FINAL YEAR 2 INTERIM REPORT

GUADALUPE RIVER COORDINATED MONITORING PLAN FISH TISSUE MONITORING

Prepared for

County of Santa Clara Parks and Recreation Department
298 Garden Hill Drive
Los Gatos, CA 95032

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URS Corporation
1333 Broadway, Suite 800
Oakland, CA 94612

26817577

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Acronyms

13267	California Water Code Section 13267
Basin Plan	SFRWQCB's Water Quality Control Plan
County Parks	County of Santa Clara, Parks and Recreation Department
CMP	Coordinated Monitoring Plan
NMFS	National Marine Fisheries Service
SFRWQCB	San Francisco Bay Regional Water Quality Control Board
TMDL	Total Maximum Daily Loads
USFWS	U.S. Fish and Wildlife Service
Water District	Santa Clara Valley Water District

This report presents the Year 2 (2012) results from fish survey efforts performed by URS for the County of Santa Clara Parks and Recreation Department (County Parks) to satisfy San Francisco Regional Water Quality Control Board (SFRWQCB) reporting requirements for mercury Total Maximum Daily Loads (TMDL) in the Guadalupe River Watershed. These reporting requirements are in accordance with Clean Water Act Section 303(d), California Water Code Section 13267, and the Guadalupe River Coordinated Monitoring Plan (URS 2010). Specifically, this report presents fish sampling data and fish tissue mercury concentrations from several reservoirs and stream reaches within the Guadalupe River Watershed that will be used to evaluate impacts on aquatic ecosystems and human consumption of fish.

1.1 PROJECT SETTING

The Guadalupe River watershed covers approximately 170 square miles, draining the eastern Santa Cruz Mountains to San Francisco Bay through Alviso Slough. The Guadalupe River begins at the confluence of Guadalupe Creek and Alamitos Creek. Important tributaries include Ross Creek, Canoas Creek, and Los Gatos Creek.

The Guadalupe River Watershed contains several reservoirs that are used for flood control, drinking water storage, groundwater recharge, and recreation. These reservoirs include Calero, Guadalupe, Almaden and Lexington reservoirs, and Lake Almaden. The area within the Guadalupe River Watershed was historically used for quicksilver mining, which has contributed to mercury levels within the watershed. Figure 1 illustrates the location of each sampling site.

1.2 REGULATORY BACKGROUND

In 1998, several water bodies in the Guadalupe River watershed were identified by the California State Water Resources Control Board and the SFRWQCB as impaired by the presence of mercury according to provisions in the Clean Water Act Section 303(d). Being placed on the impaired waters list triggered the TMDL process for the watershed to address mercury loading to San Francisco Bay. On October 8, 2008, an amendment to the SFRWQCB's Water Quality Control Plan (Basin Plan) was adopted to amend mercury water quality objectives and incorporate TMDLs for mercury in the Guadalupe River watershed. The TMDL was approved on June 1, 2010 by the State Water Resources Control Board.

On November 23, 2009, the SFRWQCB, under the authority of California Water Code Section 13267, delivered a letter (13267 letter) requiring monitoring plans for mercury in waters downstream of New Almaden Mercury Mining District, Guadalupe Mercury Mine, and/or Bernal Mercury Mine. The 13267 letter was directed jointly to the County of Santa Clara, the Guadalupe Rubbish Disposal Company, Inc., the Midpeninsula Regional Open Space District, and the Santa Clara Valley Water District (Interested Parties).

On February 12, 2010, the Interested Parties presented a letter stating intent to develop a coordinated monitoring plan for monitoring mercury in waters downstream of the New Almaden Mercury Mine and Bernal Mercury Mine (Coordinated Monitoring Plan). The Final Coordinated Monitoring Plan (CMP) was submitted on November 15, 2010 by the Interested Parties to the SFRWQCB to satisfy the SFRWQCB's requirements for developing a plan for monitoring water and fish within the watershed. The CMP was approved by the SFRWQCB in a February 1, 2011 letter to the Interested Parties (SFRWQCB, 2011).

The survey efforts and results presented in this report are presented as part of the Coordinated Monitoring Plan's Fish Tissue Monitoring Objectives and satisfy the requirements for a Water Year 2012 Interim Monitoring Report due to the SFRWQCB on or before January 30, 2013.

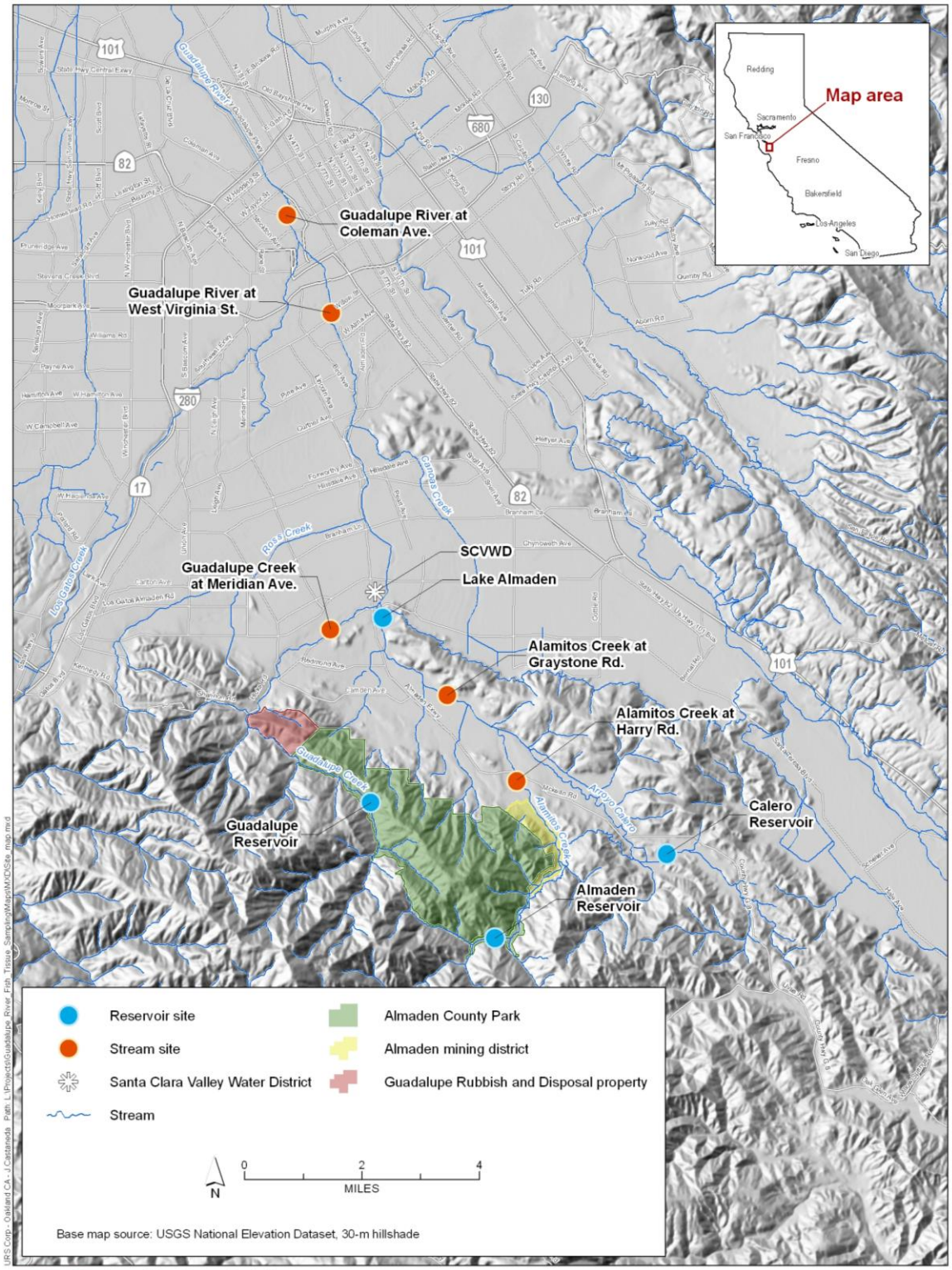

Figure 1. Site Map

All samples were collected in the Guadalupe River watershed. The Guadalupe River begins at the confluence of Guadalupe Creek and Alamitos Creek. Tributaries in the Guadalupe River watershed include Los Gatos Creek, Canoas Creek, Ross Creek, as well as Randol Creek and Golf Creek, both of which are tributaries to Alamitos Creek, and Arroyo Calero.

New Almaden Mining District is located along the watershed divide that drains towards both Guadalupe Reservoir and Almaden Reservoir. Guadalupe Reservoir is on Guadalupe Creek. Almaden Reservoir is on Alamitos Creek. Calero Reservoir is on Arroyo Calero, a tributary to Alamitos Creek.

2.1 OBJECTIVES

The following objectives are from the Guadalupe River Coordinated Monitoring Plan (URS 2010).

The objectives of the Fish Tissue Monitoring Plan are to satisfy the SFRWQCB reporting requirements in a manner that reflects the natural history of Guadalupe River watershed fish populations. The SFRWQCB formulated the following questions to guide the fish tissue monitoring and support the attainment of numeric targets derived for the Guadalupe River TMDL:

- What is the inter-annual variation in fish mercury for remediation effectiveness indicators (age-1 largemouth bass [*Micropterus salmoides*] in reservoirs and lakes) and California roach [*Hesperoleucus symmetricus*] in creeks and the river (trophic level 3 fish 5–15 cm and >15–35 cm in length)?
- What is the trend in fish tissue mercury concentrations in remediation effectiveness indicators and target fish?

To answer these questions, a multi-year monitoring program has been established where fish are collected in streams and reservoirs and analyzed for total mercury content to help assess the success of TMDL implementation efforts. Fish are collected from stream locations below reservoirs in the Guadalupe River watershed, Santa Clara Valley Water District (Water District) reservoirs, and Lake Almaden. This report summarizes the second year of the sampling results.

The size of fish selected as remediation effectiveness indicators were based on the size distribution and species that have been historically present in the Guadalupe River Watershed, and may not correspond to the sizes prescribed by the SFRWQCB (2010). The SFRWQCB selected those target sizes based on a recommendation by the US Fish and Wildlife Service (USFWS; 2005). However, USFWS based their findings on studies outside of the Guadalupe River Watershed. Therefore, it is likely that the size ranges listed in the SFRWQCB's numeric targets do not reflect the conditions in the Guadalupe River Watershed. However, fish collections will allow the monitoring of the fish population and identification of other species that meet the TMDL numeric targets. The numeric targets selected by the SFRWQCB are assumed to be protective of avian reproductive success because they were calculated using a reference dose for methylmercury with impaired reproductive success in captive mallard ducks (*Anas platyrhynchos*) as an endpoint (USFWS 2005). Therefore, achievement of the numeric targets using the approach here would demonstrate the absence of reproductive harm to avian receptors.

2.2 STREAM SAMPLING

Stream sampling locations include Guadalupe River at Coleman Avenue, downstream of Los Gatos Creek; Guadalupe River at West Virginia Street, downstream of Canoas and Ross creeks; Guadalupe Creek at Meridian Avenue, downstream of Guadalupe Reservoir; Alamitos Creek at Graystone Lane, downstream of Arroyo Calero; and Alamitos Creek at Harry Road, downstream of Almaden Reservoir. These locations are shown on Figure 1.

2.2.1 Collection

California roach (*Hesperoleucus symmetricus*) were collected from five stream reaches within the Guadalupe River watershed, including sections of Alamitos Creek and Guadalupe Creek, as well as reaches within the Guadalupe River. The locations and the dates of sampling are described in Table 1. Field data sheets and photographs of these sampling locations are included in Appendix A.

Table 1. Stream Site Locations and Dates of Sampling

Site #	Location	GPS Coordinates		Sampling Date (2012)
1	Guadalupe River at Coleman Avenue	37.3414	-121.9022	June 26
2	Guadalupe River at West Virginia Street[1]	37.3162	-121.8885	June 29
3	Guadalupe Creek at Meridian Avenue[2]	37.2386	-121.8869	June 29
4	Alamitos Creek at Graystone Lane	37.2224	-121.8511	June 26
5	Alamitos Creek at Harry Road	37.2015	-121.8289	June 27

Fish were collected using backpack electrofisher (Smith-Root Model LR-24) units. Stream conductivity and temperature measurements were recorded before each stream electrofishing session began in order to adjust electrofisher unit settings to minimize damage or mortality to non-target fish. Electrofishing was conducted in an upstream direction for each reach, following methods described in Guidelines for Electrofishing Waters Containing Salmonids Listed under the Endangered Species Act [National Marine Fisheries Service (NMFS) 2000]. Block nets were used at the upstream extent of each reach in channels that were relatively wide or lacked in-stream features (i.e., a narrow channel leading to a relative high-gradient, low-flow riffle or a relatively isolated pool) to confine fish and prevent escape from the electrical field. Individuals greater than 4 cm were kept and processed for mercury analysis in the following manner:

- Specimen identified and the identity verified by fin ray counts (as described below)
- Fork and standard length (mm) measured on a fixed measuring board
- Specimen weighed using an electronic scale (Ohaus Scout SC4010, 400 + 0.1g)

[1] During Year 1, this site was located at Foxworthy Ave. Due to construction activities from the Upper Guadalupe River Flood Control Project this section of stream was completely dry and diverted around the project area. URS biologists, after consulting with SCVWD and NMFS, decided to move the site downstream to West Virginia Street whgere suitable habitat was present.

[2] During Year 1, this site was moved upstream to just below Masson fish ladder due to high flows. This year, flows were much lower and the site originally identified was sampled.

- Carcass rinsed with deionized water
- Individual samples placed in a sterile container and assigned a specimen number

2.2.2 Species Identification

Captured specimens were verified by fin ray counts due to the morphological similarities between the target fish and hitch (*Lavinia exilicauda*), which is known to hybridize with California roach within the watershed. Dorsal ray counts were performed to distinguish between each species (California roach dorsal rays = 7–9, hitch dorsal rays = 10–13, [Moyle 2002]). Fish collected with dorsal ray counts of 10 or more were released. Fish collected with a dorsal ray count between 7 and 9 were kept for processing and analysis. Other fish not selected for analysis were identified and released in the immediate capture area.

2.2.3 Sample Analysis

Samples were placed on dry ice for temporary storage in the field then placed into a zero-degree freezer and transported to the laboratory on dry ice. Stream fish were analyzed individually for total mercury concentration. Dry and wet weight concentrations of mercury were determined along with percent moisture.

2.2.4 Water Quality

Water quality parameters, including conductivity, temperature, pH, and dissolved oxygen were measured at all fish sampling locations. Surface water samples were not collected for mercury parameters.

2.3 RESERVOIR SAMPLING

Lake and reservoir sampling locations include Guadalupe Reservoir, Almaden Reservoir, Calero Reservoir and Lake Almaden. Lake Almaden is located on Alamitos Creek just upstream of Alamitos Creek's confluence with Guadalupe Creek (shown on Figure 1).

