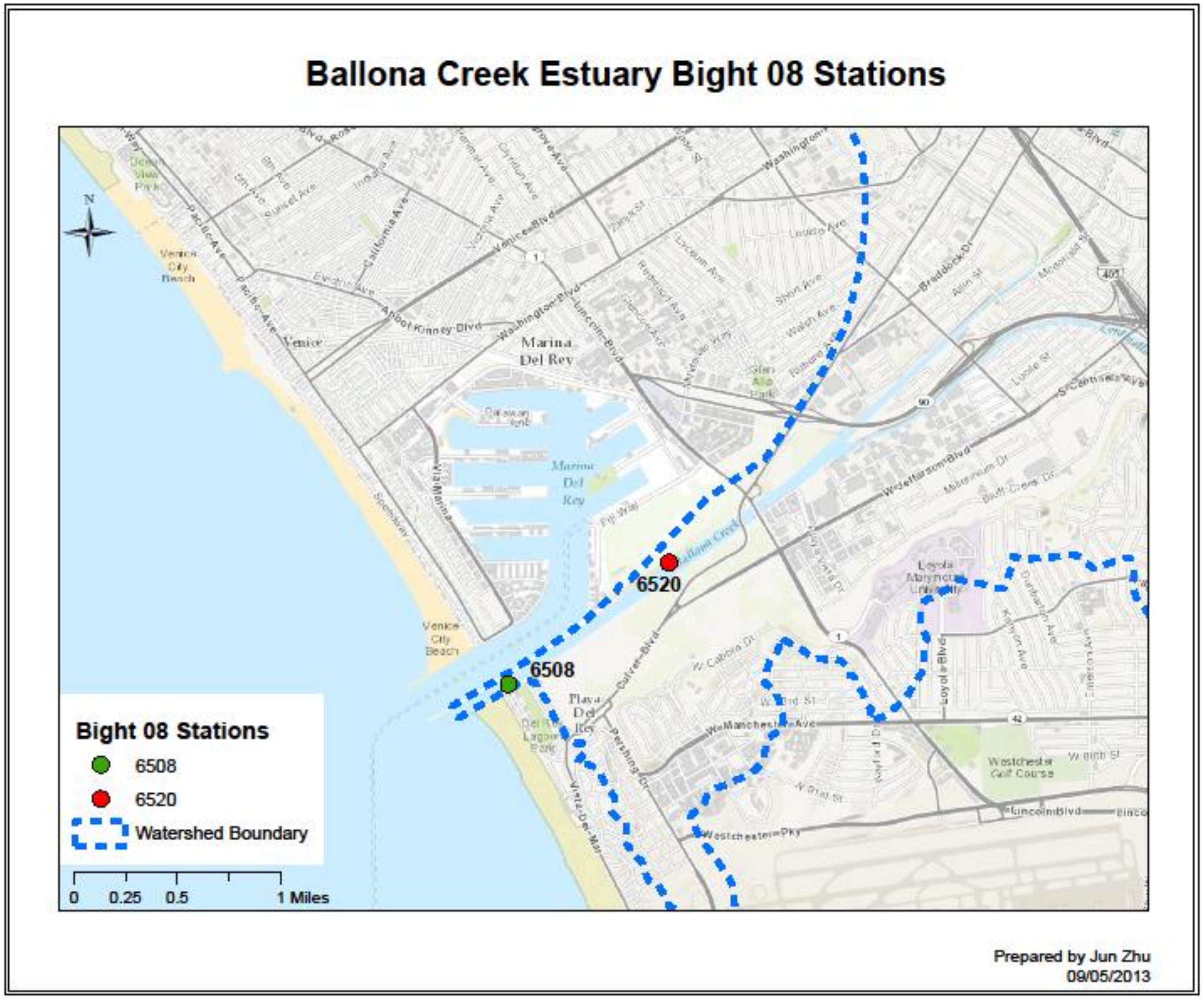
The Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality (SWRCB, 2009), which promulgated Sediment Quality Objectives (SQOs), was adopted after the effective date of the Ballona Creek Estuary Toxics TMDL.

The SQO Part I employs a multiple lines of evidence approach (MLOE) for the evaluation of sediments to interpret narrative water quality objectives to protect estuarine habitat, marine habitat, commercial and sport fishing, aquaculture, and shellfish harvesting beneficial uses. The three lines of evidences or “triad” for assessing sediment quality include sediment toxicity, benthic community conditions, and sediment chemistry. High confidence in the assessment of sediment quality is achievable when all three lines of evidence are available for assessing a waterbody. This assessment is sometimes called a “direct effects” assessment for the direct effect of contaminants and toxicity on benthic organisms and does not include an assessment of the “indirect effects” of contaminants transferring up the food chain to fish, which can impact human health.

