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January 30, 2014

VIA U.S. MAIL AND ELECTRONIC MAIL

Ms. Dyan Whyte
Assistant Executive Officer
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, California 94612

Re: *Fourth Quarter 2013 Status Report – June 27, 2013 Amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, Directive 10.b . - Selenium Study Work Plan*

Dear Ms. Whyte:

Enclosed, in accordance with the Regional Water Quality Control Board, San Francisco Bay Region's, ("Regional Water Board") June 27, 2013 amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, ("Order"), Lehigh Southwest Cement Company ("Lehigh") provides and encloses the 4th Quarter Status Report for the Selenium Study Work Plan pursuant to Directive 10.b. of that Order. Please note that due to the size of the excel files, much of the referenced data is being provided in electronic format, on the enclosed CD.

If you or your staff have any questions regarding the above report or enclosed documents, please do not hesitate to contact me or Greg Knapp at Lehigh.

Very truly yours,

Nicole E. Granquist

Nicole E. Granquist

Enclosures

Cc: Brian Thompson, Regional Water Quality Control Board, San Francisco Bay Region
Greg Knapp, Director Environmental Region West, Lehigh
Scott Rickman, Regional Counsel, Lehigh Hanson

TECHNICAL MEMORANDUM

Date: January 30, 2014

To: San Francisco Bay Regional Water Quality Control Board

From: Ben Giudice, Ph.D., P.E.; Paul Bedore, M.S.

Cc: Greg Knapp, Nicole Granquist

On Behalf of: Lehigh Southwest Cement Company

Project: Permanente Quarry and Cement Plant Selenium Impact Assessment Study

Subject: Quarter 4, 2013 Report

Introduction

This memo summarizes results from samples collected in Quarter 4, 2013, pursuant to the Permanente Quarry Cement Plant Selenium Impact Assessment Study (Study). The Study Work Plan was initially submitted on May 17, 2013, and was a requirement of the 13267 Investigative Order, No. R2-2013-1005, issued in January 2013 by the San Francisco Bay Regional Water Quality Control Board (Regional Water Board) and finalized in a June 27, 2013 amended 13267 Investigative Order, No. R2-2013-1005-A1 (Order). The final Study Plan was submitted on July 11, 2013. This report satisfies one of the quarterly reporting requirements in section 10b of the Order. Laboratory reports containing the data are included as attachments.

Summary of Sampling Events in this Quarter (Q4 2013)

Permanente and Stevens Creeks were sampled on November 4, and December 9, 2013. The following summarizes the sampling events.

November 4, 2013

- The weather was clear and sunny. The event commenced at 9:20 a.m. and was complete by 12:30 p.m.
- The background station, Wild Violet Creek (WVC), was dry. There was no flow into or out of Pond 13 or Pond 14, and there was no flow at PER070. Thus, Permanente Creek and the Permanente Facility discharge were hydrologically disconnected from Pond 13, Pond 14, and all sites downstream. Per the Work Plan, since sediment samples were not being collected during this event, no sites downstream of Pond 14 were sampled, except PER010. Site STE040 was also visited to observe flow conditions. The site was dry.
- Water samples were collected at Pond 13, Pond 14, and PER010.

- No sediment samples were collected.
- No flow measurements were taken.
- pH and DO loggers were deployed in Pond 13.

December 9, 2013

- The weather was clear and cold. The event commenced at 8:35 a.m. and was complete by 2:00 p.m.
- The background station, Wild Violet Creek (WVC), was dry. There was no flow into or out of Pond 13 or Pond 14, and there was no flow at PER070. Pond 13 had a layer of ice approximately 1-3 inches thick on its surface. In Rancho San Antonio Open Space at PER080 (West Permanente Creek), water was intermittently present (i.e., portions of the streambed were dry, and portions were wet), but there was no discernible flow. At PER060, water was present and flowing, even though one hundred yards upstream, at the footbridge over Permanente Creek, there was no water or flow. Water samples were collected at PER060. Downstream of the Open Space, PER035, PER045, and STE040 were dry, while the sites closest to San Francisco Bay (PER010, STE020, and STE010) were flowing. Thus, Permanente Creek and the Facility discharge were hydrologically disconnected from Pond 13, Pond 14, PER010, STE020, and STE010.
- Water samples were collected at Pond 13, Pond 14, PER060, PER010, STE020, and STE010.
- Sediment samples were collected at WVC, Pond 13, PER060, PER045, PER035, STE020, and STE010. The sample at PER010 that was indicated in the work plan to be collected was inadvertently missed. This sample was instead taken on January 15, 2014, and will be reported with the Q1 2014 results. A field duplicate (FD) sediment sample was collected at Pond 13 (and analyzed for total-Se, grain size, SO_4^{2-} , and TOC).
- No flow measurements were taken.
- pH and DO loggers that had been deployed in Pond 13 on November 4, 2013 were retrieved.

Issues Encountered in Sampling/Analysis

As mentioned above, the sediment sample at PER010 that was indicated in the work plan to be collected was inadvertently missed. This sample was instead taken January 15, 2014, and will be reported with the Q1 2014 results.

Deviations from Work Plan

The following summarizes all deviations from either (1) the Final Study Work Plan submitted on July 11, 2013, or (2) corrective actions noted in the previous quarterly reports (Q2 and Q3 2013).

- Sediment particle size was measured by the sieve method (ASTM D422 M). As the Q2 2013 report indicated, sediment particle size was intended to be measured with the laser light scattering method (ASTM D4464 M). This will be corrected in subsequent sampling events.

Data

Measurements taken in the field, including flow, pH, temperature, etc., are reported in Appendix B. Selenium concentrations measured in water and sediment samples are provided in Appendix C. Other constituents that were measured in water and sediment samples are reported in Appendix D. While grain size has not been reported in the appendices, all of the data from all of the sampling events, including sediment grain size, has been provided in an electronic resource accompanying this memo.

Water

The following are general observations regarding levels of selenium and other constituents in the November and December water samples.