2.3.1 Collection

Young of the year largemouth bass measuring 60 to 90 mm (standard length) were collected from reservoirs within the Guadalupe River watershed. The locations and dates of sampling are described in Table 2. At the Guadalupe Reservoir location, sufficient numbers of largemouth bass and bluegill (*Lepomis macrochirus*) were collected to allow for statistical comparison (10 fish of each species). Bluegills were collected in 2012 because they are similar to the green sunfish collected in 2011.

Table 2. Reservoir site locations and dates of sampling

Site #	Location	GPS Coordinates		Sampling Date (2012)
1	Calero Reservoir	37.1857	-121.7755	August 23
2	Lake Almaden	37.2394	-121.8698	August 23
3	Almaden Reservoir	37.1591	-121.8426	August 23
4	Guadalupe Reservoir	37.1933	-121.8721	August 23

Fish were collected using a boat-mounted electrofisher unit [Smith-Root Model SR-16H equipped with a 7.5 generator powered pulsator (GPP)]. Water conductivity and temperature were measured before electrofishing began in order to adjust electrofisher unit settings to minimize potential damage or mortality to encountered fish. Four amps of output power was initially employed and adjusted as necessary to elicit appropriate taxis. Captured fish were placed in an aerated live well until they were processed. Discrete locations within the reservoirs and Lake Almaden were not sampled individually; the sampling vessel boat was run as close to the shoreline as the draft allowed in a counter-clockwise direction from the launch point. Sampling depth ranged from 1 to 8 feet deep. Each fish collected for mercury analysis was processed in the following manner:

- Specimen identified and enumerated.
- Fork and standard length (mm) measured on a fixed measuring board.
- Whole fish (year old largemouth bass) placed into heavy-duty aluminum foil (shiny side out) and labeled.
- Samples placed on dry ice for temporary storage in the field and then placed into a zero-degree freezer and transported to the laboratory on dry ice.

2.3.2 Sample Analysis

Reservoir fish were analyzed individually for total mercury content. Dry and wet weight concentrations of mercury were determined along with percent moisture.

2.3.3 Water Quality

Water quality parameters, including conductivity, temperature, pH, and dissolved oxygen were measured at all fish sampling locations. Surface water samples were not collected for mercury parameters.

3.1 SUMMARY OF YEAR 2 MERCURY RESULTS

Summary statistics for whole body mercury concentrations for fish captured at the sampling locations are listed in Tables 3 and 4. These concentrations are reported in both wet and dry weight. Mercury concentrations for individual fish are tabulated in Appendix B. The laboratory reports and the QA/QC analysis of these results are included in Appendix C.

On average, lake and reservoir fish had higher mercury concentrations in their tissues than stream fish (Table 3). Average mercury concentrations were highest in fish caught at Almaden Reservoir (Table 4). Fish caught downstream in Alamitos Creek at Harry Road and at Graystone Lane and in Guadalupe River at West Virginia Street and at Coleman Avenue had incrementally lower average mercury concentrations in their tissues (2446, 1483, 1186, and 319 ng/g dry weight, respectively). Fish caught at Lake Almaden had average mercury concentrations similar to fish caught nearby in Alamitos Creek at Graystone Lane (1721 and 1483 ng/g dry weight, respectively).

Fish caught at Guadalupe Reservoir and at Guadalupe Creek at Meridian Avenue had similar average mercury concentrations (2923 and 2509 ng/g dry weight, respectively). Calero Reservoir, which receives only occasional flow from Almaden Reservoir, had lower average mercury concentrations in fish (465 ng/g dry weight).

The weight of the fish collected at each location is indicated in Table 5. Lake and reservoir fish were generally larger than stream fish, with the exception of fish collected in the Guadalupe Creek at Meridian Avenue.

Because there is a potential for total mercury uptake to vary by species for young of the year fish in the lakes and reservoirs of the Guadalupe River watershed, a statistical test was performed to evaluate whether or not there was a significant difference in whole body mercury concentrations between largemouth bass and blue gill in the Guadalupe Reservoir. Largemouth bass was found to have significantly higher total mercury content than blue gill (t-Test assuming unequal variances, p-value = 0.0001). The results of this test are summarized in Table 6 and Figure 2 and detailed in Appendix D.

Table 3. Mercury Concentrations in Fish by Location Type

Parameter	Type	Count	Mean	Std Dev	CV	Min	Median	Max
Mercury (ng/g, dry weight)	Stream	81	1693	902	0.53	139	1600	3630
	Lake	80	2708	2075	0.77	177	1905	7730
	All Samples	161	2197	1671	0.76	139	1810	7730
Mercury (ng/g, wet weight)	Stream	81	406	215	0.53	38.3	393	829
	Lake	80	584	437	0.75	37.3	427	1750
	All Samples	161	494	354	0.72	37.3	425	1750
ng/g = nanogram per gram								

Table 4. Mercury Concentrations in Fish by Sampling Location

Sampling Location	Type	Count	Mean	Std Dev	CV	Min	Median	Max
Mercury, Dry Weight Concentration (ng/g)								
Guadalupe River at Coleman Ave	Stream	13	319	172	0.54	139	277	800
Guadalupe River at W. Virginia St	Stream	12	1186	283	0.24	839	1145	1580
Guadalupe Creek at Meridian Ave	Stream	16	2509	491	0.20	1720	2575	3430
Alamitos Creek at Graystone Lane	Stream	20	1483	455	0.31	957	1380	2820
Alamitos Creek at Harry Road	Stream	20	2446	556	0.23	1690	2330	3630
Guadalupe Reservoir	Lake	20	2923	916	0.31	1780	2715	4480
Lake Almaden	Lake	20	1721	149	0.09	1500	1685	1990
Almaden Reservoir	Lake	20	5722	1023	0.18	3830	5815	7730
Calero Reservoir	Lake	20	465	257	0.55	177	433	1310
Mercury, Wet Weight Concentration (ng/g)								
Guadalupe River at Coleman Ave	Stream	13	79	36	0.46	38.3	72	173
Guadalupe River at W. Virginia St	Stream	12	260	48	0.19	177	253	336
Guadalupe Creek at Meridian Ave	Stream	16	607	102	0.17	439	645	751
Alamitos Creek at Graystone Lane	Stream	20	352	93	0.26	242	321	597
Alamitos Creek at Harry Road	Stream	20	598	116	0.19	429	603	829
Guadalupe Reservoir	Lake	20	645	168	0.26	415	617	946
Lake Almaden	Lake	20	382	27	0.07	346	379	428
Almaden Reservoir	Lake	20	1211	229	0.19	795	1195	1750
Calero Reservoir	Lake	20	98	56	0.57	37.3	91	289
ng/g = nanogram per gram								

Table 5. Weight of the Fish (g) by Location

Sampling Location	Type	Count	Mean	Std Dev	CV	Min	Median	Max
Guadalupe River at Coleman Ave	Stream	13	3.2	1.9	0.58	1.2	2.8	7.2
Guadalupe River at W. Virginia St	Stream	12	4.6	2.8	0.61	1.8	3.7	11.8
Guadalupe Creek at Meridian Ave	Stream	16	6.0	3.6	0.60	3.3	5.1	18.5
Alamitos Creek at Graystone Lane	Stream	20	3.5	2.1	0.60	1.3	2.8	8.1
Alamitos Creek at Harry Road	Stream	20	2.3	1.0	0.41	1.3	2.1	5.2
Guadalupe Reservoir	Lake	20	7.6	2.4	0.32	3.8	8.2	10.6
Lake Almaden	Lake	20	6.7	1.5	0.23	4.4	6.2	9.7
Almaden Reservoir	Lake	20	4.9	2.5	0.51	2.3	3.9	10.0
Calero Reservoir	Lake	20	6.0	2.3	0.38	2.7	5.8	9.5

g = gram

Table 6. Summary Statistics and Normality Tests for Guadalupe Reservoir Samples

Metric		Summary Statistics (Mercury in ng/g, dry weight)					Shapiro-Wilk W Test	
Species	No. of Samples	Mean	Std Dev	Min	Median	Max	p-value	Distribution
Blue Gill	10	2220	346	1780	2205	2820	0.7485	Normal
Largemouth Bass	10	3626	743	2380	3985	4480	0.0857	Normal

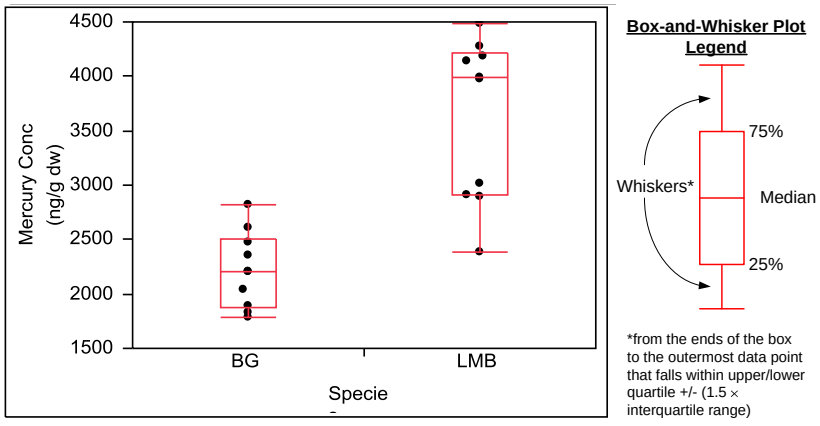

Figure 2. Mercury in Largemouth Bass and Blue Gill in Guadalupe Reservoir Samples

3.2 WATER QUALITY RESULTS

Water quality parameters, including temperature, dissolved oxygen and conductivity were measured at all fish sampling locations. These data are in Table 7.

Table 7. Water Quality Data

Sampling Location	Type	Temperature (°C)	Dissolved Oxygen (mg/L, % saturation)	Conductivity (µm/cm)
Guadalupe River at Coleman Ave	Stream	18.0	8.6, 91%	670
Guadalupe River at W. Virginia St	Stream	19.8	7.1, 80%	472
Guadalupe Creek at Meridian Ave	Stream	17.3	9.1, 95%	364
Alamitos Creek at Graystone Lane	Stream	17.8	9.7, 104%	469
Alamitos Creek at Harry Road	Stream	15.7	9.5, 96%	337
Guadalupe Reservoir	Lake	27.0	8.0, 100%	321
Lake Almaden	Lake	24.2	14.4, 171%	500
Almaden Reservoir	Lake	26.5	11.3, 117%	314
Calero Reservoir	Lake	23.2	8.5, 101%	449

3.3 COMPARISON TO NUMERIC TARGETS

The Basin Plan for mercury in the Guadalupe River watershed set forth numeric targets for mercury in fish tissue that, if attained, protect ecological and human health. The numeric targets for fish tissue mercury concentrations are:

- 0.05 mg/kg (50 ng/g) methylmercury fish average wet-weight concentration in whole trophic level 3 fish 5–15 cm in length, and
- 0.1 mg/kg (100 ng/g) methylmercury fish average wet-weight concentration measured in whole trophic level 3 fish 15–35 cm in length

All of the fish collected were trophic level 3 fish that were 5 to 15 cm in length. Total mercury concentrations for these fish, on a wet weight basis, are summarized by location in Table 3 and results for individual fish are listed in Appendix B.

There is a well-established relationship between total mercury and methylmercury in fish tissue (Bloom 1992); this relationship was confirmed for small fish in the Guadalupe River watershed, as discussed in the Year 1 Interim Report.

Because total mercury concentrations includes all of the methylmercury found in fish tissue, numeric targets for fish tissue would be met if total mercury concentrations were less than 0.05 mg/kg (50 ng/g) wet weight. Although average mercury concentrations were greater than 50 ng/g wet weight at each sampling location, four individual fish had mercury concentrations less than 50 ng/g wet weight. Two of these fish were collected at Calero Reservoir and the other two were collected in Guadalupe River at Coleman Avenue.

3.4 COMPARISON OF YEAR 1 AND YEAR 2 MERCURY RESULTS

Summary statistics for total mercury concentrations for fish captured during both Year 1 and Year 2 are listed in Table 8 and the results are shown on Figure 3. In some locations average concentrations of total mercury in fish have increased (e.g., Almaden Reservoir, Guadalupe Creek at Meridian Avenue) while average mercury concentrations in fish at other locations have decreased (e.g., Lake Almaden, Guadalupe River at Coleman Avenue).

Statistical tests were performed to evaluate inter-annual trends in total mercury concentrations. The results of these tests are summarized in Table 9 detailed in Appendix D. These tests found that total mercury trends between Year 1 and Year 2 by both location and type of site (e.g., streams, reservoirs) are not statistically significant.

Table 8. Summary Statistics and Normality Tests for Mercury in Years 1 and 2 (ng/g, dry weight)

Metric			Summary Statistics							Shapiro-Wilk W Test	
Location	Type	Year	Count	Mean	Std Dev	CV	Min	Median	Max	p-value	Distribution
Guadalupe River at Coleman Ave	Stream	2011	20	599	89	0.15	480	565.5	827	0.0568	Normal
Guadalupe River at Coleman Ave	Stream	2012	13	319	172	0.54	139	277	800	0.0067	Non-parametric
Guadalupe River at Foxworthy Ave	Stream	2011	20	1689	558	0.33	1020	1615	3080	0.0844	Normal
Guadalupe River at W. Virginia St	Stream	2012	12	1186	283	0.24	839	1145	1580	0.1087	Normal
Guadalupe Creek at Meridian Ave	Stream	2011	20	1722	572	0.33	1300	1615	3990	<.0001	Non-parametric
Guadalupe Creek at Meridian Ave	Stream	2012	16	2509	491	0.20	1720	2575	3430	0.6353	Normal
Alamitos Creek at Graystone Lane	Stream	2011	20	1698	551	0.32	1070	1525	3300	0.0081	Non-parametric
Alamitos Creek at Graystone Lane	Stream	2012	20	1483	455	0.31	957	1380	2820	0.0049	Non-parametric
Alamitos Creek at Harry Road	Stream	2011	20	2882	939	0.33	1600	3010	5290	0.1471	Normal
Alamitos Creek at Harry Road	Stream	2012	20	2446	556	0.23	1690	2330	3630	0.1010	Normal
Guadalupe Reservoir	Reservoir	2011	9	3168	779	0.25	2160	2920	4900	0.1691	Normal
Guadalupe Reservoir	Reservoir	2012	20	2923	916	0.31	1780	2715	4480	0.0222	Non-parametric
Lake Almaden	Reservoir	2011	20	3012	591	0.20	1680	3195	3670	0.0169	Non-parametric
Lake Almaden	Reservoir	2012	20	1721	149	0.09	1500	1685	1990	0.2380	Normal
Almaden Reservoir	Reservoir	2011	20	3723	1131	0.30	2300	3530	7210	0.0189	Non-parametric
Almaden Reservoir	Reservoir	2012	20	5722	1023	0.18	3830	5815	7730	0.8587	Normal
Calero Reservoir	Reservoir	2011	16	509	264	0.52	287	435.5	1320	0.0002	Non-parametric
Calero Reservoir	Reservoir	2012	20	465	257	0.55	177	432.5	1310	0.0014	Non-parametric