The MLOE are used to categorize a sediment as “Unimpacted,” “Likely unimpacted,” “Inconclusive,” “Possibly impacted,” Likely impacted,” or “Clearly impacted.” The categories - “Unimpacted,” and “Likely unimpacted” - are considered as achieving the protective condition for aquatic life in sediment.

Little MLOE data is currently available to assess Ballona Creek Estuary using the SQO. Bight ’08 is one of the few data sources available that has employed the MLOE outlined in the SQO. Figure 3-5 is a map of Bight’ 08 monitoring stations for Ballona Creek Estuary. The SQO MLOE category results from Bight’ 08 are listed in Table 3-18.

Figure 3-5 Bight’ 08 stations in the Ballona Creek Estuary



Prepared by Jun Zhu
09/05/2013

Table 3-18 Bight' 08 SQO Categories for Ballona Creek Estuary

Site	SQO Category	Toxicity	Chemistry	Benthic Community
6508	Unimpacted	Nontoxic	Moderate Exposure	Low Disturbance
6520	Likely Impacted	High Toxicity	Low Exposure	Moderate Disturbance

Two toxicity tests were used to characterize sediment throughout the Southern California Bight during Bight' 08: a 10-day survival test using the amphipod *Eohaustorius estuarius* and a 10-day embryo development test using *Mytilus galloprovincialis* (Bay *et al.*, 2011). The results of the Bight '08 toxicity tests were used to classify sediments according to toxicity categories included in the SQOs.

The SQO uses four indices, Benthic Response Index (BRI), Index of Biotic Integrity (IBI), Relative Benthic Index (RBI), and River Invertebrate Prediction and Classification System (RIVPACS), to assess for benthic community conditions. The benthic community category is determined by the median of all benthic indices response categories. Individual benthic index scores and categories are listed in Appendix C.

Based on the Bight' 08 data, station 6520 located upstream from Del Rey Lagoon was classified as "Likely Impacted" so the site exceeds the State's Sediment Quality Objectives.

3.2.2 Toxicity Identification Evaluation (TIE)

Stakeholders completed a Toxicity Identification Evaluation for sediment in the Ballona Creek Estuary in 2010 (Bay *et al.*, 2010). The purpose of the study was to determine the extent of chemical contamination within the estuary and identify the likely causes of toxicity. The TIE used similar methods to the "stressor identification" methods later outlined in the State's SQOs.

A TIE consists of several chemical or physical modifications of a toxic sample. Each modification is designed to affect the toxicity of a particular type of contaminant (e.g., trace metals or organics). By comparing the post-treatment sample toxicity with that of an unmodified sample (baseline toxicity), it is possible to identify whether certain types of contaminants are contributing to the sample's toxicity. A variety of TIE treatments were applied in this study, depending on whether a sediment or pore water sample was analyzed. Three types of treatments were usually applied to the whole sediments or pore water; these treatments enabled sediment toxicity to be classified as likely due to trace metals, trace organics, or pyrethroid pesticides.

Some of the findings of the studies are listed below.

1. Chemical contamination of Ballona Creek Estuary sediments was widespread and causing toxicity to sediment-dwelling organisms.
2. Sediment quality in Ballona Creek Estuary shows high seasonal and spatial variability.
3. Pyrethroids, and possibly other current use pesticides, are the principal cause of sediment toxicity in Ballona Creek Estuary.
4. The contaminants currently listed in the Ballona Creek Estuary toxics TMDL including DDT, PCBs and PAHs are minor contributors to the toxicity, but metals were responsible for some toxicity to sea urchins.

Because the TIE study found pyrethroids to be a major contributor to toxicity, the Regional Board may wish to pursue including pyrethroids on the State's 303(d) list in the future or develop a pyrethroid TMDL.

While DDT, PCBs and PAHs were not found to be significant contributors to the toxicity in this particular study, an analysis of the current Ballona Creek CMP data indicates continued exceedances of the sediment DDT, PCB and chlordane targets as well as metals targets in sediment. DDT was also present in the limited fish sampling, but at levels below the Office of Environmental Health Hazard Assessment Fish Contaminant Goals (2008).

3.2.3 PAHs

PAHs were originally included on the State's 1998 303(d) List.

Since the adoption of the 1998 303(d) List, the State Water Resources Control Board adopted the Water Control Policy for Developing California's Clean Water Act Section 303(d) List, 2004 (Listing Policy). The Listing Policy uses a weight of evidence approach to evaluate whether to place waters on, or remove waters from, the 303(d) List (SWRCB, 2004).

Sediment samples collected in Ballona Creek Estuary since the implementation of the CMP show zero exceedances of the PAH target. This data satisfies the data quality requirements of sections 6.1.4 and 6.1.5 of the Listing Policy and the frequency of exceedance, 0 exceedances out of 36 samples, does not exceed the allowable frequency listed in Table 4.1 of the Listing Policy. Table 4.1 is the "Maximum Number of Measured Exceedances Allowed to Remove a Water Segment from the Section 303(d) List for Toxicants." The data quality and the limited exceedances of the criteria would allow PAHs to be delisted based on Table 4.1.