- Chlorophyll *a* concentrations were low (<0.03 mg/L) or below the reporting limit (0.01 mg/L) at all sites in November and December.
- Hardness ranged from 471-696 mg/L as CaCO₃, with the highest concentrations found at Pond 14 in November and at PER060 in December.
- Sulfate concentrations at Pond 13 and 14 ranged from 390-440 mg/L, and the concentration was 420 mg/L at PER060 in December. Sulfate was much lower at sites PER010, STE020, and STE010 (<140 mg/L).
- Total alkalinity was lowest in Ponds 13 and 14 (90-220 mg/L as CaCO₃), was 240 mg/L at PER060 in December, and ranged from 310-390 mg/L as CaCO₃ at PER010, STE020, and STE010.
- TOC ranged 0.74-6.05 mg/L across all sites.
- TSS concentrations were highest at STE010 (1100 mg/L). Across all other sites, concentrations ranged from below the reporting limit of 1 mg/L to 27 mg/L.
- Total Se concentrations at Pond 13 and Pond 14 ranged from 1.85-3.64 µg/L, while levels at PER010, STE010, and STE020 ranged from 0.46-4.23 µg/L. At PER060 in December, the concentration of total Se was 23.8 µg/L. It is unknown at this time why this sample showed an elevated total Se concentration, but we are investigating possible explanations. As noted above, at this site, water was emergent groundwater, and the stream was dry less than 100 yards upstream of the sampling point.
- Dissolved Se made up 70-100% of the total Se concentration across all samples.
- Se(IV) was the predominant Se species observed at Pond 13 and Pond 14, while Se(VI) was the predominant Se species at sites downstream of Lehigh.

Sediment

- As previously observed, the sulfate levels at Pond 13 (1200 mg/kg) and at the tidal site, STE010 (200 mg/kg), are greater than measured at WVC, PER060, PER045, PER035, and PER020 (17-100 mg/kg).
- Total Se (dw basis) in sediment was highest in Pond 13 (19.2 mg/kg, and 9.79 mg/kg in the Pond 13 field duplicate). All other sites had total Se of < 2 mg/kg.

Loggers

Temperature, pH, and DO loggers were deployed on a buoy in Pond 13 from 11/4/13 through 12/9/13. Logger data is shown in Figure 1 and Figure 2. The pH was relatively stable from 11/4/13 through 11/26/13, varying between about 7.8 and 8.1. Beginning on 11/27/13, pH started to show more variability, and on 11/28/13 and 11/29/13, dropped to about 7.3, where it was stable through 12/7/13. It is not clear what caused the drop in pH, but it was possibly associated with natural die-off of algae in the pond. The cold temperatures in the pond likely resulted in death of some of the algae in the pond. Because algae take up carbon dioxide, a weak acid, they naturally raise the pH. When they die, more carbon dioxide is dissolved in the water, resulting in lower pH. None of the pH values recorded are problematic for aquatic life, but the change in pH may have a minor effect on Se speciation in the pond water and sediments.

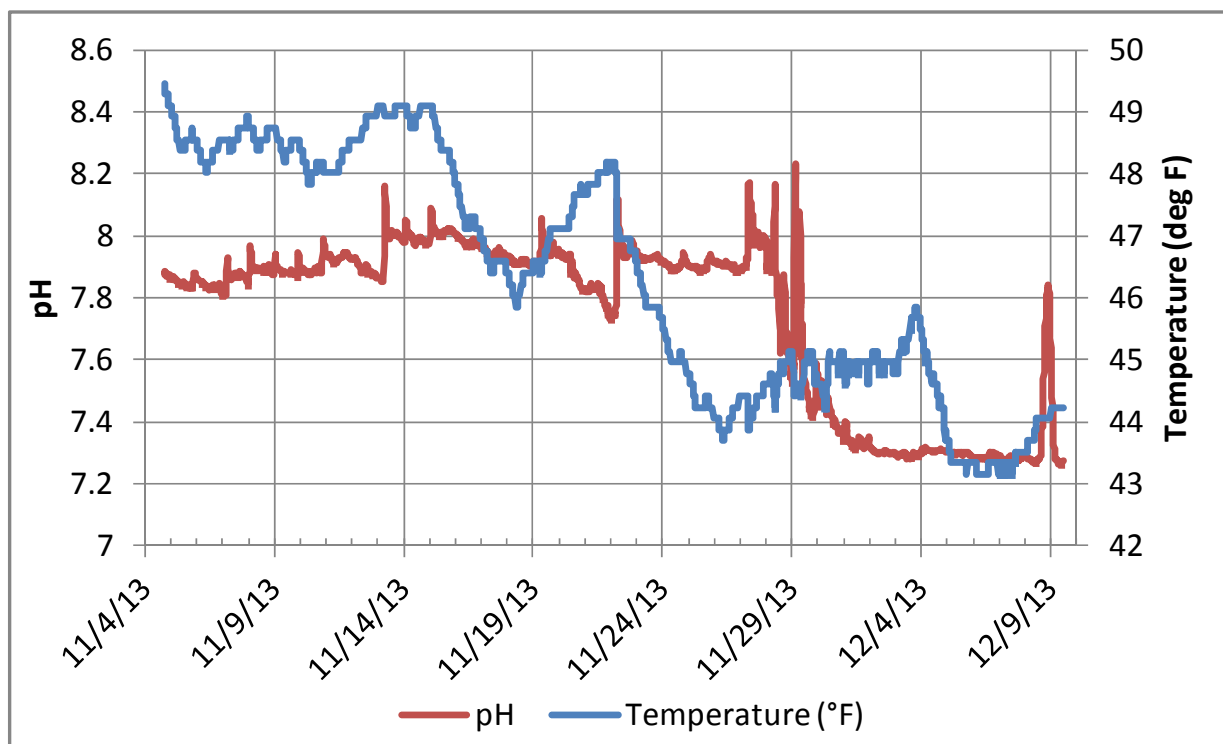


Figure 1. pH and temperature in Pond 13 from the time logging started at 18:00 on 11/4/13 until 11:00 on 12/9/13.

DO was high (> 10 mg/L) and had daily fluctuations expected in a pond that contains algae and decomposition of organic material. DO increased as temperatures dropped through 12/4/13. On 12/5/13, when water temperatures dipped to around 40 °F, the logger data indicated that DO began to drop significantly, eventually reaching about 1 mg/L on 12/9/13. As with pH above, it is possible that this drop reflects a large die off of algae in the pond due to cold temperatures, and subsequent dissolved oxygen depletion as the algae decomposed. Additionally, since there was no inflow to the pond and by 12/9/13 the surface of the pond was covered in ice, there was very little if any oxygen being supplied to the pond, other than that provided by algae and other aquatic plants living in the pond. However, the grab sample taken on 12/9/13 had a DO of 18.8 mg/L. The logger was calibrated and appeared to be functioning properly at deployment, but subsequent testing has indicated that it is possible the logger was malfunctioning. The handheld meter was calibrated and appeared to be functioning properly. At a site visit on 1/15/14, there was no evidence that the pond had experienced very low DO concentrations indicated by the logger data. No dead aquatic life was seen, most of the submerged algae appeared to still be

alive, there was no noticeable odor, and DO readings taken at multiple depths with a calibrated handheld meter around the pond all indicated DO of > 15.5 mg/L. Therefore, the evidence suggests that the logger was malfunctioning during the final few days of its deployment, and that DO has consistently been high in Pond 13.