ng/g = nanograms per gram

Std Dev = standard deviation

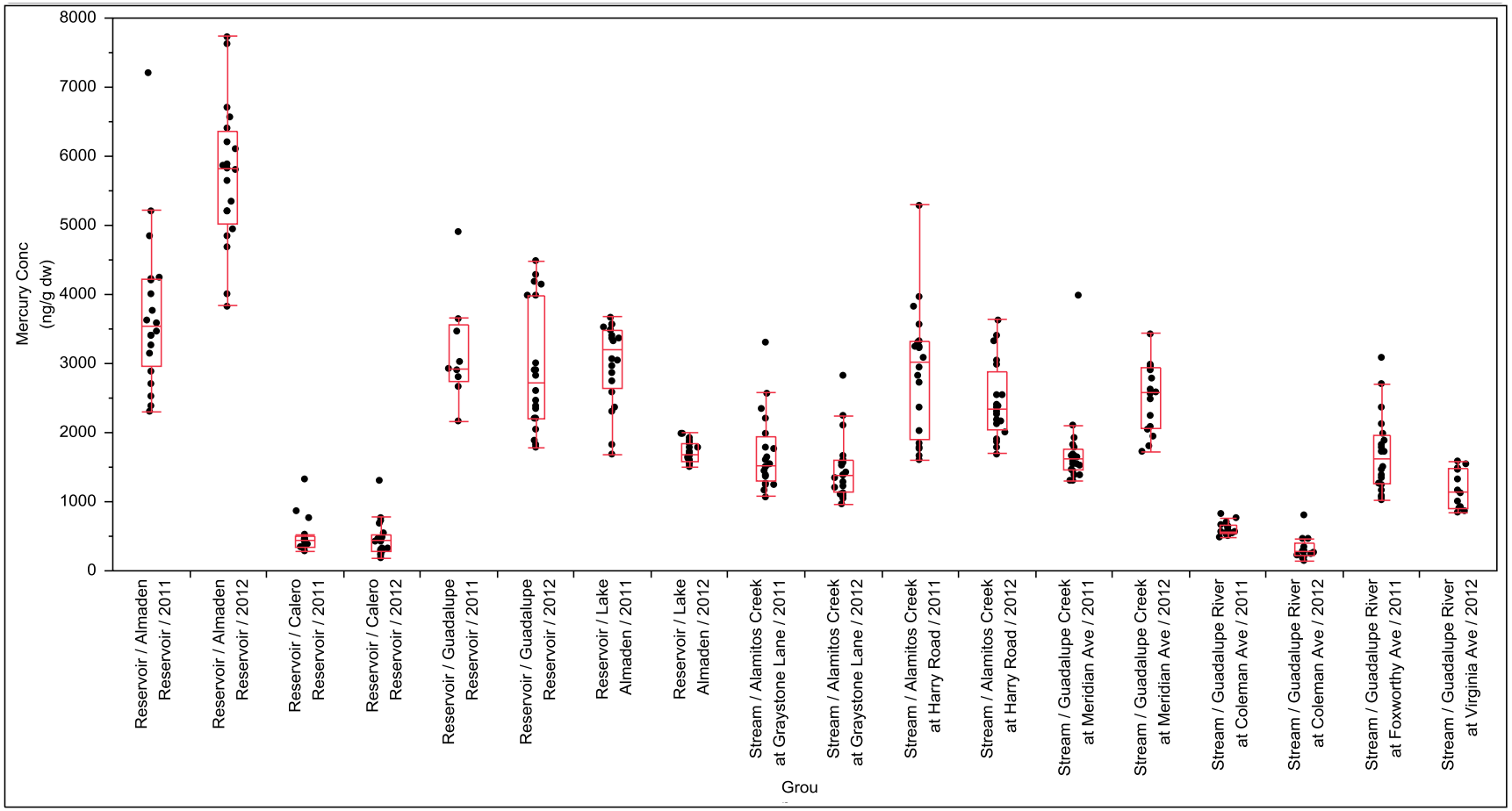

Figure 3. Comparison of Year 1 and Year 2 Mercury Concentrations by Sampling Location

Table 9. Results of the Twoway Anova Comparisons

Metric		p-value	Conclusion
Factors: Location and Year			
Whole Model Test		<.0001	There is at least one significant regression factor in the model.
Effect Tests	Location	<.0001	Location is a significant factor; with some locations have significantly higher total mercury.
	Year	0.5998	Year is not a significant factor.
Factors: Category and Year			
Whole Model Test		<.0001	There is at least one significant regression factor in the model.
Effect Tests	Category	<.0001	Category is a significant factor; with Reservoir has significantly higher total mercury.
	Year	0.9088	Year is not a significant factor.

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Appendix A

Field Datasheets

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Quad at Coleman	Weather: Sunny 70's
Date: 6/26/12	GPS Lat (DMS):
Time: 915	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	18
D.O. (mg/L):	8.06
D.O. (%):	91
Conductivity (us/cm):	670, 776
pH:	—

E-fisher settings	
Voltage:	100
Duty Cycle (Hz):	33, 30%
Output (A):	0.8
Seconds 1284	

Fish Sampling

#	Species	Fork L (mm)	Standard	Weight(g)	Ray Count	Condition	Disposition
1	Sac. Sucker	300	270				
2	Carp	155	146				
3	Green Sunfish	86	74				
4	" "	120	102				
5	" "	107	90				
CB1R 6	Cal Roach CB1R	55	48	2.4		CB1R	
CB2R 7	Cal Roach CB2R	62	56	3.2			
CB3R 8	Cal Roach CB3R	50	46	1.8			
CB4R 9	Cal Roach CB4R	56	48	2.0			
CB5R 10	Cal Roach CB5R	57	52	2.5			
11	Carp	42	37				
CB6R 12	Cal Roach CB6R	66	60	4.0			
CB7R 13	Cal Roach CB7R	61	54	2.8			
CB8R 14	Cal Roach CB8R	49	43	1.2			
15	Roach CB9R	53	47	1.8			
16	Prickly Sc	81	68				
17	Prickly Sc	115	130				
18	Pacific Lamprey		115				
19							
20							

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Graystone Ln / ALMADEN CR	Weather: Sunny 70s no wind
Date: 6/26/12	GPS Lat (DMS):
Time: 12:45	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	17.8
D.O. (mg/L):	9.7
D.O. (%):	104
Conductivity (us/cm):	469, 407 (flashing)
pH:	

E-fisher settings	
Voltage:	100 ~~200~~
Duty Cycle (Hz):	30 hertz
Output (A):	
922 seconds	

Fish Sampling

#	Species	Fork L (mm)	Standard	Weight(g)	Ray Count	Condition	Disposition
1	Rainbow trout	87	78				
2	Prickly sculpin	95	78				
3	Prickly sculpin	93	77				
4	Prickly sculpin	82	69				
5	Sac. Sucker	125	111				
6	Prickly sculpin	135	114				
7	Cal. Roach - GL1R	72	63	6.5			
8	Prickly Sculpin	83	67				
9	Cal. Roach - GL2R	76	70	7.5			
10	Prickly Sculpin	84	71				
11	Cal. Roach - GL3R	83	69	7.4			
12	Cal. Roach - GL4R	67	59	4.0			
13	Cal. Roach - GL5R	51	46	1.9			
14	Prickly sculpin	82	69				
15	Cal. Roach - GL6R	83	72	8.1			
16	Cal. Roach - GL7R	72	61	4.5			
17	Sac. Sucker	93	81				
18	Tule perch	42	36				
19	Cal. Roach GL-8R	60	52	2.8			
20	Cal. Roach GL-9R	56	48	2.5			

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

Sampling #/Location: Date:

Fish Sampling

#	Species	Fork L (mm)	Standard	Weight(g)	Ray Count	Condition	Disposition
21	Cal Roach - GL10R	56	50	2.9			
22	Cal Roach - GL11R	55	50	1.9			
23	Cal Roach - GL12R	59	50	~~3.033~~			
24	Cal Roach - GL13R	51	45	1.3			
25	Cal Roach		38			- did not keep - too small	
26	Cal Roach - GL14R	53	46	2.2			
27	Cal Roach - GL15R	51	45	1.6			
28	Cal Roach - GL16R	60	54	3.4			
29	Tule perch	41	34				
30	Cal Roach - GL17R	54	48	2.6			
31	Cal. Roach ~~GL~~	43	37			- did not keep - too small	
32	Cal. Roach - GL18R	49	43	1.4			
33	Cal. Roach - GL19R	60	53	2.8			
34	Cal. Roach ~~GL20R~~	37	32			- did not keep too small	
35	Cal Roach GL20R	56	48	2.2			
36	Prickly sculpin	91	77				
37	Prickly sculpin	93	84				
38	Prickly sculpin	82	67				
39	Prickly sculpin	98	85				
40							
41							
42							
43							
44							
45							
46							
47							
48							
49							
50							

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Quad B Foxworthy (Alameda xpsway)	Weather: Sunny 70's no wind
Date: 6/27/12	GPS Lat (DMS):
Time: 0940	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	19.4
D.O. (mg/L):	7.9
D.O. (%):	85
Conductivity (us/cm):	492, 551
pH:	

E-fisher settings	
Voltage:	100V
Duty Cycle (Hz):	33 Hz 30% Duty Cycle
Output (A):	0.4A
516 shocking seconds	

Fish Sampling Standard

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	Prickly Sculpin	115/138			Fine	Released
2	Largemouth Bass	93/119			"	"
3	Largemouth Bass	41/49			"	"
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page 1 of 2

Sampling #/Location: Almaden at Harry Rd.	Weather: Sunny, 75°, Light Breeze
Date: 06/27/2012	GPS Lat (DMS):
Time: 11:00 AM	GPS Long (DMS):

HB1R
HB2R etc

Water Quality Parameters	
Temperature (deg C):	15.7°C
D.O. (mg/L):	9.5
D.O. (%):	96%
Conductivity (us/cm):	337 / 410
pH:	

E-fisher settings	
Voltage:	150
Duty Cycle (Hz):	33
Output (A):	30%
151 seconds	

Fish Sampling FORK/STD

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	steelhead	97/85				
2	steelhead	100/89				
3	steelhead	110/99				
4	SAC SUCKER	122/106				
5	SAC SUCKER	107/92				
6	roach - HB1R	49/44	1.5			
7	SAC SUCKER	104/89				
8	roach - HB2R	69/63	5.3			
9	SAC SUCK	77/68				
10	SAC SUCKER	107/94				
11	roach - HB3R	62/55	3.3			
12	roach - HB4R	65/54	4.0			
13	SAC SUCK	97/88				
14	SAC SUCKER	74/68				
15	steelhead	78/68			black spots/bumps on side	
16	roach - HB5R	54/54	2.5			
17	roach - HB6R	58/50	2.4			
18	roach - HB7R	48/44	1.6			
19	roach - HB8R	52/44	1.7			
20	roach - HB9R	57/52	2.1			

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page 2 of 2

Sampling #/Location: Almaden @ HAPPY RD Date: 6/27/12

Fish Sampling		FORK/STD				
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	roach - HB10R	53/46	2.0			
22	roach - HB11R	52/47	1.7			
23	roach - HB12R	51/44	1.7			
24	roach - HB13R	55/49	2.5			
25	roach - HB14R	52/45	2.2			
26	roach - HB15R	57/52	2.9			
27	roach - HB16R	52/45	1.9			
28	roach - HB17R	52/58	2.5			
29	roach - HB18R	49/46	1.3			
30	roach - HB 20 R	53/46	1.7			
31	roach - HB 19 R	48/44	1.5			
32						
33	+ 12 addl roach					
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

SCVWD Fish Tissue Sampling for Mercury Page 1 of 3

Meridian / Fish Ladder Downstream

Sampling #/Location: Guadalupe Creek	Weather:
Date: 06/27/2012	GPS Lat (DMS):
Time: 1:00 to	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	18.0
D.O. (mg/L):	6.9
D.O. (%):	80%
Conductivity (us/cm):	399/461
pH:	

E-fisher settings	
Voltage:	12 S
Duty Cycle (Hz):	30 Hz 35% Duty Cycle
Output (A):	0.6 A
	1217 Seconds

Fish Sampling

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	See Sheet 2					
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

Below Fish Ladder
Guadalupe Creek

SCVWD Fish Tissue Sampling for Mercury Page 2 of 3

Sampling #/Location: Standard/

Date: 06/27/2012

Fish Sampling		Fork				
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	Sac Sucker	160/175				
22	Sac Sucker	175/180				
23	Sac Sucker	122/130				
24	Prickly	57/70				
25	"	70/83				
26	"	63/76				
27	"	56/66				
28	"	72/87				
29	"	82/96				
30	"	64/79				
31	"	90/109				
32	"	79/92				
33	"	56/73				
34	"	82/99				
35	"	53/66				
36	"	54/69				
37	"	66/77				
38	"	61/75				
39	"	74/88				
40	"	72/86				
41	"	76/92				
42	"	49/59				
43	"	70/87				
44	"	82/100				
45	"	71/87				
46	"	59/70				
47	"	66/80				
48	"	79/95				
49	"	85/98				
50	"	54/70				

+ 12 sculpin

Guadalupe Creek SCVWD Fish Tissue Sampling for Mercury Page 3 of 3

Sampling #/Location: Below Fish Ladder Date: 06/27/2012

Fish Sampling						
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	Steelhead	58/64				
22	Sac Sucker	108/123				
23	steelhead	60/71				
24	steelhead	55/60				
25	steelhead	60/66				
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

Sampling #/Location: GUAD Creek @ Meridian, b/w fish ldr	Weather:
Date: 6/28/12	GPS Lat (DMS):
Time: 10:00	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	17.3
D.O. (mg/L):	9.1
D.O. (%):	95%
Conductivity (us/cm):	364, 428.
pH:	

E-fisher settings	
Voltage:	100
Duty Cycle (Hz):	30
Output (A):	33%
3699 seconds	

Fish Sampling FORK/STD

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	roach - GC1R	111/98	18.5			
2	roach - GC2R	64/56	3.3			
3	roach - GC3R	70/61	4.9			
4	roach - GC4R	69/60	4.2			
5	roach - GC5R	73/63	5.2			
6	roach - GC6R	80/71	6.8			
7	roach - GC7R	75/62	5.7			
8	roach - GC8R	66/59	3.6			
9	roach - GC9R	81/70	6.0			
10	roach - GC10R	84/71	8.7			
11	roach - GC11R	71/64	4.6			
12	roach - GC12R	71/62	4.4			
13	roach - GC13R	83/71	6.6			
14	roach - GC14R	68/60	4.1			
15	roach - GC16R	80/70	6.3			
16	roach - GC~~16~~15R	65/57	3.6			
17						
18						
19						
20						

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Guad Rivers d/s of Foxworthy (at Virginia)	Weather: Foggy 60's
Date: 5/29/12	GPS Lat (DMS):
Time: 0930	GPS Long (DMS):