3.2.4 Recommendation based on the TIE and SQOs

Staff recommends requiring attainment of the protective SQO categories of "Unimpacted," or "Likely unimpacted" and including SQO assessment in the required monitoring.
Staff recommends removing the DDT, PCBs and chlordane targets, WLA and LA based on the ERLs, which are intended to protect the benthic beneficial use (i.e., direct effects). Targets, WLA and LA to protect the human health beneficial use (i.e., indirect effect) are discussed in Section 3.2.3, below.

In addition, to confirm the likely toxicity contributor or to determine additional toxicity contributors, staff recommends that a stressor identification to include examination of DDT, chlordane and PCBs, as required by the State's EB&E Plan Part 1 (Section VII.F), is conducted if sediments fail to meet the protective condition of Unimpacted or Likely Unimpacted after 2013.

Staff recommends removing the TMDL for PAHs, including the WLAs and LAs. However, staff does not recommend removing all the monitoring requirements for PAHs to ensure the watershed does not become impaired due to PAHs again in the future. Staff will recommend removing PAHs from the State's CWA 303(d) list at the next listing opportunity should additional collected data continue to support delisting.

3.2.5 Fish Targets

During the 2005 TMDL development, staff reviewed the original listing data for pesticides which included Mussel Watch data and Toxic Substance Monitoring Program data and assessed the data against the Office of Environmental Health Hazard Assessment (OEHHA) screening values. Staff found that there was a single fish data point and three shellfish data points for Ballona Creek Estuary and the data was more than 10-years old at the time. Based on the limited amounts of data and the age of the data, staff did not recommend including fish tissue targets or developing allocations to address bioaccumulatives in fish tissue at that time. The toxics TMDL included a requirement for fish and mussel tissue monitoring and the CMP included an annual monitoring effort for fish and mussel. Mussels have been collected every year (2009- 2012). To date, only three fish have been collected (in 2012). The fish and mussel data is shown in Appendix D.

The State's Water Quality Control Plan for Enclosed Bays and Estuaries – Part 1 Sediment Quality (EB&E Plan Part 1), which was adopted in 2009 after the original establishment of the toxics TMDL, includes (1) a narrative objective to protect benthic communities along with an evaluation approach based on integrating multiple lines of evidence (the "triad" approach) to determine whether this objective is achieved, and (2) a narrative objective to protect the human health beneficial use. Therefore, it is necessary to include fish tissue targets and associated sediment targets for the bioaccumulatives to protect the human health beneficial use and ensure that the narrative objective for indirect effects contained in the State's EB&E Plan is achieved. The requirement that a TMDL for a particular pollutant must be developed to achieve all water quality objectives for that pollutant set to protect designated beneficial uses was affirmed in a 2011 court decision, Anacostia Riverkeeper, Inc., et al. v. Lisa Jackson, US EPA. In its decisions, the court affirmed that a TMDL must address all the beneficial uses and water quality objectives for a particular pollutant whether or not they are listed on the Section 303(d) list.

Additionally, since the adoption of the 2006 TMDL, fish consumption guidelines have been instituted for southern California waters including Ballona Creek estuary (OEHHA, 2009). Ballona Creek estuary is in the fish consumption "red zone" in the 2009 fish consumption advisory. Depending on species of fish and gender and age of the potential consumer, OEHHA and the State of California recommends no consumption, "Do Not Eat" of as many as 5 fish species (white croaker, black croaker, topsmelt, barred sand bass, and barracuda) and as many as 14 species have recommended consumption limitations.

Since adoption of the toxics TMDL, OEHHA developed new fish screening values in 2008, "Fish Contaminant Goals and Advisory Tissue Levels for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene" (OEHHA, 2008).

Use of fish tissue targets is necessary and appropriate to account for uncertainty in the relationship between pollutant loadings and beneficial use effects (USEPA, 2002) and directly addresses potential human health impacts from consumption of contaminated fish or other aquatic organisms. Use of fish tissue targets also allows the TMDL analysis to more completely use site-specific data where limited water column data are available, consistent with the provisions of 40 CFR section 130.7(c)(1)(i). Thus, use of Fish Contaminant Goals (FCGs) provides an effective method for accurately quantifying achievement of the water quality objectives/standards (Table 3-19).

Table 3-19 Targets for bioaccumulatives in fish tissue (LARWQCB, 2011)

Pollutant	Fish Tissue target (µg/kg wet)	Associated sediment target (µg/kg dry)
Chlordane	5.6	1.3[b]
Total DDT	21	1.9[b]
Total PCBs	3.6	3.2[c]

[b] Chlordane and total DDT associated sediment values from Newport Bay Indirect Effects draft report (SFEI, 2007)
[c] PCBs-total associated sediment target from San Francisco Bay bioaccumulation study (Gobas and Arnot, 2010)
N/A indicates that a target is not established in this TMDL for this constituent.