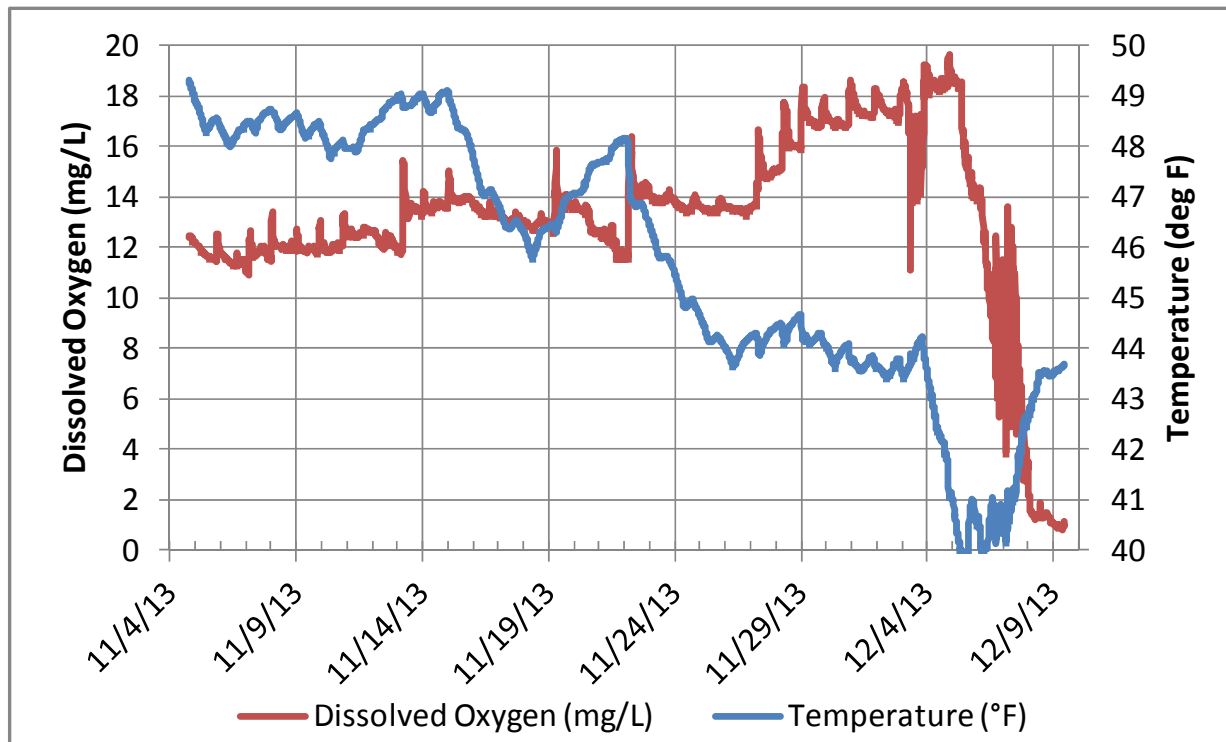


Figure 2. Dissolved oxygen (DO) and temperature in Pond 13 the time logging started at 18:00 on 11/4/13 until 11:00 on 12/9/13.

Quality Assurance/Quality Control

The following summarizes quality assurance/quality control issues. Analysis of Se species was conducted by Applied Speciation and Consulting (ASC), and split water and sediment samples by a second laboratory, Brooks-Rand Laboratories (BRL).

Water

- No field duplicates or field blanks of water were collected.
- All recoveries and relative percent differences (RPD) for laboratory QC samples (matrix spike, matrix spike duplicates, laboratory spike, laboratory spike duplicates) were within acceptable limits.
- During BRL's Se speciation analytical run, the SeCN analysis of the first continuing calibration verification standard (CCV1) recovered low and bracketed the analysis of several samples. However, the matrix spike/matrix spike duplicate (MS/MSD) performed on sample Pond 13 recovered well and, on this basis, any sample following the analysis of the MS/MSD was not qualified by the lab. The only result affected by potential low bias was Pond 13, analyzed just prior to the MS/MSD. The result was qualified by the lab as an estimate.

Sediment

- Regarding the measurement of total Se by ASC, the RPD of the Pond 13 field duplicate (FD Pond 13) sample from December (49.0%) was outside of the measurement quality objective of 25%. The RPD for sediment TOC (19%) and for sediment sulfate (17%) were within acceptable limits. Previously, due to observations of high RPD for Pond 13 field duplicate samples, the sediment sampling protocol for field duplicates had been modified to ensure that the sample and field duplicate are as similar as possible. The current results suggest that sediment Se concentrations in Pond 13 are highly heterogeneous. To continue capturing this variability, field duplicate sediment samples will continue to be collected at Pond 13.
- All recoveries and relative percent differences for laboratory QC samples (laboratory control spike, matrix spike, matrix spike duplicates, reference material) were within acceptable limits, with one exception. At BRL, the laboratory control spike for Total Se in sediment yielded a recovery of 72%, outside the laboratory's lower recovery QC objective of 75%. Because recoveries from BRL's sediment matrix spike, matrix spike duplicate, and reference material were consistent with the laboratory's measurement quality objectives, the Total Se concentrations reported by BRL were deemed acceptable.

Split Water and Sediment Samples

Split samples of sediment and water were taken for QA/QC purposes. Split water samples were taken by collecting two samples for Total Se in rapid succession using the lab-provided containers. Aliquots of the total Se samples were then field-filtered to produce the Dissolved Se and Se speciation samples. The preservation requirements for the samples were identical between ASC and BRL, with the exception that BRL recommended samples for Se speciation be acid preserved with HCl. Analytical methods for Total Se and Dissolved Se followed the analytical procedure of EPA 200.8/1638. For Se speciation, ASC utilizes an in-house ion chromatography (IC) method to separate Se species ahead of an ICP-CRC-MS, while BRL uses a slightly different method, high pressure liquid chromatography (HPLC) to separate Se species ahead of an ICP-DRC-MS.

Results from the split water samples are presented in Table 1. Total Se measurements on the split samples met the measurement quality objective of 25% RPD in the concentrations reported by separate labs, with the exception of the Pond 13 sample. Dissolved Se measurements were in agreement between the two labs, yielding RPDs less than 25% for all samples. When detected, BRL reported higher concentrations of Se(IV), Se(VI), and SeCN than ASC. At Pond 13 and Pond 14, where there was a greater amount of Se species unaccounted for, the RPDs for Se(IV) and Se(VI) were greater than 25%. Additionally, at Pond 13 and Pond 14, SeCN was not detected by ASC above their method detection limit (MDL) of 0.014 µg/L, but SeCN was detected by BRL above their MDL of 0.15 µg/L. It is possible that acidification of Se speciation samples, as recommended for freshwater samples by BRL, may have caused conversion of unaccounted for dissolved Se compounds or complexes into Se(IV), Se(VI), and SeCN. However, the different techniques used by ASC and BRL to separate Se species ahead of the ICP-MS (IC vs. HPLC) may have also contributed to the variance in Se species concentrations.