Water Quality Parameters
Temperature (deg C): 19.8
D.O. (mg/L): ~~8~~ 7.1
D.O. (%): 80
Conductivity (us/cm): 472 / ~~557~~
pH:

E-fisher settings
Voltage: 100
Duty Cycle (Hz): 30 35%
Output (A): 0.7
1615 shock seconds Total

Fish Sampling SL FL

#	Species	~~Forks~~ (mm)		Weight(g)	Ray Count	Condition	Disposition
1	Roach VB1R	59	65	2.5	✓		
2	Roach VB2R	61	69	3.9	✓		
3	Roach VB3R	68	76	4.7	✓		
4	Roach VB4R	44	49	1.8	✓		
5							
6	The following were		Between Virginia +			Foxworthy	
7	collected ~~at~~ at						
8	roach - VB5R	84	98	11.8	✓		
9	roach - VB6R	57	67	3.4	✓		
10	roach - VB7R	71	80	6.4	✓		
11	roach - VB8R	73	84	7.4	✓		
12	roach - VB9R	52	59	2.8	✓		
13	roach - VB10R	62	70	4.5	✓		
14	roach - VB11R	56	64	2.9	✓		
15	roach - VB12R	55	64	3.0	✓		
16							
17							
18							
19							
20							

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location:	Weather: Sunny, 70°, light Breeze
Date: ~~06~~ 06/29/2012	GPS Lat (DMS):
Time: 10:55 am	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	Similar to
D.O. (mg/L):	1st Sampling
D.O. (%):	
Conductivity (us/cm):	
pH:	

E-fisher settings	
Voltage:	100
Duty Cycle (Hz):	30 Hz 30% Duty Cycle
Output (A):	0.7 A
	696 seconds shocking

Fish Sampling Standard

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	Roach	60/67	3.6	✓		CB10R
2	" "	81/88	6.6	✓		CB11R
3	" "	72/81	7.2	✓		CB12R
4	" "	58/65	3.7	✓		CB13R
5	" "	46/53	1.2	✓		CB14R
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Calero Reservoir	Weather: Sunny, 70°
Date: 7/23/2012	GPS Lat (DMS):
Time: 8:30	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	23.2
D.O. (mg/L):	8.50
D.O. (%):	101%
Conductivity (us/cm):	444 / 459
pH:	

E-fisher settings	
Voltage:	Low range 50-500 30%
Duty Cycle (Hz):	30
Output (A):	4-6
	1286

Fish Sampling Std /

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	Largemouth	~~[illegible]~~ 370/410				Released
2		280/320				
3		365/420				
4	1 Goldfish	~200				
5	Tule Perch	74/86				
6	Log Perch	97/113				
7	Largemouth	95/112				
8	" "	93/108				
9	Tule Perch	78/90				
10	" "	78/91				
11	Bluegill	145/175				
12	Largemouth	97/114				
13	Bluegill	64/80				
14	Black Crappie	145/181				
15	Bluegill	80/102				
16	Bluegill	65/82				
17	Golden shiner	59/65				
18	" "	65/72				
19	" "	55/65				
20	" "	55/82				

21 LP
2 BS
1 TP
1 LMB

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Calero Date: 7/23/12

Fish Sampling						
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	goldenshiner	55/60			CRLMB26	55/65 3.2
22	Largemouth	94/97			CRLMB27	77/90 10.2
23	Pumpkinseed	84/896				
24	Largemouth	75/87				
25	LMB - CRLMB1	81/92	11.3			
26	CR LMB 2	77/90	9.5			
27	~~CR LMB~~	~~82/93~~				
28	CR LMB 3	78/89	9.7			
29	CR LMB 4	80/90	10.6			
30	CR LMB 5	73/85	8.1			
31	CR LMB 6	78/89	9.9			
32	CR LMB 7	76/88	9.8			
33	CR LMB 8	55/66	3.0			
34	CR LMB 9	78/88	9.8			
35	CR LMB 10	79/91	10.0			
36	CR LMB 11	70/81	7.1			
37	CR LMB 12	59/70	4.3			
38	CR LMB 13	65/76	6.2			
39	CR LMB 14	76/89	8.4			
40	CR LMB 15	64/74	5.9			
41	CR LMB 16	57/66	3.2			
42	CR LMB 17	53/62	3.3			
43	CR LMB 18	54/65	3.3			
44	CR LMB 19	63/74	6.2			
45	CR LMB 20	59/70	4.6			
46	CR LMB 21	54/62	3.8			
47	CR LMB 22	57/65	4.3			
48	CR LMB 23	53/62	2.8			
49	CR LMB 24	58/69	4.5			
50	CR LMB 25	68/82	8.2			

LMB +9

Prickly Sc +15

Am Shad +2

Golden shiner +10 +5

Black crappie +1

Pumpkinseed +1

Tule perch +1 Bluegill

Log perch +50 +29 +5

Sampling #/Location: Lake Almaden	Weather: Sunny, Wind 5-10
Date: 7/23/12	GPS Lat (DMS):
Time: 1200	GPS Long (DMS):

Water Quality Parameters
Temperature (deg C): 24.2
D.O. (mg/L): 14.4
D.O. (%): 171
Conductivity (us/cm): 500 / 508
pH:

E-fisher settings Low Range
Voltage: 50-500
Duty Cycle (Hz): 30 20%
Output (A):
238 seconds

Fish Sampling STD/Fork

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	LA LMB 1	75/81	9.1			
2	LA LMB 2	58/65	4.2			
3	LA LMB 3	74/85	7.2			
4	LA LMB 4	64/74	5.1			
5	LA LMB 5	59/68	3.8			
6	LA LMB 6	62/72	5.1			
7	LA LMB 7	61/70	4.4			
8	LA LMB 8	67/78	6.1			
9	LA LMB 9	74/86	8.4			
10	LA LMB 10	64/74	5.6			
11	LA LMB 11	73/84	7.2			
12	LA LMB 12	74/86	8.4			
13	LA LMB 13	69/80	6.2			
14	LA LMB 14	77/88	8.4			
15	LA LMB 15	73/85	7.9			
16	LA LMB 16	62/74	5.1			
17	LA LMB 17	74/85	9.7			
18	LA LMB 18	66/74	6.3			
19	LA LMB 19	68/79	6.2			
20	LA LMB 20	65/76	5.2			

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

4 log perch 3 LMB bass 1 sunfish

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Date:

Fish Sampling						
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	LA LMB 21	74/83	6.2			
22	LA LMB 22	71/82	6.2			
23	~~LA LMB 23~~	~~71/82~~	~~6.2~~			
24						
25						
26						
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						
41						
42						
43						
44						
45						
46						
47						
48						
49						
50						

Sampling #/Location: Almaden Res.	Weather: Sunny, 80°
Date: 07/23/2012	GPS Lat (DMS):
Time: 1400	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	26.5°
D.O. (mg/L):	11.3
D.O. (%):	117%
Conductivity (us/cm):	314
pH:	

E-fisher settings	Low
Voltage:	50-500
Duty Cycle (Hz):	60 15%
Output (A):	
	618

Fish Sampling

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	ARLMB-01	76/88	11.1			
2	ARLMB-02	77/89	11.2			
3	ARLMB-03	62/70	4.4			
4	ARLMB-04	65/76	6.1			
5	ARLMB-05	66/79	6.8			
6	ARLMB-06	58/66	3.4			
7	ARLMB-07	54/64	2.6			
8	ARLMB-08	76/90	9.7			
9	ARLMB-09	76/88	8.9			
10	ARLMB-10	57/68	3.8			
11	ARLMB-11	55/62	2.8			
12	ARLMB-12	54/64	3.1			
13	ARLMB-13	55/62	2.7			
14	ARLMB-14	54/61	3.2			
15	ARLMB-15	52/60	2.6			
16	ARLMB-16	57/64	4.0			
17	ARLMB-17	52/60	2.6			
18	ARLMB-18	52/60	2.3			
19	ARLMB-19	66/77	6.3			
20	ARLMB-20	72/82	7.4			

20 samples per site, 17 whole THg, 1 whole THG and MeHg, 1 gutted THg, 1 gutted Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Date:

Fish Sampling						
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	ARLMB-21	65/75	6.2			
22	ARLMB-22	76/88	10.0			
23						
24						
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SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Guadalupe Reservoir	Weather: Sunny wind 0-5 80's
Date: 7/17/12	GPS Lat (DMS):
Time: 1800	GPS Long (DMS):

Water Quality Parameters	
Temperature (deg C):	80.6°
D.O. (mg/L):	~~100~~ 8.0
D.O. (%):	100
Conductivity (us/cm):	321
pH:	

E-fisher settings	LOW
Voltage:	50-500
Duty Cycle (Hz):	60 20%
Output (A):	
591 seconds	

Fish Sampling ~~6 STD~~/FORK

#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
1	GR LMB 1	76/89	9.3			
2	GR LMB 2	72/85	8.0			
3	GR LMB ~~3~~	53/60	2.7			
4	GR LMB 4	74/88	8.7			
5	GR LMB 5	73/84	8.6			
6	GR LMB 6	73/85	9.5			
7	GR BG 7	64/76	8.0			
8	GR BG8	68/83	10.8			
9	GR BG9	53/64	4.7			
10	GR BG10	57/69	6.2			
11	GR BG11	52/64	5.1			
12	GR BG12	63/76	8.4			
13	GR LMB 13	69/81	7.0			
14	GR LMB 14	54/60	2.7			
15	GR LMB 15	59/65	3.0			
16	GR LMB 16	54/60	2.5			
17	GR BG 17	59/73	5.5			
18	GR BG 18	69/82	9.5			
19	GR BG 19	54/65	4.2			
20	GR BG 20	51/62	3.8			

20 samples per site, 17 whole THg, 1 whole THG and MeHg, ~~1 gutted THg, 1 gutted~~ Thg and MeHg.

SCVWD Fish Tissue Sampling for Mercury Page ___ of ___

Sampling #/Location: Date:

Fish Sampling						
#	Species	Fork L (mm)	Weight(g)	Ray Count	Condition	Disposition
21	GR BG 21	50/60	4.0			
22	GR BG 22	52/60	3.7			
23	GR LMB 23	58/68	3.2			
24	GR LMB 24	62/73	4.2			
25	GR BG 25	51/64	6.0			
26						
27						
28						
29						
30						
31						
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Appendix B

Analytical Results

The results of the mercury analysis of both stream and reservoir fish specimens are presented below.

STREAM SAMPLING RESULTS

The results of the mercury analysis of stream fish specimens are presented in **Table B-1**.

Table B-1. Stream Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	Weight (g)
Guadalupe River at Coleman Ave	CB1R	173	46	2.4
Guadalupe River at Coleman Ave	CB2R	287	68.3	3.2
Guadalupe River at Coleman Ave	CB3R	270	77.6	1.8
Guadalupe River at Coleman Ave	CB5R	219	61	2.5
Guadalupe River at Coleman Ave	CB6R	287	71.8	4.0
Guadalupe River at Coleman Ave	CB7R	338	82.5	2.8
Guadalupe River at Coleman Ave	CB8R	139	38.3	1.2
Guadalupe River at Coleman Ave	CB9R	204	50.9	1.8
Guadalupe River at Coleman Ave	CB10R	247	55.5	3.6
Guadalupe River at Coleman Ave	CB11R	800	173	6.6
Guadalupe River at Coleman Ave	CB12R	458	115	7.2
Guadalupe River at Coleman Ave	CB13R	451	107	3.7
Guadalupe River at Coleman Ave	CB14R	277	74.3	1.2
Guadalupe River at Virginia Ave	VB1R	1130	268	2.5
Guadalupe River at Virginia Ave	VB2R	869	208	3.9
Guadalupe River at Virginia Ave	VB3R	1540	311	4.7
Guadalupe River at Virginia Ave	VB4R	903	247	1.8
Guadalupe River at Virginia Ave	VB5R	1160	318	11.8
Guadalupe River at Virginia Ave	VB6R	1470	249	3.4
Guadalupe River at Virginia Ave	VB7R	1580	295	6.4
Guadalupe River at Virginia Ave	VB8R	1490	336	7.4
Guadalupe River at Virginia Ave	VB9R	1000	220	2.8
Guadalupe River at Virginia Ave	VB10R	839	177	4.5
Guadalupe River at Virginia Ave	VB11R	1330	257	2.9
Guadalupe River at Virginia Ave	VB12R	926	230	3.0
Guadalupe Creek at Meridian Ave	GC1R	3430	711	18.5
Guadalupe Creek at Meridian Ave	GC2R	2240	523	3.3
Guadalupe Creek at Meridian Ave	GC3R	1720	439	4.9

Table B-1. Stream Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	Weight (g)
Guadalupe Creek at Meridian Ave	GC4R	2080	439	4.2
Guadalupe Creek at Meridian Ave	GC5R	2490	652	5.2
Guadalupe Creek at Meridian Ave	GC6R	2630	676	6.8
Guadalupe Creek at Meridian Ave	GC7R	2790	653	5.7
Guadalupe Creek at Meridian Ave	GC8R	2980	751	3.6
Guadalupe Creek at Meridian Ave	GC9R	2940	687	6.0
Guadalupe Creek at Meridian Ave	GC10R	1810	495	8.7
Guadalupe Creek at Meridian Ave	GC11R	2560	637	4.6
Guadalupe Creek at Meridian Ave	GC12R	2590	599	4.4
Guadalupe Creek at Meridian Ave	GC13R	2910	711	6.6
Guadalupe Creek at Meridian Ave	GC14R	1950	504	4.1
Guadalupe Creek at Meridian Ave	GC15R	2050	548	3.6
Guadalupe Creek at Meridian Ave	GC16R	2970	686	6.3
Alamitos Creek at Graystone Lane	GL1R	1430	321	6.5
Alamitos Creek at Graystone Lane	GL2R	1220	305	7.5
Alamitos Creek at Graystone Lane	GL3R	1670	393	7.4
Alamitos Creek at Graystone Lane	GL4R	1530	320	4.0
Alamitos Creek at Graystone Lane	GL5R	1380	353	1.9
Alamitos Creek at Graystone Lane	GL6R	2110	491	8.1
Alamitos Creek at Graystone Lane	GL7R	1200 J	270	4.5
Alamitos Creek at Graystone Lane	GL8R	2240	496	2.8
Alamitos Creek at Graystone Lane	GL9R	1050	266	2.5
Alamitos Creek at Graystone Lane	GL10R	957	267	2.9
Alamitos Creek at Graystone Lane	GL11R	2820	597	1.9
Alamitos Creek at Graystone Lane	GL12R	1090	260	3.3
Alamitos Creek at Graystone Lane	GL13R	1560	374	1.3
Alamitos Creek at Graystone Lane	GL14R	1130	290	2.2
Alamitos Creek at Graystone Lane	GL15R	1350	288	1.6
Alamitos Creek at Graystone Lane	GL16R	1280	380	3.4
Alamitos Creek at Graystone Lane	GL17R	1100	242	2.6
Alamitos Creek at Graystone Lane	GL18R	1600	371	1.4
Alamitos Creek at Graystone Lane	GL19R	1380	320	2.8

Table B-1. Stream Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	Weight (g)
Alamitos Creek at Graystone Lane	GL20R	1560	427	2.2
Alamitos Creek at Harry Road	HB1R	3320	798	1.5
Alamitos Creek at Harry Road	HB2R	2190	537	5.2
Alamitos Creek at Harry Road	HB3R	2130	592	3.3
Alamitos Creek at Harry Road	HB4R	2540	643	4.0
Alamitos Creek at Harry Road	HB5R	2360	582	2.5
Alamitos Creek at Harry Road	HB6R	2410	626	2.4
Alamitos Creek at Harry Road	HB7R	2380	604	1.6
Alamitos Creek at Harry Road	HB8R	1910	493	1.7
Alamitos Creek at Harry Road	HB9R	2980	751	2.1
Alamitos Creek at Harry Road	HB10R	1690	442	2.0
Alamitos Creek at Harry Road	HB11R	1860	506	1.7
Alamitos Creek at Harry Road	HB12R	2170	458	1.7
Alamitos Creek at Harry Road	HB13R	2010	456	2.5
Alamitos Creek at Harry Road	HB14R	2270	649	2.2
Alamitos Creek at Harry Road	HB15R	3400	601	2.9
Alamitos Creek at Harry Road	HB16R	1780 J	429	1.9
Alamitos Creek at Harry Road	HB17R	3040	829	2.5
Alamitos Creek at Harry Road	HB18R	2300	618	1.3
Alamitos Creek at Harry Road	HB19R	3630	726	1.5
Alamitos Creek at Harry Road	HB20R	2540	627	1.7

g = gram
ID = identification
ng/g dw = nanograms per gram dry weight
ng/g ww = nanogram per gram wet weight

RESERVOIR AND LAKE SAMPLING RESULTS

The results of the mercury analysis of reservoir fish specimens are presented in **Table B-2**.