Figure 3-6 Map of Yellow and Red Zones for Fish

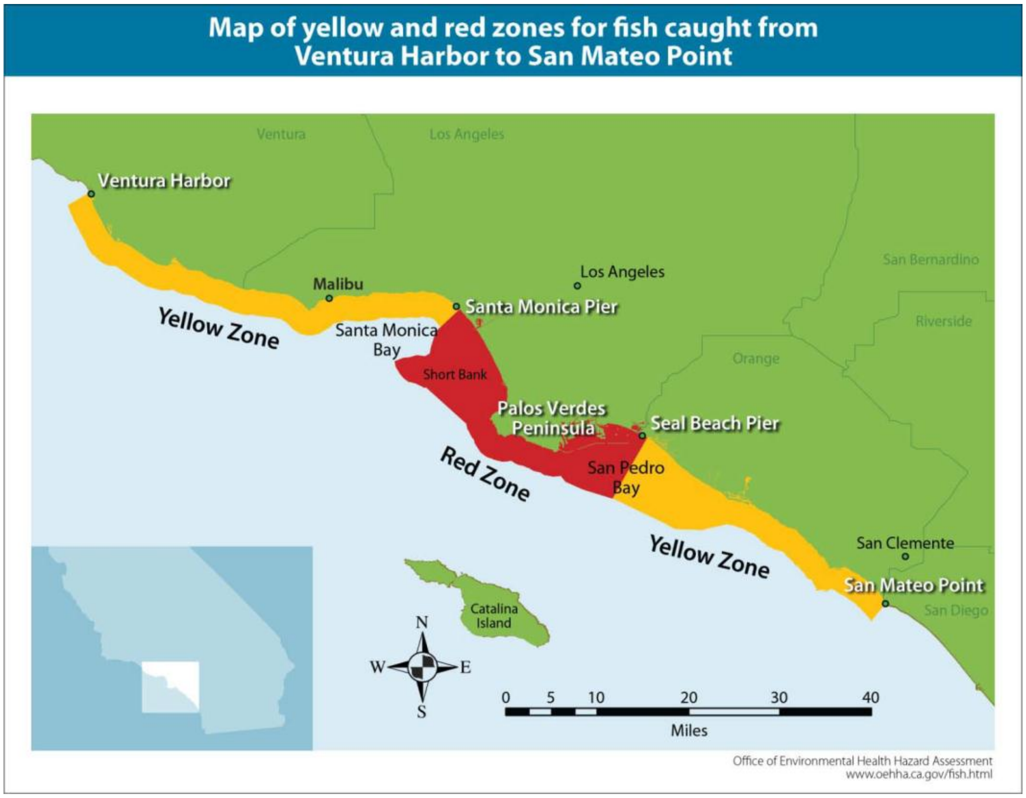


Figure taken from OEHHA, 2009. Health Advisory and Safe Eating Guidelines for Fish from Coastal Areas of Southern California: Ventura Harbor to San Mateo Point

3.2.5.1 Recommendations fish targets

Staff recommends that fish tissue targets and associated sediment targets be included in the Ballona Creek Estuary Toxics TMDL. The loading capacity, LAs, and WLAs shall be adjusted accordingly, where necessary. The fish tissue targets and associated sediment targets are consistent with other previously adopted TMDLs in the region including the Dominguez Channel and Greater Los Angeles and Long Beach Harbors Toxics TMDL.

3.2.6 Summary of Adjusted Targets and Allocations for the 2006 Toxics TMDL

Staff has recommended using the fish tissue associated sediment targets for the bioaccumulative targets, DDT, PCBs and chlordane. Therefore, the loading capacity and wasteload and load allocations are adjusted based on the fish tissue associated sediment targets shown in Table 3-19.

For the calculation of loading capacity in the 2006 toxics TMDL, the translation to pollutant specific loading capacity was calculated by multiplying the average annual deposition of 5,004 m^3/year of fine sediment, defined as silts (grain size 0.0625 millimeters) and smaller, by the numeric sediment targets. The bulk sediment density of the deposition was assumed to be 1.42

metric tons per cubic meter (mt/m^3) (Steinberger et al., 2003). The TMDL is set equal to the loading capacity. Revisions to the loading capacity was made in the same manner. The resultant loading capacity and numeric target for toxics is shown in Table 3-20.