Sub-samples of the Pond 13 and FD Pond 13 sediment samples were sent from ASC to BRL for analysis of total Se. The methods used by ASC and BRL to measure “total recoverable Se” (total Se) extracts almost all elements that could become “environmentally available.” Differences between the ASC and BRL methods include the type of reagent mixtures and type of digestion devices (ASC = $\text{HNO}_3/\text{H}_2\text{O}_2$ + hot block; BRL = HNO_3/HCl + oven). Total Se concentrations in sediment as measured by BRL were comparable to ASC, as shown in Table 2. The interlaboratory variability in total Se was acceptable (RPDs of 18% and 8.3%, respectively). Results from BRL validate ASC measurements, and confirm that the Pond 13 sample contained a higher total Se concentration than FD Pond 13.

While the %RPDs were above 25% for some samples and analytes, the analyte concentrations themselves were quite low, and thus the absolute differences in concentrations from the different laboratories was small. Overall, the results of the split sampling indicate that the primary laboratory (ASC) results are of sufficient accuracy for the purposes of the study. A second round of split sampling will be conducted prior to the conclusion of the study to confirm this finding.

Table 1. Results of Selenium Analyses on Split Water Samples Taken on December 9, 2013. Concentration Units are in µg/L.

Analysis	Pond 13			Pond 14			STE010			PER010		
	ASC ^a	BRL ^a	RPD (%) ^b	ASC ^a	BRL ^a	RPD (%) ^b	ASC ^a	BRL ^a	RPD (%) ^b	ASC ^a	BRL ^a	RPD (%) ^b
Total Se	2.61	3.37	29%	3.64	3.60	1.1%	4.23	3.68	13%	2.42	2.43	0.4%
Diss.Se	2.75	3.17	15%	3.33	3.43	3.0%	2.96	3.14	6.1%	2.25	2.11	6.2%
Se (IV)	0.994	1.41	42%	0.716	1.08	51%	0.244 J	0.329 J	35%	0.083 J	< 0.150 U	NC
Se (VI)	0.755	0.997	32%	1.60	2.04	28%	2.18	2.79	18%	1.81	2.18	20%
SeCN ^c	< 0.014 U	0.28 F,J	NC	< 0.014 U	0.16 J	NC	< 0.014 U	< 0.15 U	NC	< 0.014 U	< 0.15 U	NC
Additional Se Species ^d	0.288	< 0.150 U	NC	0.234	< 0.150 U	NC	0.080	< 0.150 U	NC	0.068	< 0.150 U	NC

^a ASC = Applied Speciation and Consulting; BRL = Brooks Rand Laboratories.

^b Relative percent difference (RPD) = 100 x Abs(ASC concentration – BRL concentration) / ASC concentration.

^c SeCN = Selenocyanate

^d Additional Se Species = Sum of all additional Se species observed by IC-ICP-MS

Qualifier Symbols:

U = Sample concentration is below the estimated method detection limit (eMDL)

J = Sample concentration is between the eMDL and the reporting limit (RL)

F = Flagged data. Estimated value.

NC = Not calculated due to one of the sample concentrations < eMDL.

Table 2. Results of Total Se Analyses on Split Samples of Pond 13 and FD Pond 13 Sediment Samples Taken on December 9, 2013.

Sediment Sample ^a	Total Se (mg/kg)		RPD (%) ^c
	ASC ^b	BRL ^b	
Pond 13	19.2	15.7	18%
FD Pond 13	9.79	10.6	8.3%

^a FD = Field duplicate.

^b ASC = Applied Speciation and Consulting; BRL = Brooks Rand Laboratories.

^c Relative percent difference (RPD) = $100 \times \text{Abs}(\text{ASC concentration} - \text{BRL concentration}) / \text{ASC concentration}$.

Appendix A



Photo Log

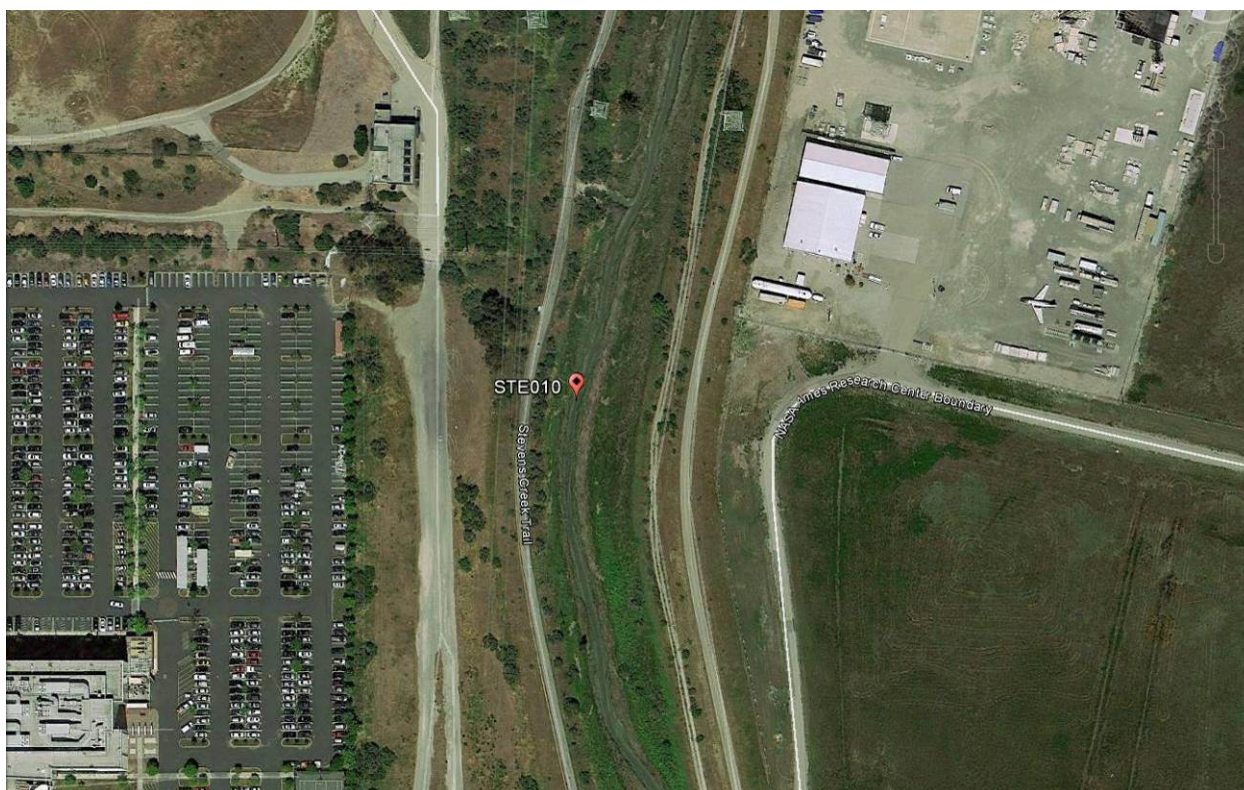


Figure A 1. STE010 sampling station on Stevens Creek.