Table B-2. Reservoir and Lake Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	Weight (g)
Calero Reservoir	CR LMB 2	770	155	9.5
Calero Reservoir	CR LMB 3	281	58.6	9.7
Calero Reservoir	CR LMB 4	473	97.1	10.6
Calero Reservoir	CR LMB 5	417	79	8.1
Calero Reservoir	CR LMB 6	429	91.5	9.9
Calero Reservoir	CR LMB 7	715	144	9.8
Calero Reservoir	CR LMB 9	436	89.5	9.8
Calero Reservoir	CR LMB 10	688	150	10.0
Calero Reservoir	CR LMB 11	177	37.3	7.1
Calero Reservoir	CR LMB 12	461	95.2	4.3
Calero Reservoir	CR LMB 13	446	96	6.2
Calero Reservoir	CR LMB 14	280	61.4	8.4
Calero Reservoir	CR LMB 15	548	113	5.9
Calero Reservoir	CR LMB 19	324	68.4	6.2
Calero Reservoir	CR LMB 20	304	61.9	4.6
Calero Reservoir	CR LMB 21	248	52.3	3.8
Calero Reservoir	CR LMB 22	319	73	4.3
Calero Reservoir	CR LMB 24	215	45.3	4.5
Calero Reservoir	CR LMB 25	1310	289	8.2
Calero Reservoir	CR LMB 27	451	97.6	10.2
Lake Almaden	LA LMB 1	1640	379	9.1
Lake Almaden	LA LMB 3	1630	364	7.2
Lake Almaden	LA LMB 4	1840	399	5.1
Lake Almaden	LA LMB 6	1580	358	5.1
Lake Almaden	LA LMB 7	1640	357	4.4
Lake Almaden	LA LMB 8	1550	353	6.1
Lake Almaden	LA LMB 9	1920	428	8.4
Lake Almaden	LA LMB 10	1780	378	5.6
Lake Almaden	LA LMB 11	1850	412	7.2
Lake Almaden	LA LMB 12	1580	403	8.4

Table B-2. Reservoir and Lake Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	Weight (g)
Lake Almaden	LA LMB 13	1880	412	6.2
Lake Almaden	LA LMB 14	1670	358	8.4
Lake Almaden	LA LMB 15	1730	370	7.9
Lake Almaden	LA LMB 16	1500	346	5.1
Lake Almaden	LA LMB 17	1700	379	9.7
Lake Almaden	LA LMB 18	1780	406	6.3
Lake Almaden	LA LMB 19	1610	349	6.2
Lake Almaden	LA LMB 20	1980	425	5.2
Lake Almaden	LA LMB 21	1570	355	6.2
Lake Almaden	LA LMB 22	1990	407	6.2
Almaden Reservoir	AR LMB 3	5830	1240	4.4
Almaden Reservoir	AR LMB 4	7620	1590	6.1
Almaden Reservoir	AR LMB 5	7730	1750	6.8
Almaden Reservoir	AR LMB 6	5880	1200	3.4
Almaden Reservoir	AR LMB 7	5350	1120	2.6
Almaden Reservoir	AR LMB 8	6570	1430	9.7
Almaden Reservoir	AR LMB 9	6410	1300	8.9
Almaden Reservoir	AR LMB 10	4680	1040	3.8
Almaden Reservoir	AR LMB 11	6200	1300	2.8
Almaden Reservoir	AR LMB 12	4850	1020	3.1
Almaden Reservoir	AR LMB 13	6110	1320	2.7
Almaden Reservoir	AR LMB 14	3830	795	3.2
Almaden Reservoir	AR LMB 15	5800	1220	2.6
Almaden Reservoir	AR LMB 16	4000	844	4.0
Almaden Reservoir	AR LMB 17	5200	1190	2.6
Almaden Reservoir	AR LMB 18	5640	1140	2.3
Almaden Reservoir	AR LMB 19	6700	1430	6.3
Almaden Reservoir	AR LMB 20	5210	1090	7.4
Almaden Reservoir	AR LMB 21	4950	1020	6.2
Almaden Reservoir	AR LMB 22	5870	1180	10.0
Guadalupe Reservoir	GR LMB 1	4280	901	9.3
Guadalupe Reservoir	GR LMB 2	4140	856	8.0

Table B-2. Reservoir and Lake Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	Weight (g)
Guadalupe Reservoir	GR LMB 3	2380	524	2.7
Guadalupe Reservoir	GR LMB 4	2900	657	8.7
Guadalupe Reservoir	GR LMB 5	4480	946	8.6
Guadalupe Reservoir	GR LMB 6	4190	846	9.5
Guadalupe Reservoir	GR LMB 13	3990	843	7.0
Guadalupe Reservoir	GR LMB 15	2910	674	3.0
Guadalupe Reservoir	GR LMB 23	3010 J	656	3.2
Guadalupe Reservoir	GR LMB 24	3980	800	4.2
Guadalupe Reservoir	GR BG 7	2200	508	8.0
Guadalupe Reservoir	GR BG 9	1890	454	4.7
Guadalupe Reservoir	GR BG 10	1780	415	6.2
Guadalupe Reservoir	GR BG 11	2820	628	5.1
Guadalupe Reservoir	GR BG 12	2350	605	8.4
Guadalupe Reservoir	GR BG 17	2470	599	5.5
Guadalupe Reservoir	GR BG 19	2610	601	4.2
Guadalupe Reservoir	GR BG 20	2040	486	3.8
Guadalupe Reservoir	GR BG 21	2210	457	4.0
Guadalupe Reservoir	GR BG 25	1830	437	6.0

g = gram
ID = identification
ng/g dw = nanograms per gram dry weight
ng/g ww = nanogram per gram wet weight

Appendix C

Laboratory Reports and QA-QC Memo

URS

Memorandum

Date: November 16, 2012

To: Mike Carbiener and Terry Cooke

From: Elizabeth Nielsen

Subject: QA/QC Evaluation for the Guadalupe River Watershed 2012 Fish Sampling for the Year 2 Interim Report

Data associated with the fish sampling in the Guadalupe River watershed during June and July 2012 have been evaluated for quality assurance and quality control (QA/QC) in accordance with EPA guidelines. This memorandum is a review of the data reported by the Brooks Rand Labs on October 23rd for BRL Reports 1232029 and 1232030. These data were reviewed for the QA/QC elements of precision, accuracy, reporting limits, and contamination.

The QA/QC parameters reviewed during data evaluation include the following.

- Holding Times - Holding times were checked to see if they were in excess of EPA guidelines. Holding times were calculated using analysis date, preparation date, and/or test date in relation to sampling date.
- Method Blanks - Blank analyses were reviewed for evidence of potential contamination.
- Laboratory Control Samples or Certified Reference Materials- Spike recoveries were reviewed as a check for analytical accuracy.
- Matrix Spikes (MS) - Spike recoveries and relative percent differences (RPDs) were reviewed as a check for analytical precision and accuracy.
- Laboratory Duplicates - RPDs were reviewed as a check for analytical precision.

The following EPA qualifications were used when deemed necessary for inorganic results.

- "U" - The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
- "J" - The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- "J+" - The result is an estimated quantity, but the result may be biased high.
- "J-" - The result is an estimated quantity, but the result may be biased low.
- "UJ" - The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
- "R" - The data are unusable. The sample results are rejected due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.

Below is a brief discussion of each QA/QC element reviewed and the relevant findings.

Requested Analysis

Tables A-1 and A-2 list each of the tissue samples requested for analysis and the requested parameters. All of the requested analyses were reported.

Sample Handling:

Stream and reservoir fish samples were received by Brooks Rand Labs on August 9th on dry ice with the exception of AR LMB 8, AR LMB 9, AR LMB 20 and AR LMB 22. These samples were received by the laboratory on August 29th. Samples were received frozen, in good condition and under chain of custody (COC). Upon receipt at the laboratory, cooler temperature was -11°C for initial shipment and 1.2°C for the second shipment. No sampling handing problems were identified.

Holding Times
Recommended hold times for mercury and in biota is 1 year when frozen. All samples were analyzed within recommended holding times.

Method Blanks
Method blanks consist of clean laboratory matrix that is carried through each step of the analysis with the environmental samples for each parameter. Four method blanks were analyzed for each mercury analytical batch and two method blanks were analyzed for each percent total solids analytical batch. The averages for each of these series of blanks were less than the method detection limit. The absolute values of the average of the blanks were less than the reporting limit. All method blanks were less than the reporting limit for target analytes.

Sample results were blank corrected.

Laboratory Control Samples or Certified Reference Materials
Certified reference material spikes (or blank spikes) are well-characterized, laboratory-generated samples used to monitor the laboratory's day-to-day performance for analyses and assess the accuracy of the analytical process independent of matrix effects. All recoveries were within laboratory generated control limits.

Matrix Spikes
MS/MSD samples are analyzed to evaluate matrix interference for an analytical batch and to assess accuracy and precision. All MS/MSD recoveries and RPDs were within laboratory generated control limits.

Laboratory Duplicates
Duplicate samples are analyzed as a check on the precision of the analytical process. RPDs were within laboratory generated control limits with the exception of GL7R, HB16R and GR LMB 23 for percent total solids. Percent total solids are used to calculate the dry weight mercury results. Because of the uncertainty associated with the percent solids determination, the mercury results reported in dry weight for GL7R, HB16R and GR LMB 23 were qualified as estimated and flagged "J".

Summary
The data reviewed are of acceptable precision and accuracy with the following qualifications.

- The mercury results reported in dry weight for GL7R, HB16R and GR LMB 23 were qualified as estimated and flagged "J" as a result of the uncertainty associated with duplicate analysis in percent solids.

Attachment A – Analytical Results

Table A-1. Stream Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	% Total Solids	Weight, Field Analysis (g)
Guadalupe River at Coleman Ave	CB1R	173	46	26.6	2.4
Guadalupe River at Coleman Ave	CB2R	287	68.3	23.8	3.2
Guadalupe River at Coleman Ave	CB3R	270	77.6	28.7	1.8
Guadalupe River at Coleman Ave	CB5R	219	61	27.9	2.5
Guadalupe River at Coleman Ave	CB6R	287	71.8	25.0	4.0
Guadalupe River at Coleman Ave	CB7R	338	82.5	24.4	2.8
Guadalupe River at Coleman Ave	CB8R	139	38.3	27.6	1.2
Guadalupe River at Coleman Ave	CB9R	204	50.9	25.0	1.8
Guadalupe River at Coleman Ave	CB10R	247	55.5	22.4	3.6
Guadalupe River at Coleman Ave	CB11R	800	173	21.7	6.6
Guadalupe River at Coleman Ave	CB12R	458	115	25.2	7.2
Guadalupe River at Coleman Ave	CB13R	451	107	23.7	3.7
Guadalupe River at Coleman Ave	CB14R	277	74.3	26.9	1.2
Guadalupe River at Virginia Ave	VB1R	1130	268	23.7	2.5
Guadalupe River at Virginia Ave	VB2R	869	208	24.0	3.9
Guadalupe River at Virginia Ave	VB3R	1540	311	20.1	4.7
Guadalupe River at Virginia Ave	VB4R	903	247	27.3	1.8
Guadalupe River at Virginia Ave	VB5R	1160	318	27.5	11.8
Guadalupe River at Virginia Ave	VB6R	1470	249	17.0	3.4
Guadalupe River at Virginia Ave	VB7R	1580	295	18.7	6.4
Guadalupe River at Virginia Ave	VB8R	1490	336	22.6	7.4
Guadalupe River at Virginia Ave	VB9R	1000	220	21.9	2.8
Guadalupe River at Virginia Ave	VB10R	839	177	21.1	4.5
Guadalupe River at Virginia Ave	VB11R	1330	257	19.3	2.9
Guadalupe River at Virginia Ave	VB12R	926	230	24.9	3.0
Guadalupe Creek at Meridian Ave	GC1R	3430	711	20.8	18.5
Guadalupe Creek at Meridian Ave	GC2R	2240	523	23.3	3.3
Guadalupe Creek at Meridian Ave	GC3R	1720	439	25.5	4.9
Guadalupe Creek at Meridian Ave	GC4R	2080	439	21.1	4.2