Table 3-20 Sediment Numeric Targets and Loading Capacity

Organics	Numeric Target (µg/kg)	Loading Capacity (g/yr)
Chlordane	**1.3**	**9.2**
DDTs	**1.9**	**13.5**
Total PCBs	**3.2**	**22.7**

Mass-based load allocations (LAs) were developed for open space and direct atmospheric deposition in the 2006 TMDL and the same calculation is used here to update the LAs. Open Space refers to discharges directly to Ballona Creek or a tributary and not through the MS4 and was estimated as 0.6% of the watershed. The LA for open space was calculated by multiplying the percentage of the watershed contributing to discharges from open space by the total loading capacity. The LA for direct atmospheric deposition was developed based on the percent area of surface water, which was estimated at 0.6% of the total watershed area. The LA for atmospheric deposition was calculated by multiplying this percentage by the total loading capacity. The revised LAs for open space and direct aerial deposition for PCBs are shown in Table 3-21.

Table 3-21 Mass-based Load Allocations

Organics	Direct Aerial Deposition (kg/yr)	Open Space Capacity (g/yr)
Chlordane	**0.05**	**0.05**
DDTs	**0.08**	**0.08**
Total PCBs	**0.13**	**0.13**

Allocations for NPDES-regulated storm water discharges from multiple point sources may be expressed as a single categorical waste load allocation (WLA) when data and information are insufficient to assign each source or outfall individual allocations. The combined storm water WLAs as partitioned among the four storm water permits (Los Angeles County MS4, Caltrans, general industrial, and general construction) are provided below based on an estimate of the percentage of land area covered under each permit (Table 3-22). Waste load allocations are expressed as allowable sediment-bound pollutant load that can be deposited in the estuary.

Table 3-22 Mass-based Waste Load Allocations

Organics	General Construction permittees (g/yr)	General Industrial permittees (g/yr)	Caltrans (g/yr)	MS4 Permittees (g/yr)	Combined Stormwater (g/yr)
Chlordane	**0.25**	**0.06**	**0.12**	**8.69**	**9.13**
DDTs	**0.37**	**0.09**	**0.18**	**12.70**	**13.35**
Total PCBs	**0.62**	**0.16**	**0.30**	**21.40**	**22.48**

Each storm water permittee enrolled under the general construction or industrial storm water permits received an individual waste load allocation on a per acre basis, based on the acreage of their facility as presented in Table 3-23.

Table 3-23 Mass-based Waste Load Allocations for Individual General Construction or Industrial Storm Water permittee (per acre)

Organics	General Construction permittees (g/yr)	General Industrial permittees (g/yr)
Chlordane	**0.11**	**0.11**
DDTs	**0.16**	**0.16**
Total PCBs	**0.28**	**0.28**

Concentration-based WLAs have been developed for the minor NPDES permits and general non-storm water NPDES permits that discharge to Ballona Creek or its tributaries to ensure that these do not contribute significant loadings to the system. The concentration-based WLAs are equal to the numeric targets. All minor NPDES permittees and general non-storm water NPDES permittees shall not discharge sediments with concentrations greater than the numeric targets as listed in Table 3-20.

3.3 Other Matters to be Considered

3.3.1 Implementation Schedule

The Ballona Creek Metals TMDL and the Ballona Estuary Toxics TMDL both include targets and allocations for multiple responsible parties, including MS4 and Caltrans storm water NPDES permittees. The TMDLs also include a phased implementation schedule. The phased implementation includes requirements to gradually reduce pollutant loads by addressing increasing percentages of the total contributing drainage area.

With the recently adopted Los Angeles County MS4 permit (Order No. R4-2012-0175) and Caltrans stormwater permit (Order No. 2012-0011-DWQ), compliance determination has become more complex with Enhanced Watershed Management Programs, Watershed Management Programs and the potential for multiple monitoring groups in a single watershed.

Staff has recognized a need for additional flexibility in compliance determination. Load reductions measured at the end-of-pipe or in stream may provide stakeholders additional flexibility in terms of targeted BMP selection and design.

3.3.1.1 Recommendation

Staff recommends revising the TMDL implementation schedule to specify implementation requirements by calendar dates instead of requirements due in numbers of months or years from the effective date of the TMDL. Staff also recommends allowing compliance with interim requirements to be demonstrated either by gradual load reductions as measured by the percentage of the total drainage area addressed, or load reductions as measured at the end-of-pipe or in stream.