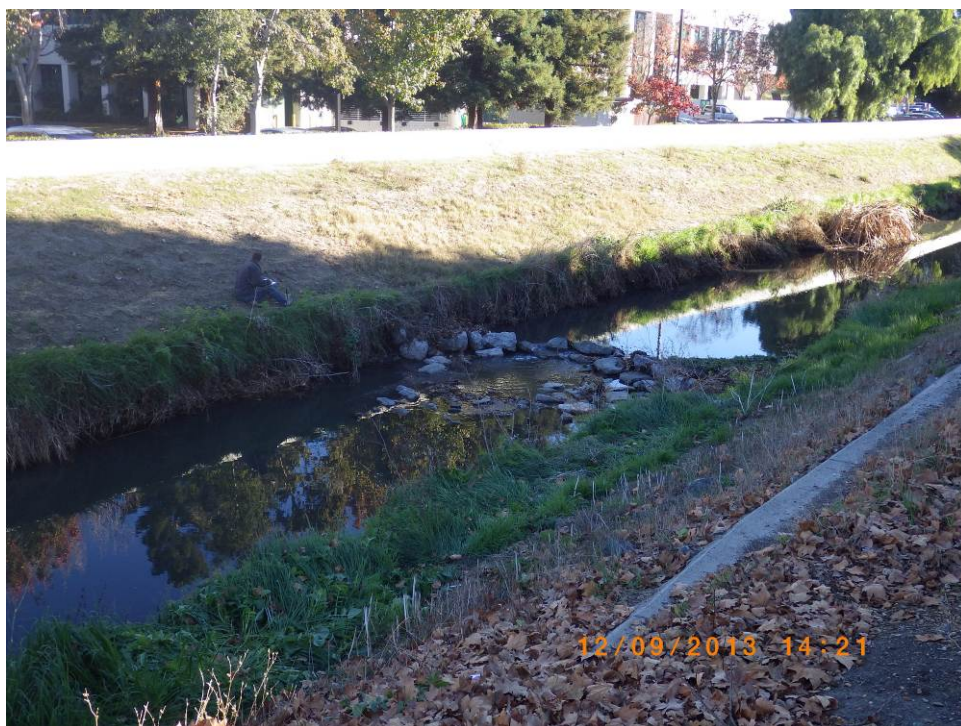


Figure A 2. PER010 sampling station on Permanente Creek.

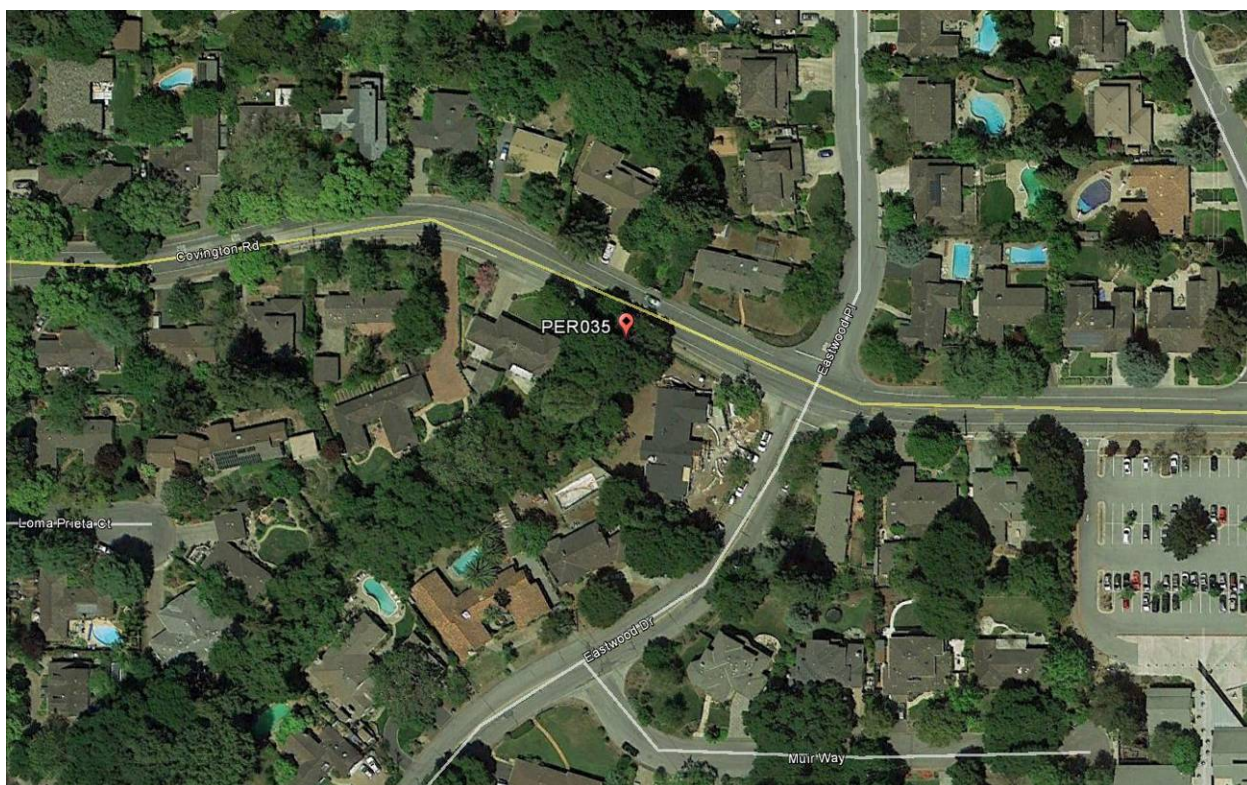
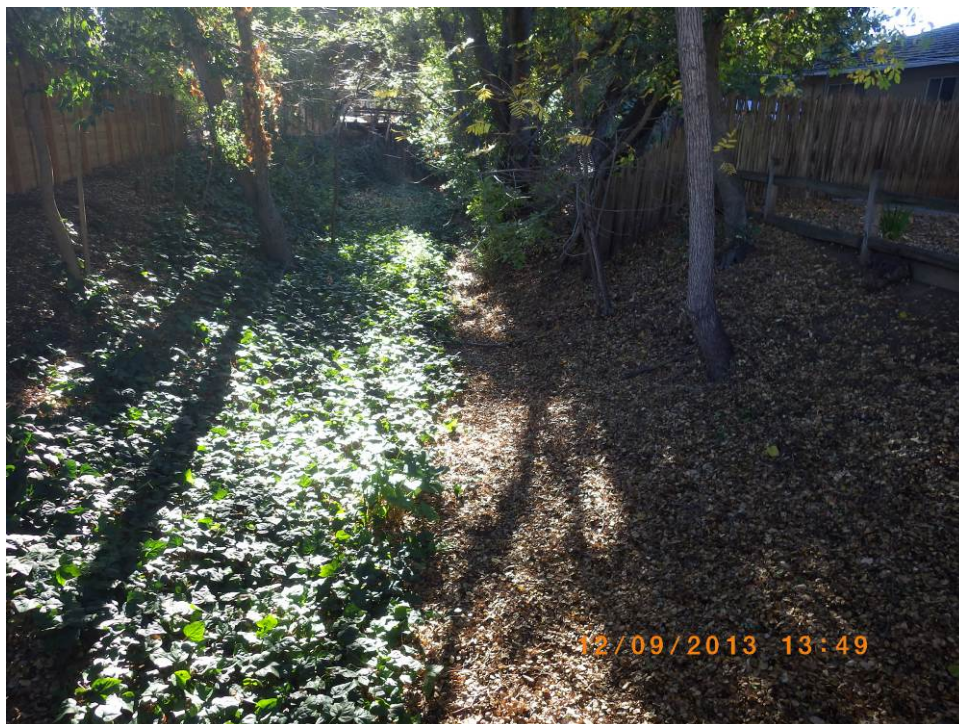