Table A-1. Stream Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	% Total Solids	Weight, Field Analysis (g)
Guadalupe Creek at Meridian Ave	GC5R	2490	652	26.2	5.2
Guadalupe Creek at Meridian Ave	GC6R	2630	676	25.7	6.8
Guadalupe Creek at Meridian Ave	GC7R	2790	653	23.4	5.7
Guadalupe Creek at Meridian Ave	GC8R	2980	751	25.2	3.6
Guadalupe Creek at Meridian Ave	GC9R	2940	687	23.4	6.0
Guadalupe Creek at Meridian Ave	GC10R	1810	495	27.4	8.7
Guadalupe Creek at Meridian Ave	GC11R	2560	637	24.9	4.6
Guadalupe Creek at Meridian Ave	GC12R	2590	599	23.1	4.4
Guadalupe Creek at Meridian Ave	GC13R	2910	711	24.4	6.6
Guadalupe Creek at Meridian Ave	GC14R	1950	504	25.8	4.1
Guadalupe Creek at Meridian Ave	GC15R	2050	548	26.7	3.6
Guadalupe Creek at Meridian Ave	GC16R	2970	686	23.1	6.3
Alamitos Creek at Graystone Lane	GL1R	1430	321	22.5	6.5
Alamitos Creek at Graystone Lane	GL2R	1220	305	25.0	7.5
Alamitos Creek at Graystone Lane	GL3R	1670	393	23.6	7.4
Alamitos Creek at Graystone Lane	GL4R	1530	320	20.9	4.0
Alamitos Creek at Graystone Lane	GL5R	1380	353	25.6	1.9
Alamitos Creek at Graystone Lane	GL6R	2110	491	23.2	8.1
Alamitos Creek at Graystone Lane	GL7R	1200 J	270	22.5 J	4.5
Alamitos Creek at Graystone Lane	GL8R	2240	496	22.1	2.8
Alamitos Creek at Graystone Lane	GL9R	1050	266	25.3	2.5
Alamitos Creek at Graystone Lane	GL10R	957	267	28.0	2.9
Alamitos Creek at Graystone Lane	GL11R	2820	597	21.2	1.9
Alamitos Creek at Graystone Lane	GL12R	1090	260	23.9	3.3
Alamitos Creek at Graystone Lane	GL13R	1560	374	24.0	1.3
Alamitos Creek at Graystone Lane	GL14R	1130	290	25.5	2.2
Alamitos Creek at Graystone Lane	GL15R	1350	288	21.4	1.6
Alamitos Creek at Graystone Lane	GL16R	1280	380	29.6	3.4
Alamitos Creek at Graystone Lane	GL17R	1100	242	21.9	2.6
Alamitos Creek at Graystone Lane	GL18R	1600	371	23.2	1.4

Table A-1. Stream Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	% Total Solids	Weight, Field Analysis (g)
Alamitos Creek at Graystone Lane	GL19R	1380	320	23.3	2.8
Alamitos Creek at Graystone Lane	GL20R	1560	427	27.4	2.2
Alamitos Creek at Harry Road	HB1R	3320	798	24.0	1.5
Alamitos Creek at Harry Road	HB2R	2190	537	24.5	5.2
Alamitos Creek at Harry Road	HB3R	2130	592	27.8	3.3
Alamitos Creek at Harry Road	HB4R	2540	643	25.3	4.0
Alamitos Creek at Harry Road	HB5R	2360	582	24.7	2.5
Alamitos Creek at Harry Road	HB6R	2410	626	25.9	2.4
Alamitos Creek at Harry Road	HB7R	2380	604	25.4	1.6
Alamitos Creek at Harry Road	HB8R	1910	493	25.8	1.7
Alamitos Creek at Harry Road	HB9R	2980	751	25.2	2.1
Alamitos Creek at Harry Road	HB10R	1690	442	26.2	2.0
Alamitos Creek at Harry Road	HB11R	1860	506	27.1	1.7
Alamitos Creek at Harry Road	HB12R	2170	458	21.1	1.7
Alamitos Creek at Harry Road	HB13R	2010	456	22.7	2.5
Alamitos Creek at Harry Road	HB14R	2270	649	28.6	2.2
Alamitos Creek at Harry Road	HB15R	3400	601	17.7	2.9
Alamitos Creek at Harry Road	HB16R	1780 J	429	24.2 J	1.9
Alamitos Creek at Harry Road	HB17R	3040	829	27.2	2.5
Alamitos Creek at Harry Road	HB18R	2300	618	26.9	1.3
Alamitos Creek at Harry Road	HB19R	3630	726	20.0	1.5
Alamitos Creek at Harry Road	HB20R	2540	627	24.7	1.7

g = gram
ID = identification
ng/g dw = nanograms per gram dry weight
ng/g ww = nanogram per gram wet weight

Table A-2. Reservoir and Lake Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	% Total Solids	Weight, Field Analysis (g)
Calero Reservoir	CR LMB 2	770	155	20.1	9.5
Calero Reservoir	CR LMB 3	281	58.6	20.8	9.7
Calero Reservoir	CR LMB 4	473	97.1	20.5	10.6
Calero Reservoir	CR LMB 5	417	79	18.9	8.1
Calero Reservoir	CR LMB 6	429	91.5	21.3	9.9
Calero Reservoir	CR LMB 7	715	144	20.2	9.8
Calero Reservoir	CR LMB 9	436	89.5	20.5	9.8
Calero Reservoir	CR LMB 10	688	150	21.8	10.0
Calero Reservoir	CR LMB 11	177	37.3	21.1	7.1
Calero Reservoir	CR LMB 12	461	95.2	20.6	4.3
Calero Reservoir	CR LMB 13	446	96	21.5	6.2
Calero Reservoir	CR LMB 14	280	61.4	22.0	8.4
Calero Reservoir	CR LMB 15	548	113	20.6	5.9
Calero Reservoir	CR LMB 19	324	68.4	21.1	6.2
Calero Reservoir	CR LMB 20	304	61.9	20.4	4.6
Calero Reservoir	CR LMB 21	248	52.3	21.0	3.8
Calero Reservoir	CR LMB 22	319	73	22.9	4.3
Calero Reservoir	CR LMB 24	215	45.3	21.1	4.5
Calero Reservoir	CR LMB 25	1310	289	22.0	8.2
Calero Reservoir	CR LMB 27	451	97.6	21.6	10.2
Lake Almaden	LA LMB 1	1640	379	23.1	9.1
Lake Almaden	LA LMB 3	1630	364	22.3	7.2
Lake Almaden	LA LMB 4	1840	399	21.7	5.1
Lake Almaden	LA LMB 6	1580	358	22.7	5.1
Lake Almaden	LA LMB 7	1640	357	21.7	4.4
Lake Almaden	LA LMB 8	1550	353	22.7	6.1
Lake Almaden	LA LMB 9	1920	428	22.3	8.4
Lake Almaden	LA LMB 10	1780	378	21.2	5.6
Lake Almaden	LA LMB 11	1850	412	22.2	7.2
Lake Almaden	LA LMB 12	1580	403	25.6	8.4

Table A-2. Reservoir and Lake Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	% Total Solids	Weight, Field Analysis (g)
Lake Almaden	LA LMB 13	1880	412	22.0	6.2
Lake Almaden	LA LMB 14	1670	358	21.5	8.4
Lake Almaden	LA LMB 15	1730	370	21.4	7.9
Lake Almaden	LA LMB 16	1500	346	23.0	5.1
Lake Almaden	LA LMB 17	1700	379	22.2	9.7
Lake Almaden	LA LMB 18	1780	406	22.8	6.3
Lake Almaden	LA LMB 19	1610	349	21.7	6.2
Lake Almaden	LA LMB 20	1980	425	21.4	5.2
Lake Almaden	LA LMB 21	1570	355	22.7	6.2
Lake Almaden	LA LMB 22	1990	407	20.4	6.2
Almaden Reservoir	AR LMB 3	5830	1240	21.2	4.4
Almaden Reservoir	AR LMB 4	7620	1590	20.9	6.1
Almaden Reservoir	AR LMB 5	7730	1750	22.7	6.8
Almaden Reservoir	AR LMB 6	5880	1200	20.4	3.4
Almaden Reservoir	AR LMB 7	5350	1120	21.0	2.6
Almaden Reservoir	AR LMB 8	6570	1430	21.8	9.7
Almaden Reservoir	AR LMB 9	6410	1300	20.3	8.9
Almaden Reservoir	AR LMB 10	4680	1040	22.1	3.8
Almaden Reservoir	AR LMB 11	6200	1300	20.9	2.8
Almaden Reservoir	AR LMB 12	4850	1020	21.0	3.1
Almaden Reservoir	AR LMB 13	6110	1320	21.7	2.7
Almaden Reservoir	AR LMB 14	3830	795	20.8	3.2
Almaden Reservoir	AR LMB 15	5800	1220	21.1	2.6
Almaden Reservoir	AR LMB 16	4000	844	21.1	4.0
Almaden Reservoir	AR LMB 17	5200	1190	22.9	2.6
Almaden Reservoir	AR LMB 18	5640	1140	20.2	2.3
Almaden Reservoir	AR LMB 19	6700	1430	21.3	6.3
Almaden Reservoir	AR LMB 20	5210	1090	20.9	7.4
Almaden Reservoir	AR LMB 21	4950	1020	20.6	6.2
Almaden Reservoir	AR LMB 22	5870	1180	20.1	10.0

Table A-2. Reservoir and Lake Sampling Results

Location	Sample ID	Mercury (ng/g dw)	Mercury (ng/g ww)	% Total Solids	Weight, Field Analysis (g)
Guadalupe Reservoir	GR LMB 1	4280	901	21.1	9.3
Guadalupe Reservoir	GR LMB 2	4140	856	20.7	8.0
Guadalupe Reservoir	GR LMB 3	2380	524	22.0	2.7
Guadalupe Reservoir	GR LMB 4	2900	657	22.6	8.7
Guadalupe Reservoir	GR LMB 5	4480	946	21.1	8.6
Guadalupe Reservoir	GR LMB 6	4190	846	20.2	9.5
Guadalupe Reservoir	GR LMB 13	3990	843	21.1	7.0
Guadalupe Reservoir	GR LMB 15	2910	674	23.2	3.0
Guadalupe Reservoir	GR LMB 23	3010 J	656	21.8 J	3.2
Guadalupe Reservoir	GR LMB 24	3980	800	20.1	4.2
Guadalupe Reservoir	GR BG 7	2200	508	23.1	8.0
Guadalupe Reservoir	GR BG 9	1890	454	24.1	4.7
Guadalupe Reservoir	GR BG 10	1780	415	23.3	6.2
Guadalupe Reservoir	GR BG 11	2820	628	22.3	5.1
Guadalupe Reservoir	GR BG 12	2350	605	25.8	8.4
Guadalupe Reservoir	GR BG 17	2470	599	24.3	5.5
Guadalupe Reservoir	GR BG 19	2610	601	23.0	4.2
Guadalupe Reservoir	GR BG 20	2040	486	23.8	3.8
Guadalupe Reservoir	GR BG 21	2210	457	20.7	4.0
Guadalupe Reservoir	GR BG 25	1830	437	23.9	6.0

g = gram
ID = identification
ng/g dw = nanograms per gram dry weight
ng/g ww = nanogram per gram wet weight

Appendix D

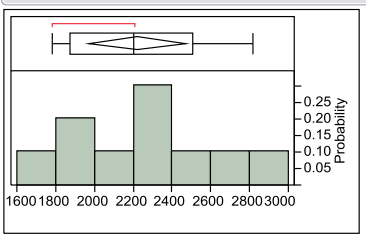
Statistical Results

STATISTICAL RESULTS

The results of the statistical analysis are presented below.

Distributions Species=BG

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	2820
99.5%		2820
97.5%		2820
90.0%		2799
75.0%	quartile	2505
50.0%	median	2205
25.0%	quartile	1875
10.0%		1785
2.5%		1780
0.5%		1780
0.0%	minimum	1780

Moments

Mean	2220
Std Dev	346.24975
Std Err Mean	109.49378
Upper 95% Mean	2467.6921
Lower 95% Mean	1972.3079
N	10

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2220	1972.3079	2467.6921
Dispersion	σ	346.24975	238.16277	632.11707

-2log(Likelihood) =

Goodness-of-Fit Test

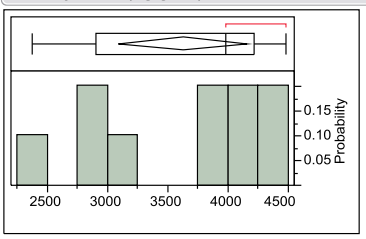
Shapiro-Wilk W Test

W	Prob<W
0.956769	0.7485

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Species=LMB

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	4480
99.5%		4480
97.5%		4480
90.0%		4460
75.0%	quartile	4212.5
50.0%	median	3985
25.0%	quartile	2907.5
10.0%		2432
2.5%		2380
0.5%		2380
0.0%	minimum	2380

Moments

Mean	3626
Std Dev	743.02983
Std Err Mean	234.96666
Upper 95% Mean	4157.5315
Lower 95% Mean	3094.4685
N	10

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3626	3094.4685	4157.5315
Dispersion	σ	743.02983	511.08208	1356.4828

-2log(Likelihood) =

Goodness-of-Fit Test

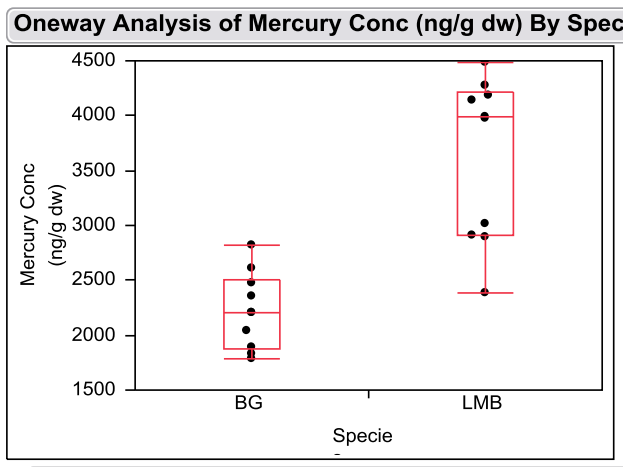
Shapiro-Wilk W Test

W	Prob<W
0.864272	0.0857

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Figure D-1. Distribution of Mercury by Species in Guadalupe Reservoir Samples

Oneway Analysis of Mercury Conc (ng/g dw) By Species



Oneway Anova

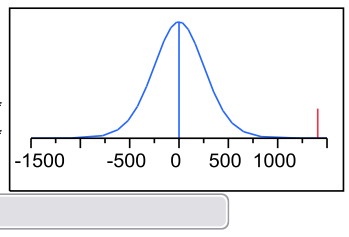
Summary of Fit

Rsquare	0.620397
Adj Rsquare	0.599308
Root Mean Square Error	579.6474
Mean of Response	2923
Observations (or Sum Wgts)	20

t Test

LMB-BG
Assuming equal variances

Difference	1406.00	t Ratio	5.423834
Std Err Dif	259.23	DF	18
Upper CL Dif	1950.61	Prob > |t|	<.0001 *
Lower CL Dif	861.39	Prob > t	<.0001 *
Confidence	0.95	Prob < t	1.0000



Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Species	1	9884180	9884180	29.4180	<.0001 *
Error	18	6047840	335991		
C. Total	19	15932020			

Means for Oneway Anova

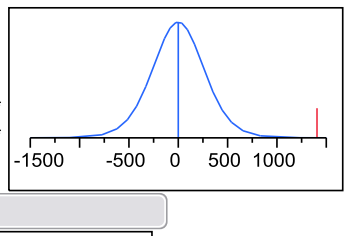
Level	Number	Mean	Std Error	Lower 95%	Upper 95%
BG	10	2220.00	183.30	1834.9	2605.1
LMB	10	3626.00	183.30	3240.9	4011.1