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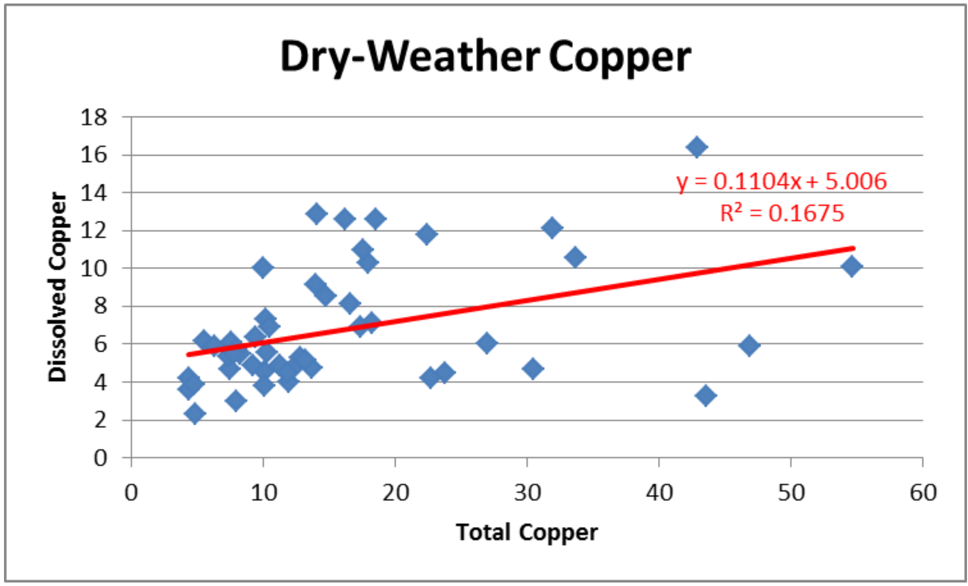
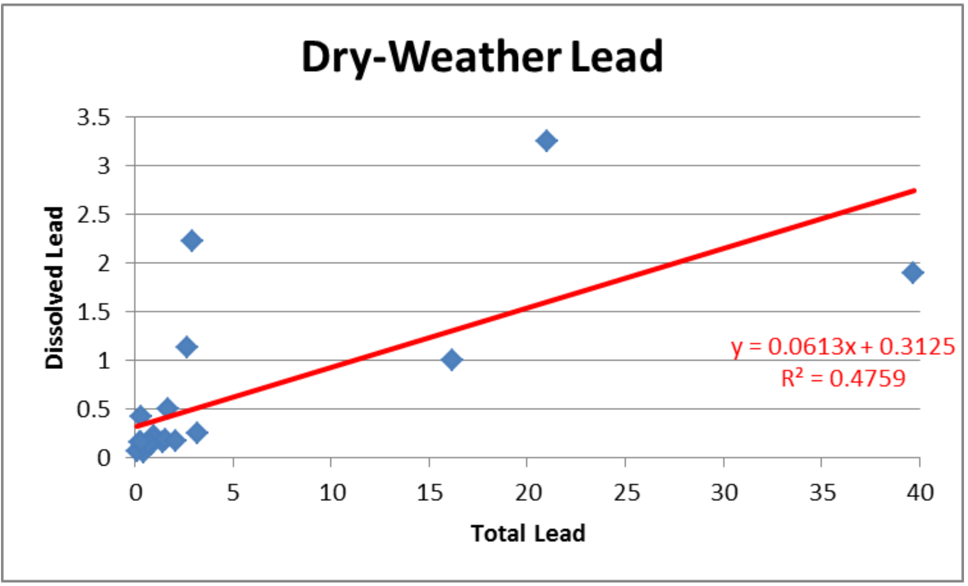
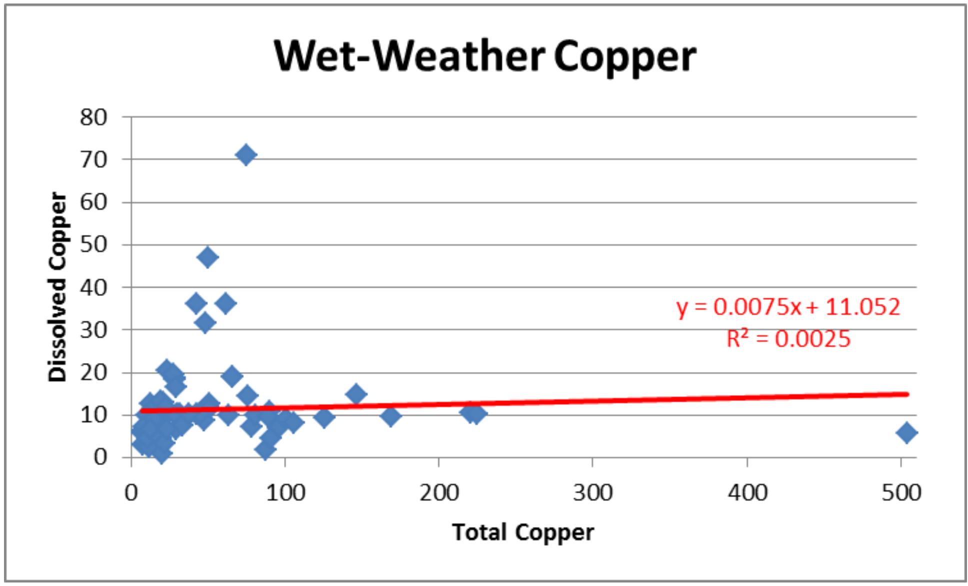
Appendix A: Metals Conversion Factor Statistics