Figure A 3. PER035 sampling station on Permanente Creek.

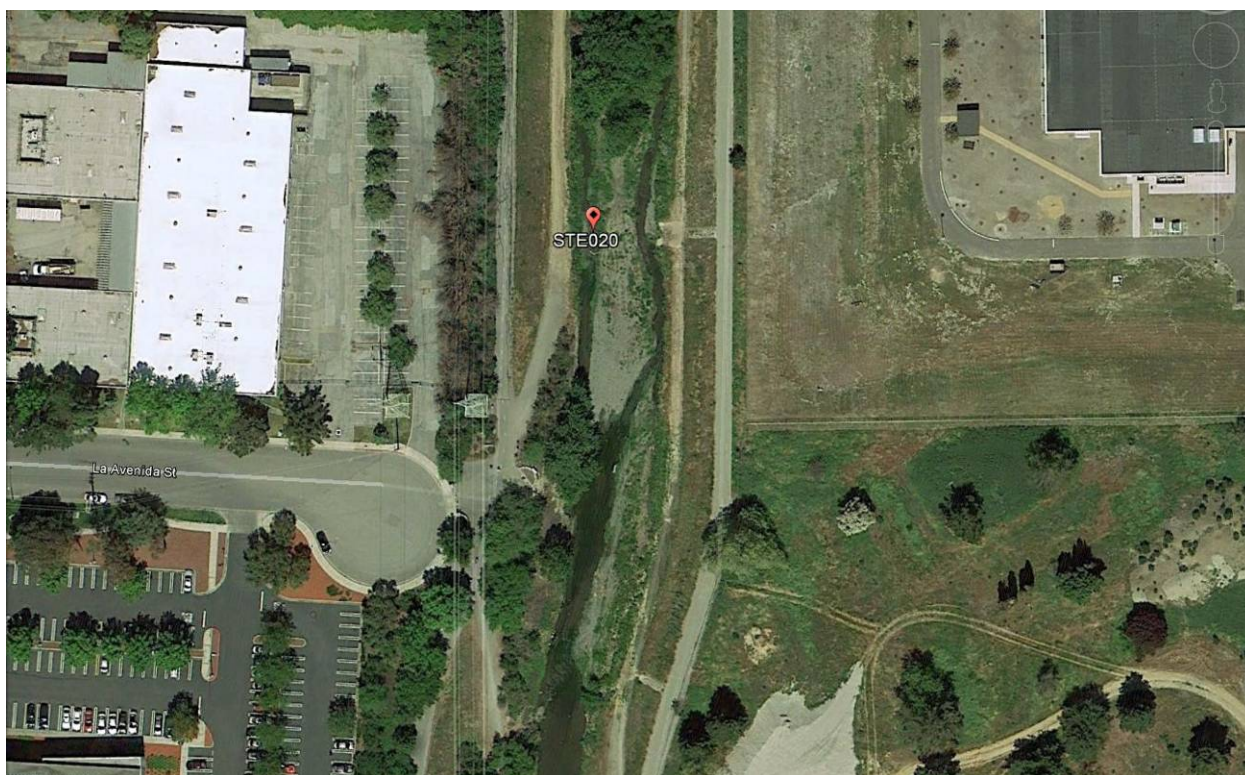


Figure A 4. STE020 sampling station on Stevens Creek.