Std Error uses a pooled estimate of error

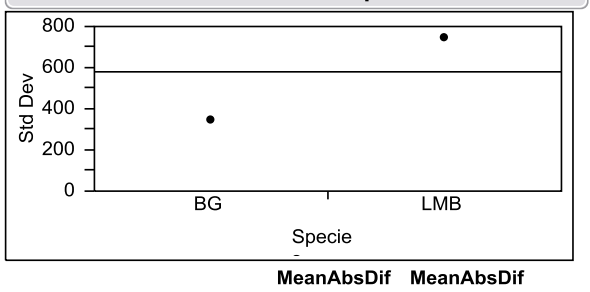
t Test

LMB-BG
Assuming unequal variances

Difference	1406.00	t Ratio	5.423834
Std Err Dif	259.23	DF	12.73274
Upper CL Dif	1967.22	Prob > |t|	0.0001 *
Lower CL Dif	844.78	Prob > t	<.0001 *
Confidence	0.95	Prob < t	0.9999



Tests that the Variances are Equal



Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
BG	10	346.2497	274.0000	272.0000
LMB	10	743.0298	660.8000	590.0000

Test	F Ratio	DFNum	DFDen	p-Value
O'Brien[.5]	7.2707	1	18	0.0148 *
Brown-Forsythe	2.9189	1	18	0.1047
Levene	14.4708	1	18	0.0013 *
Bartlett	4.5521	1	.	0.0329 *
F Test 2-sided	4.6050	9	9	0.0328 *

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
29.4180	1	12.733	0.0001 *

t Test
5.4238

Wilcoxon / Kruskal-Wallis Tests (Rank Sums)

Level	Count	Score Sum	Expected Score	Score Mean	(Mean-Mean0)/Std0
BG	10	58.000	105.000	5.8000	-3.515
LMB	10	152.000	105.000	15.2000	3.515

2-Sample Test, Normal Approximation

S	Z	Prob>|Z|
152	3.51507	0.0004 *

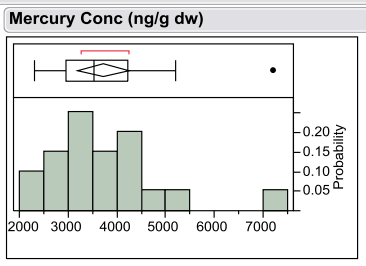
1-way Test, ChiSquare Approximation

ChiSquare	DF	Prob>ChiSq
12.6229	1	0.0004 *

Figure D-2. Oneway Anova Test of Mercury by Species in Guadalupe Reservoir Samples

Distributions Category=Reservoir, Location=Almaden Reservoir, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	7210
99.5%		7210
97.5%		7210
90.0%		5174
75.0%	quartile	4225
50.0%	median	3530
25.0%	quartile	2955
10.0%		2394
2.5%		2300
0.5%		2300
0.0%	minimum	2300

Moments

Mean	3722.5
Std Dev	1131.4307
Std Err Mean	252.99561
Upper 95% Mean	4252.0259
Lower 95% Mean	3192.9741
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3722.5	3192.9741	4252.0259
Dispersion	σ	1131.4307	860.44221	1652.5357

-2log(Likelihood) =

Goodness-of-Fit Test

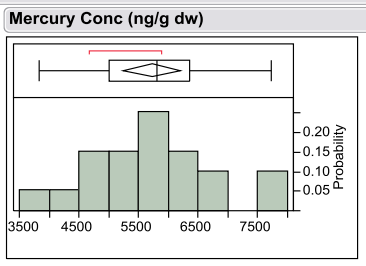
Shapiro-Wilk W Test

W	Prob<W
0.881578	0.0189 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Almaden Reservoir, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	7730
99.5%		7730
97.5%		7730
90.0%		7528
75.0%	quartile	6357.5
50.0%	median	5815
25.0%	quartile	5012.5
10.0%		4068
2.5%		3830
0.5%		3830
0.0%	minimum	3830

Moments

Mean	5721.5
Std Dev	1023.2522
Std Err Mean	228.80614
Upper 95% Mean	6200.3968
Lower 95% Mean	5242.6032
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	5721.5	5242.6032	6200.3968
Dispersion	σ	1023.2522	778.17344	1494.5331

-2log(Likelihood) =

Goodness-of-Fit Test

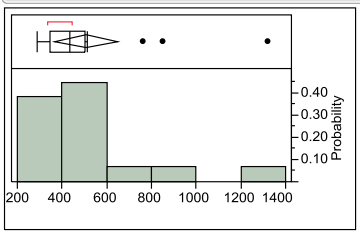
Shapiro-Wilk W Test

W	Prob<W
0.975210	0.8587

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Calero Reservoir, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	1320
99.5%		1320
97.5%		1320
90.0%		991.7
75.0%	quartile	502
50.0%	median	435.5
25.0%	quartile	348
10.0%		322
2.5%		287
0.5%		287
0.0%	minimum	287

Moments

Mean	508.75
Std Dev	263.85059
Std Err Mean	65.962647
Upper 95% Mean	649.34605
Lower 95% Mean	368.15395
N	16

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	508.75	368.15395	649.34605
Dispersion	σ	263.85059	194.90771	408.35924

-2log(Likelihood) =

Goodness-of-Fit Test

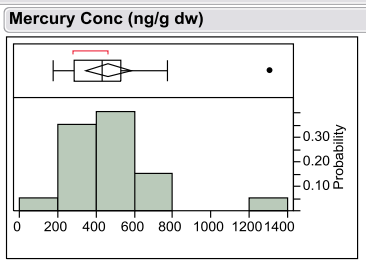
Shapiro-Wilk W Test

W	Prob<W
0.702846	0.0002 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Calero Reservoir, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	1310
99.5%		1310
97.5%		1310
90.0%		764.5
75.0%	quartile	529.25
50.0%	median	432.5
25.0%	quartile	286.75
10.0%		218.3
2.5%		177
0.5%		177
0.0%	minimum	177

Moments

Mean	464.6
Std Dev	257.41374
Std Err Mean	57.559461
Upper 95% Mean	585.07334
Lower 95% Mean	344.12666
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	464.6	344.12666	585.07334
Dispersion	σ	257.41374	195.76067	375.9712

-2log(Likelihood) =

Goodness-of-Fit Test

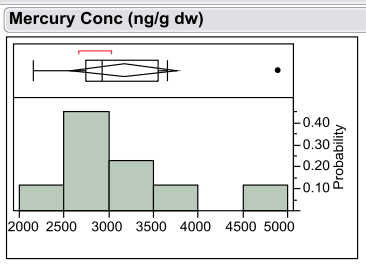
Shapiro-Wilk W Test

W	Prob<W
0.812939	0.0014 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Guadalupe Reservoir, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	4900
99.5%		4900
97.5%		4900
90.0%		4900
75.0%	quartile	3555
50.0%	median	2920
25.0%	quartile	2740
10.0%		2160
2.5%		2160
0.5%		2160
0.0%	minimum	2160

Moments

Mean	3167.7778
Std Dev	779.16266
Std Err Mean	259.72089
Upper 95% Mean	3766.6952
Lower 95% Mean	2568.8603
N	9

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3167.7778	2568.8603	3766.6952
Dispersion	σ	779.16266	526.2909	1492.6971

-2log(Likelihood) =

Goodness-of-Fit Test

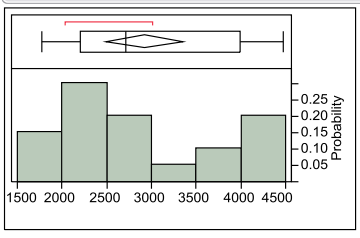
Shapiro-Wilk W Test

W	Prob<W
0.883071	0.1691

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Guadalupe Reservoir, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	4480
99.5%		4480
97.5%		4480
90.0%		4271
75.0%	quartile	3987.5
50.0%	median	2715
25.0%	quartile	2202.5
10.0%		1836
2.5%		1780
0.5%		1780
0.0%	minimum	1780

Moments

Mean	2923
Std Dev	915.7114
Std Err Mean	204.75929
Upper 95% Mean	3351.5661
Lower 95% Mean	2494.4339
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2923	2494.4339	3351.5661
Dispersion	σ	915.7114	696.38972	1337.4621

-2log(Likelihood) =

Goodness-of-Fit Test

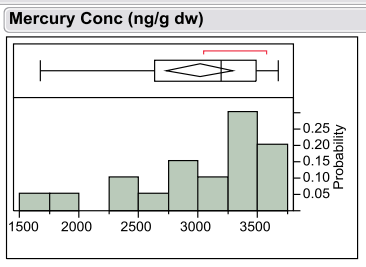
Shapiro-Wilk W Test

W	Prob<W
0.885496	0.0222 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Lake Almaden, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	3670
99.5%		3670
97.5%		3670
90.0%		3570
75.0%	quartile	3487.5
50.0%	median	3195
25.0%	quartile	2630
10.0%		1869
2.5%		1680
0.5%		1680
0.0%	minimum	1680

Moments

Mean	3012
Std Dev	591.27516
Std Err Mean	132.21315
Upper 95% Mean	3288.7253
Lower 95% Mean	2735.2747
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	3012	2735.2747	3288.7253
Dispersion	σ	591.27516	449.65908	863.59973

-2log(Likelihood) =

Goodness-of-Fit Test

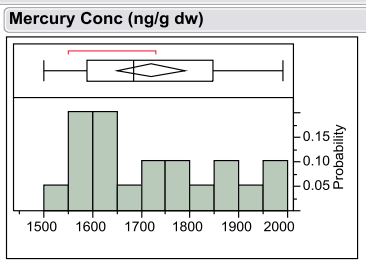
Shapiro-Wilk W Test

W	Prob<W
0.878920	0.0169 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Reservoir, Location=Lake Almaden, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	1990
99.5%		1990
97.5%		1990
90.0%		1974
75.0%	quartile	1847.5
50.0%	median	1685
25.0%	quartile	1587.5
10.0%		1552
2.5%		1500
0.5%		1500
0.0%	minimum	1500

Moments

Mean	1721
Std Dev	148.60403
Std Err Mean	33.228871
Upper 95% Mean	1790.5488
Lower 95% Mean	1651.4512
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1721	1651.4512	1790.5488
Dispersion	σ	148.60403	113.01194	217.04683

-2log(Likelihood) =

Goodness-of-Fit Test

Shapiro-Wilk W Test

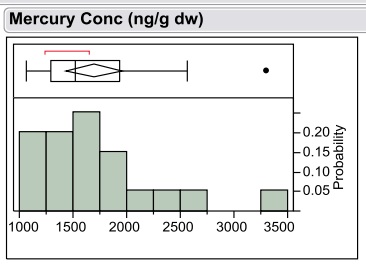
W	Prob<W
0.939831	0.2380

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Figure D-3. Distribution of Mercury by Reservoir Location and Year

Distributions Category=Stream, Location=Alamitos Creek at Graystone Lane, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	3300
99.5%		3300
97.5%		3300
90.0%		2548
75.0%	quartile	1937.5
50.0%	median	1525
25.0%	quartile	1292.5
10.0%		1168
2.5%		1070
0.5%		1070
0.0%	minimum	1070

Moments

Mean	1698
Std Dev	551.20538
Std Err Mean	123.25327
Upper 95% Mean	1955.9721
Lower 95% Mean	1440.0279
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1698	1440.0279	1955.9721
Dispersion	σ	551.20538	419.1864	805.07494

-2log(Likelihood) =

Goodness-of-Fit Test

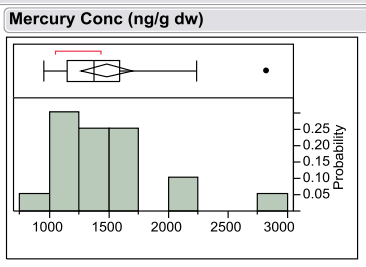
Shapiro-Wilk W Test

W	Prob<W
0.860744	0.0081 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Alamitos Creek at Graystone Lane, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	2820
99.5%		2820
97.5%		2820
90.0%		2227
75.0%	quartile	1590
50.0%	median	1380
25.0%	quartile	1147.5
10.0%		1054
2.5%		957
0.5%		957
0.0%	minimum	957

Moments

Mean	1482.85
Std Dev	455.29438
Std Err Mean	101.80692
Upper 95% Mean	1695.9343
Lower 95% Mean	1269.7657
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1482.85	1269.7657	1695.9343
Dispersion	σ	455.29438	346.24701	664.99006

-2log(Likelihood) =

Goodness-of-Fit Test

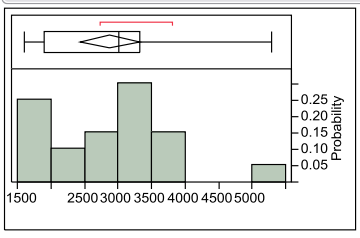
Shapiro-Wilk W Test

W	Prob<W
0.847802	0.0049 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Alamitos Creek at Harry Road, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	5290
99.5%		5290
97.5%		5290
90.0%		3955
75.0%	quartile	3317.5
50.0%	median	3010
25.0%	quartile	1895
10.0%		1671
2.5%		1600
0.5%		1600
0.0%	minimum	1600

Moments

Mean	2881.5
Std Dev	939.49188
Std Err Mean	210.07677
Upper 95% Mean	3321.1957
Lower 95% Mean	2441.8043
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2881.5	2441.8043	3321.1957
Dispersion	σ	939.49188	714.47455	1372.1952

-2log(Likelihood) =

Goodness-of-Fit Test

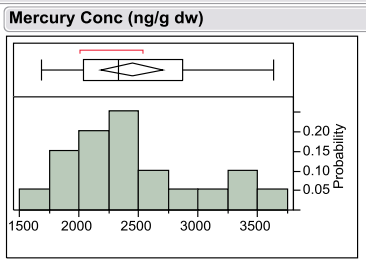
Shapiro-Wilk W Test

W	Prob<W
0.928910	0.1471

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Alamitos Creek at Harry Road, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	3630
99.5%		3630
97.5%		3630
90.0%		3392
75.0%	quartile	2870
50.0%	median	2330
25.0%	quartile	2040
10.0%		1788
2.5%		1690
0.5%		1690
0.0%	minimum	1690

Moments

Mean	2445.5
Std Dev	556.03365
Std Err Mean	124.3329
Upper 95% Mean	2705.7318
Lower 95% Mean	2185.2682
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2445.5	2185.2682	2705.7318
Dispersion	σ	556.03365	422.85825	812.12698

-2log(Likelihood) =

Goodness-of-Fit Test

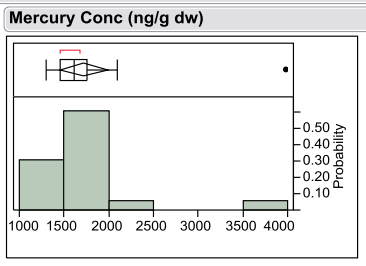
Shapiro-Wilk W Test

W	Prob<W
0.920439	0.1010

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Guadalupe Creek at Meridian Ave, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	3990
99.5%		3990
97.5%		3990
90.0%		2083
75.0%	quartile	1762.5
50.0%	median	1615
25.0%	quartile	1452.5
10.0%		1308
2.5%		1300
0.5%		1300
0.0%	minimum	1300