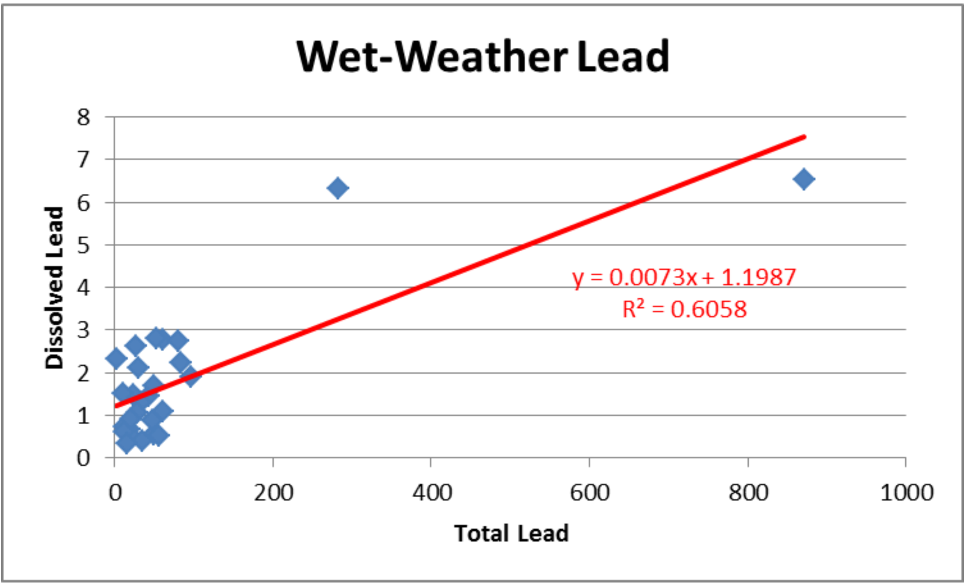
	Dry-Weather			**Wet-Weather**		
	Copper	**Lead**	**Zinc**	**Copper**	**Lead**	**Zinc**
R2	0.167519	0.4758929	0.74741	0.0498468	0.00874	0.0031388
Slope	0.1104	0.0613	0.0633	0.0075	0.0073	0.0012
P-value	0.1134234	0.9887555	0.00872	0.0001548	0.02137	0.0001018

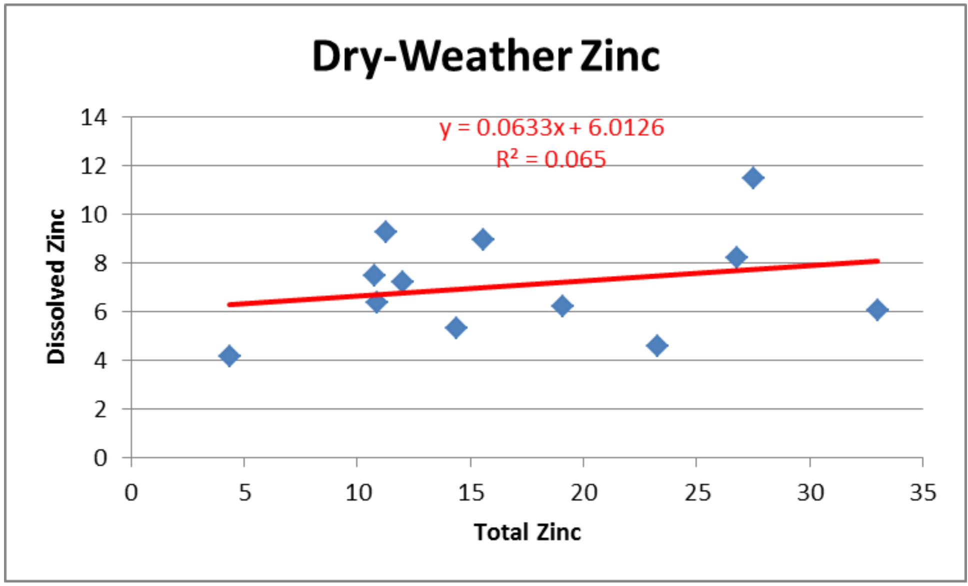
Appendix B: Total Recoverable Metals to Dissolved Metals Regression Charts