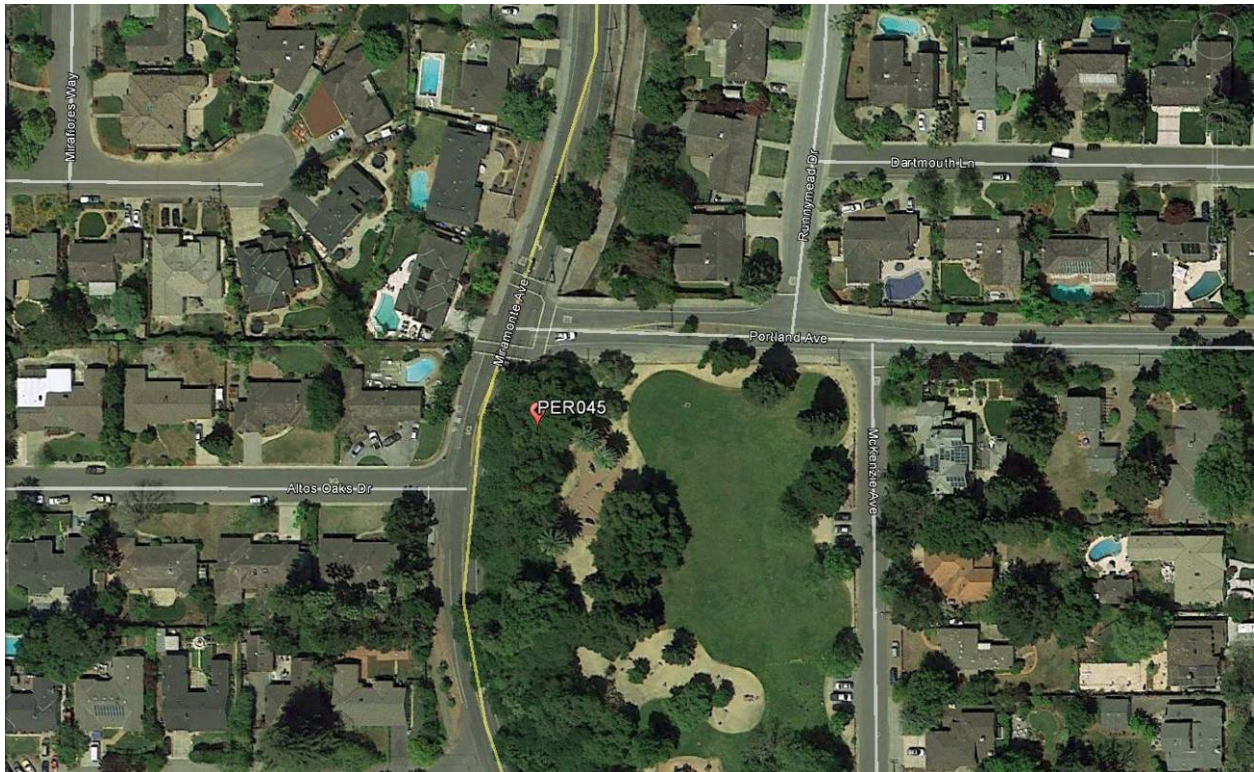
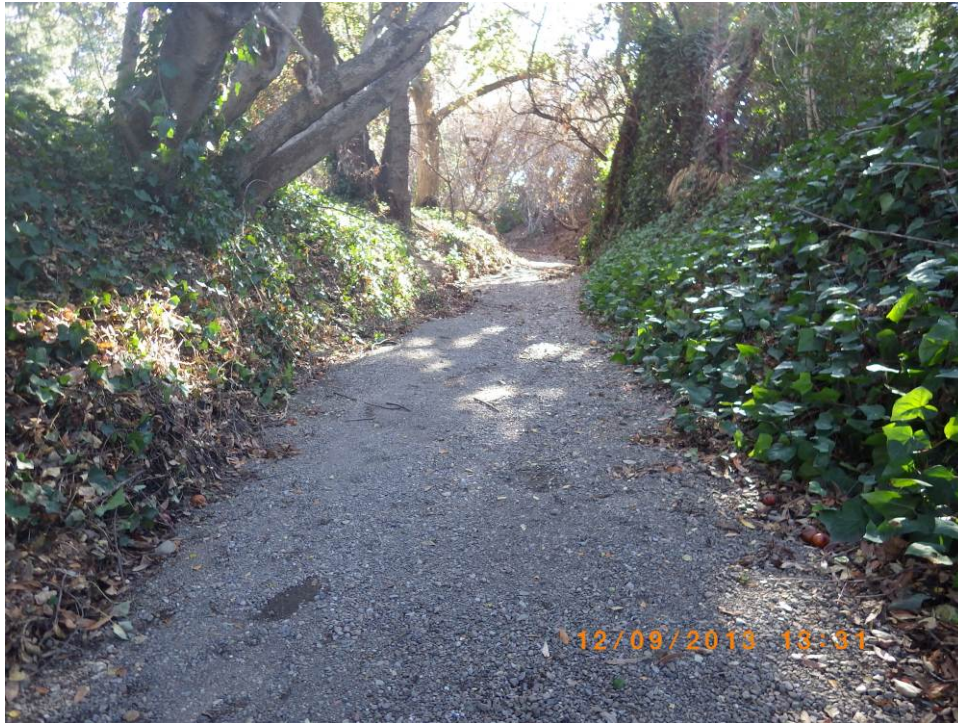


Figure A 5. PER045 sampling station on Permanente Creek.

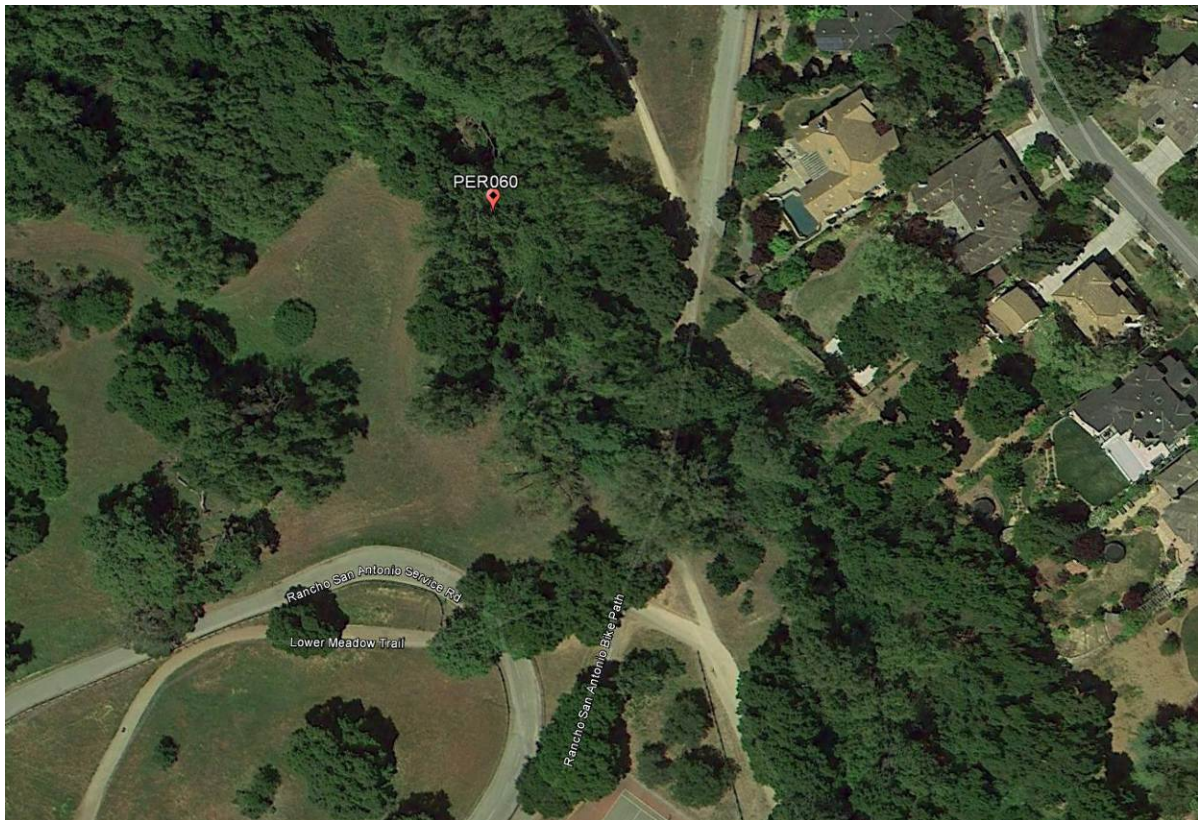


Figure A 6. PER060 sampling station on Permanente Creek.