Moments

Mean	1721.5
Std Dev	571.85087
Std Err Mean	127.86974
Upper 95% Mean	1989.1344
Lower 95% Mean	1453.8656
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1721.5	1453.8656	1989.1344
Dispersion	σ	571.85087	434.8871	835.22917

-2log(Likelihood) =

Goodness-of-Fit Test

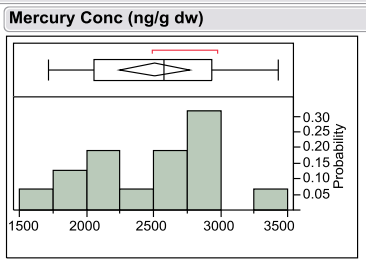
Shapiro-Wilk W Test

W	Prob<W
0.568344	<.0001 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Guadalupe Creek at Meridian Ave, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	3430
99.5%		3430
97.5%		3430
90.0%		3115
75.0%	quartile	2932.5
50.0%	median	2575
25.0%	quartile	2057.5
10.0%		1783
2.5%		1720
0.5%		1720
0.0%	minimum	1720

Moments

Mean	2508.75
Std Dev	491.45871
Std Err Mean	122.86468
Upper 95% Mean	2770.6299
Lower 95% Mean	2246.8701
N	16

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	2508.75	2246.8701	2770.6299
Dispersion	σ	491.45871	363.04294	760.62634

-2log(Likelihood) =

Goodness-of-Fit Test

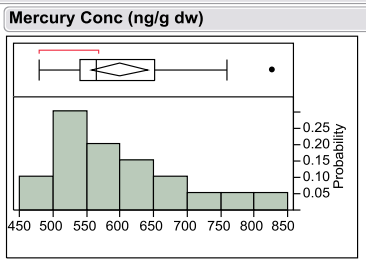
Shapiro-Wilk W Test

W	Prob<W
0.958538	0.6353

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Guadalupe River at Coleman Ave, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	827
99.5%		827
97.5%		827
90.0%		753.4
75.0%	quartile	651.25
50.0%	median	565.5
25.0%	quartile	540.25
10.0%		496
2.5%		480
0.5%		480
0.0%	minimum	480

Moments

Mean	598.9
Std Dev	89.131423
Std Err Mean	19.930392
Upper 95% Mean	640.61479
Lower 95% Mean	557.18521
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	598.9	557.18521	640.61479
Dispersion	σ	89.131423	67.783591	130.18283

-2log(Likelihood) =

Goodness-of-Fit Test

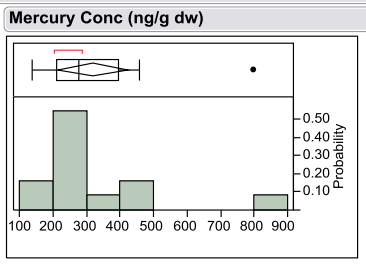
Shapiro-Wilk W Test

W	Prob<W
0.907375	0.0568

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Guadalupe River at Coleman Ave, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	800
99.5%		800
97.5%		800
90.0%		663.2
75.0%	quartile	394.5
50.0%	median	277
25.0%	quartile	211.5
10.0%		152.6
2.5%		139
0.5%		139
0.0%	minimum	139

Moments

Mean	319.23077
Std Dev	172.4346
Std Err Mean	47.824754
Upper 95% Mean	423.43196
Lower 95% Mean	215.02958
N	13

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	319.23077	215.02958	423.43196
Dispersion	σ	172.4346	123.65044	284.64386

-2log(Likelihood) =

Goodness-of-Fit Test

Shapiro-Wilk W Test

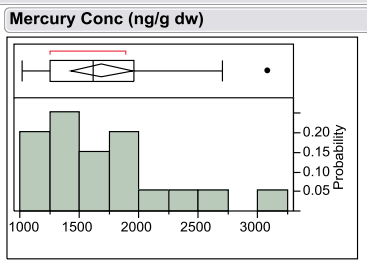
W	Prob<W
0.799555	0.0067 *

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Figure D-4. Distribution of Mercury by Stream Location and Year

Distributions Category=Stream, Location=Guadalupe River at Foxworthy Ave, Year=2011

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	3080
99.5%		3080
97.5%		3080
90.0%		2667
75.0%	quartile	1957.5
50.0%	median	1615
25.0%	quartile	1255
10.0%		1072
2.5%		1020
0.5%		1020
0.0%	minimum	1020

Moments

Mean	1688.5
Std Dev	557.74239
Std Err Mean	124.71499
Upper 95% Mean	1949.5315
Lower 95% Mean	1427.4685
N	20

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1688.5	1427.4685	1949.5315
Dispersion	σ	557.74239	424.15773	814.62272

-2log(Likelihood) =

Goodness-of-Fit Test

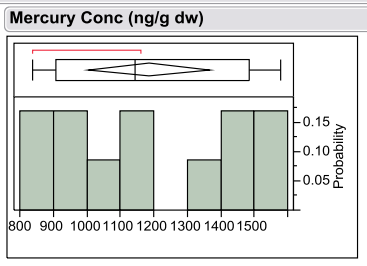
Shapiro-Wilk W Test

W	Prob<W
0.916380	0.0844

Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Distributions Category=Stream, Location=Guadalupe River at Virginia Ave, Year=2012

Mercury Conc (ng/g dw)



Quantiles

100.0%	maximum	1580
99.5%		1580
97.5%		1580
90.0%		1568
75.0%	quartile	1485
50.0%	median	1145
25.0%	quartile	908.75
10.0%		848
2.5%		839
0.5%		839
0.0%	minimum	839

Moments

Mean	1186.4167
Std Dev	283.06005
Std Err Mean	81.712398
Upper 95% Mean	1366.2644
Lower 95% Mean	1006.5689
N	12

Fitted Normal

Parameter Estimates

Type	Parameter	Estimate	Lower 95%	Upper 95%
Location	μ	1186.4167	1006.5689	1366.2644
Dispersion	σ	283.06005	200.51837	480.60144

-2log(Likelihood) =

Goodness-of-Fit Test

Shapiro-Wilk W Test

W	Prob<W
0.887278	0.1087

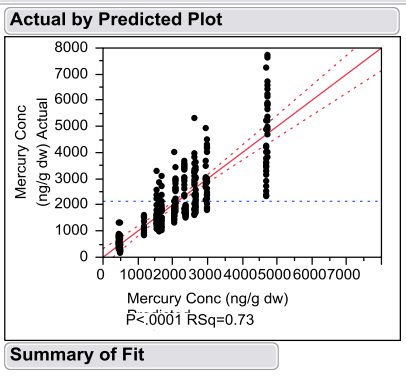
Note: Ho = The data is from the Normal distribution. Small p-values reject Ho.

Figure D-4. Distribution of Mercury by Stream Location and Year (cont.)

Response Mercury Conc (ng/g dw)

Whole Model

Actual by Predicted Plot



Summary of Fit

RSquare	0.732147
RSquare Adj	0.723644
Root Mean Square Error	775.0096
Mean of Response	2137.436
Observations (or Sum Wgts)	326

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	10	517161987	51716199	86.1018
Error	315	189201565	600639.89	Prob > F
C. Total	325	706363552		<.0001 *

Parameter Estimates

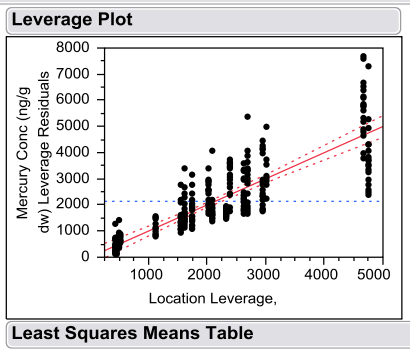
Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	2025.6631	46.09659	43.94	<.0001 *
Location[Alamitos Creek at Graystone Lane]	-435.2381	118.902	-3.66	0.0003 *
Location[Alamitos Creek at Harry Road]	637.83689	118.902	5.36	<.0001 *
Location[Almaden Reservoir]	2696.3369	118.902	22.68	<.0001 *
Location[Calero Reservoir]	-1544.109	124.4608	-12.41	<.0001 *
Location[Guadalupe Creek at Meridian Ave]	48.393696	124.5231	0.39	0.6978
Location[Guadalupe Reservoir]	964.19467	137.7258	7.00	<.0001 *
Location[Guadalupe River at Coleman Ave]	-1531.843	129.5944	-11.82	<.0001 *
Location[Guadalupe River at Foxworthy Ave]	-313.1518	168.2554	-1.86	0.0637
Location[Guadalupe River at Virginia Ave]	-863.2577	210.2075	-4.11	<.0001 *
Year[2011]	-24.01129	45.71124	-0.53	0.5998

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Location	9	9	516038342	95.4608	<.0001 *
Year	1	1	165729	0.2759	0.5998

Location

Leverage Plot

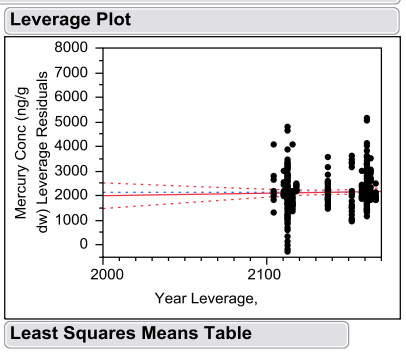


Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Alamitos Creek at Graystone Lane	1590.4250	122.53978	1590.42
Alamitos Creek at Harry Road	2663.5000	122.53978	2663.50
Almaden Reservoir	4722.0000	122.53978	4722.00
Calero Reservoir	481.5543	129.26809	484.22
Guadalupe Creek at Meridian Ave	2074.0568	129.26809	2071.39
Guadalupe Reservoir	2989.8578	144.95638	2998.97
Guadalupe River at Coleman Ave	493.8206	135.25985	488.73
Guadalupe River at Foxworthy Ave	1712.5113	179.22475	1688.50
Guadalupe River at Virginia Ave	1162.4054	228.34807	1186.42
Lake Almaden	2366.5000	122.53978	2366.50

Year

Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2011	2001.6518	65.454426	2079.44
2012	2049.6744	64.378133	2196.87

Residual by Predicted Plot

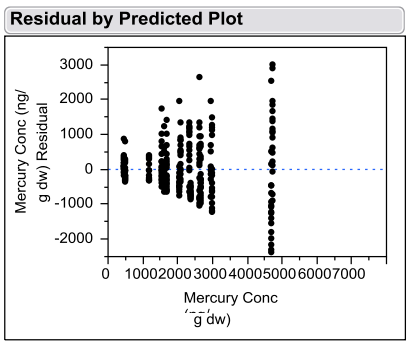
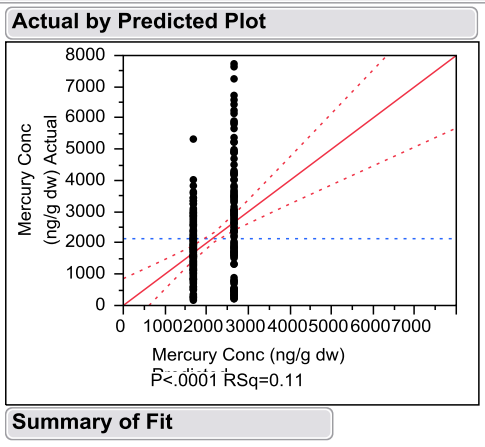


Figure D-5. Twoway Anova Test of Mercury by Location and Year

Response Mercury Conc (ng/g dw)

Whole Model

Actual by Predicted Plot



Summary of Fit

RSquare	0.107062
RSquare Adj	0.101533
Root Mean Square Error	1397.409
Mean of Response	2137.436
Observations (or Sum Wgts)	326

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	75624390	37812195	19.3635
Error	323	630739162	1952752.8	Prob > F
C. Total	325	706363552		<.0001 *

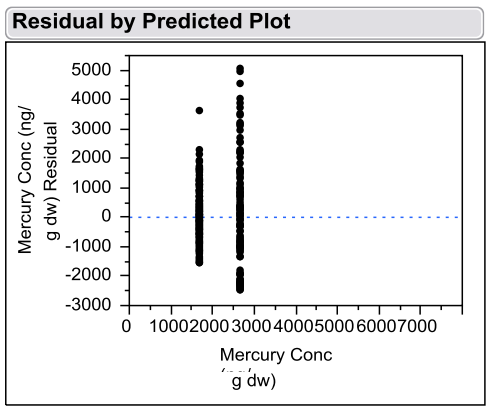
Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	2190.9478	77.87163	28.14	<.0001 *
Category[Reservoir]	483.59097	78.29274	6.18	<.0001 *
Year[2011]	-8.925455	77.81976	-0.11	0.9088

Effect Tests

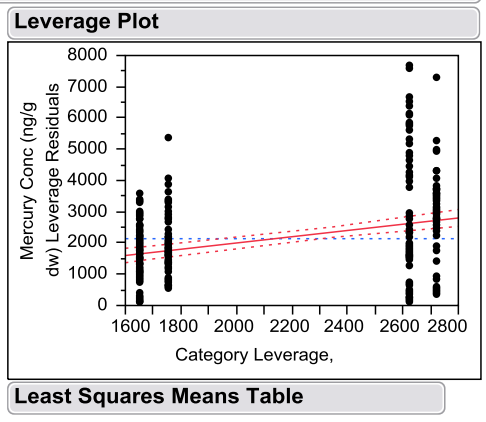
Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Category	1	1	74500745	38.1517	<.0001 *
Year	1	1	25688	0.0132	0.9088

Residual by Predicted Plot



Category

Leverage Plot

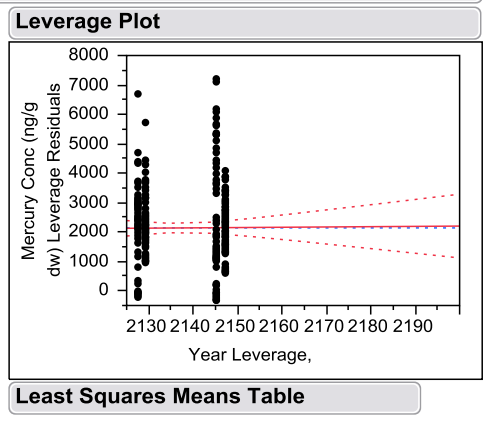


Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
Reservoir	2674.5387	116.32742	2675.46
Stream	1707.3568	104.18935	1706.42

Year

Leverage Plot



Least Squares Means Table

Level	Least Sq Mean	Std Error	Mean
2011	2182.0223	110.04852	2079.44
2012	2199.8732	110.13236	2196.87

Figure D-6. Twoway Anova Test of Mercury by Category (Stream v. Reservoir) and Year