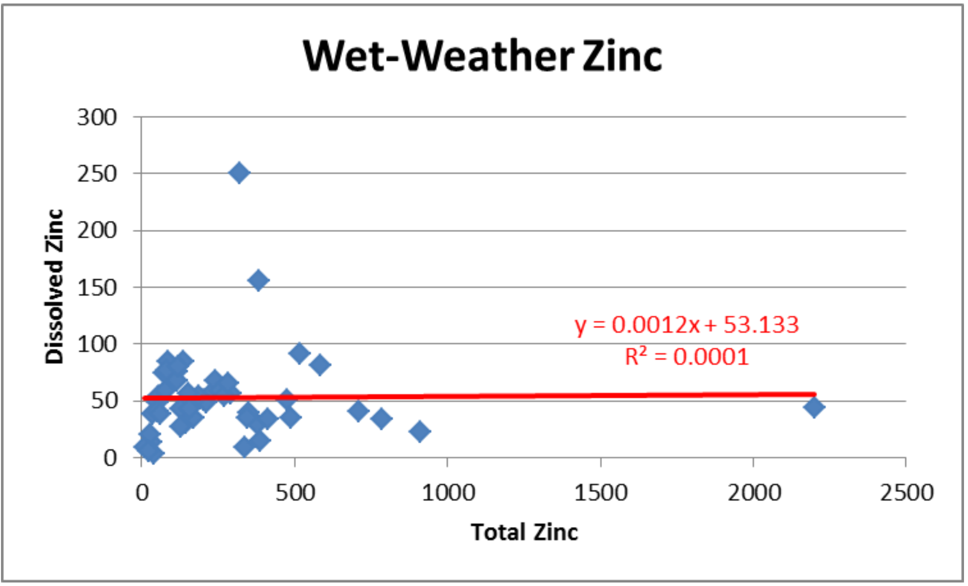









Dry-Weather Zinc
y = 0.0633x + 6.0126
R² = 0.065
Dissolved Zinc
0
2
4
6
8
10
12
14
0
5
10
15
20
25
30
35
Total Zinc


Wet-Weather Zinc
y = 0.0012x + 53.133
R² = 0.0001
Dissolved Zinc
0
50
100
150
200
250
300
0
500
1000
1500
2000
2500
Total Zinc

Appendix C: Bight 2008 Benthic Index Scores and Categorizations

Station ID	RBI Score	RBI Category	IBI Score	IBI Category	BRI Score	BRI Category	RIVPACS Score	RIVPACS Category
6508	0.359921	Reference	1	Low Disturbance	34.37145	Reference	0.558163	Moderate Disturbance
6520	0.203917	Low Disturbance	1	Low Disturbance	51.07464	Moderate Disturbance	0.281828	High Disturbance

Appendix D: CMP Data Characterization: 2007 to 2012

Receiving Water Data: 2009 to 2012							
		Copper (µg/L)		Lead (µg/L)		Zinc (µg/L)	
		Total Recoverable	Dissolved	Total Recoverable	Dissolved	Total Recoverable	Dissolved
Dry	TMDL Numeric Target	24	23	13	8.1	304	300
	Exceedance of the target	8	2	0	0	0	0
	Sample Count	100	100	100	100	100	100
Wet	TMDL Numeric Target	18	11	59	49	119	94
	Exceedance of the target	59	32	9	0	55	8
	Sample Count	62	62	62	62	62	62

Sediment Grab Data: 2007 to 2011										
	Metals					Bioaccumulatives				
	Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)	Total Chlordane (µg/kg)	Total DDT (µg/kg)	Total PCB (µg/kg)	Total PAH (µg/kg)	Amphipod Survival % (10 day)
TMDL Numeric Target	1.2	34	46.7	1	150	0.5	1.58	22.7	4022	70
Exceedance of the target	4	7	5	4	6	3	20	2	0	24
Sample Count	36	36	36	36	36	36	36	36	36	34

Fish Tissue Data: 2012

Species	Metals						Bioaccumulatives			Total PAHs (µg/kg)
	Arsenic (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	Total Chlordane (µg/kg)	Total DDTs (µg/kg)	Total PCBs (µg/kg)	
Speckled Sanddab	NS	NS	NS	NS	NS	NS	0*	0*	0*	0*
Spotted Turbot	1.75	0.4	ND	NS3	0.69	3.49	0*	0*	0*	0*
Staghorn Sculpin	ND	0.03	ND	0.0066	0.65	5.24	0*	0*	0*	0*

*Individual isomers, cogeners, or compounds were below detection limit

NS= Not enough samples to run analysis

ND= Non-detect or below detection limits

Composite Mussel Tissue Data

Station	Date	Species	Metals						Bioaccumulatives				Total PAHs (µg/kg)
			Cadmium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)	Total Chlordane (µg/kg)	Total DDTs (µg/kg)	Total PCBs (µg/kg)	Dieldrin (µg/kg)	
BCE-2	12/28/2009	*Mytilus edulis*	0.300	1.48	0.37	NA	ND	25.8	0	6.5	3#	ND	0.0
	6/17/2010	*Mytilus edulis*	0.285	0.76	0.84	0.0062	ND	13.3	0	10.6	0	NA	NA
	6/21/2011	*Mytilus galloprovincialis*	0.36	0.82	0.19	ND	ND	15.7	0	18.5	0	NA	0
BCE-4	12/28/2009	*Mytilus edulis*	0.340	1.72	0.40	NA	ND	25.3	0	3.5	0#	ND	0.0
	6/17/2010	*Mytilus edulis*	0.177	0.92	0.69	0.0075	ND	14.2	0	8.7	0	NA	0

#=Total PCB Congeners

ND= Non-detect or below detection limits

NA=Not Analyzed