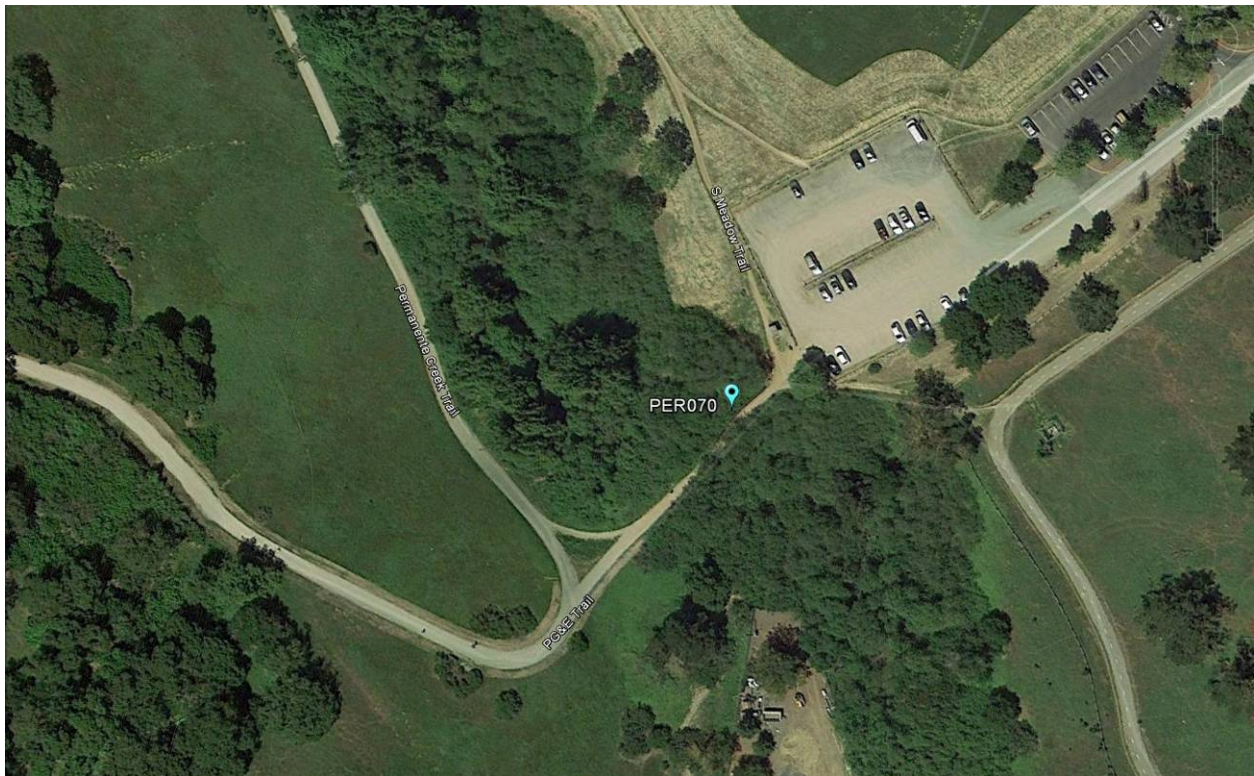


Figure A 7. PER070 sampling station on Permanente Creek.

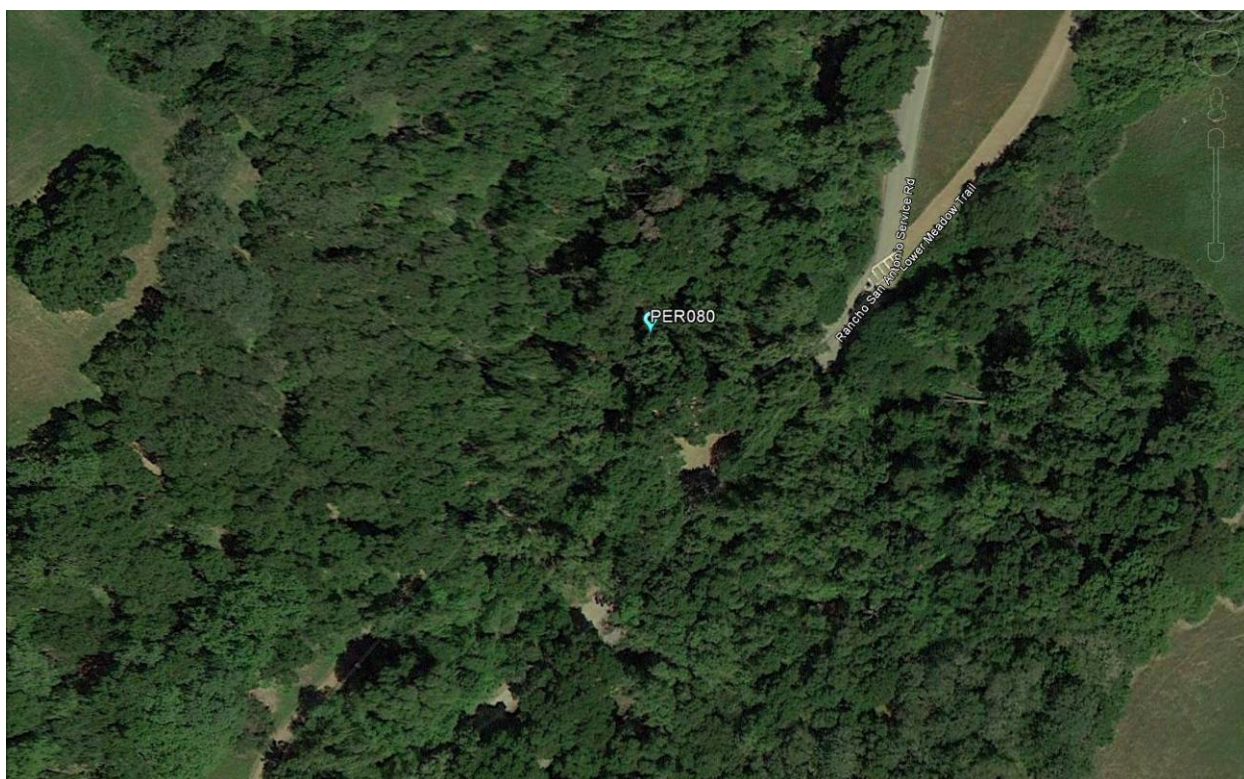


Figure A 8. PER080 sampling station on Permanente Creek.

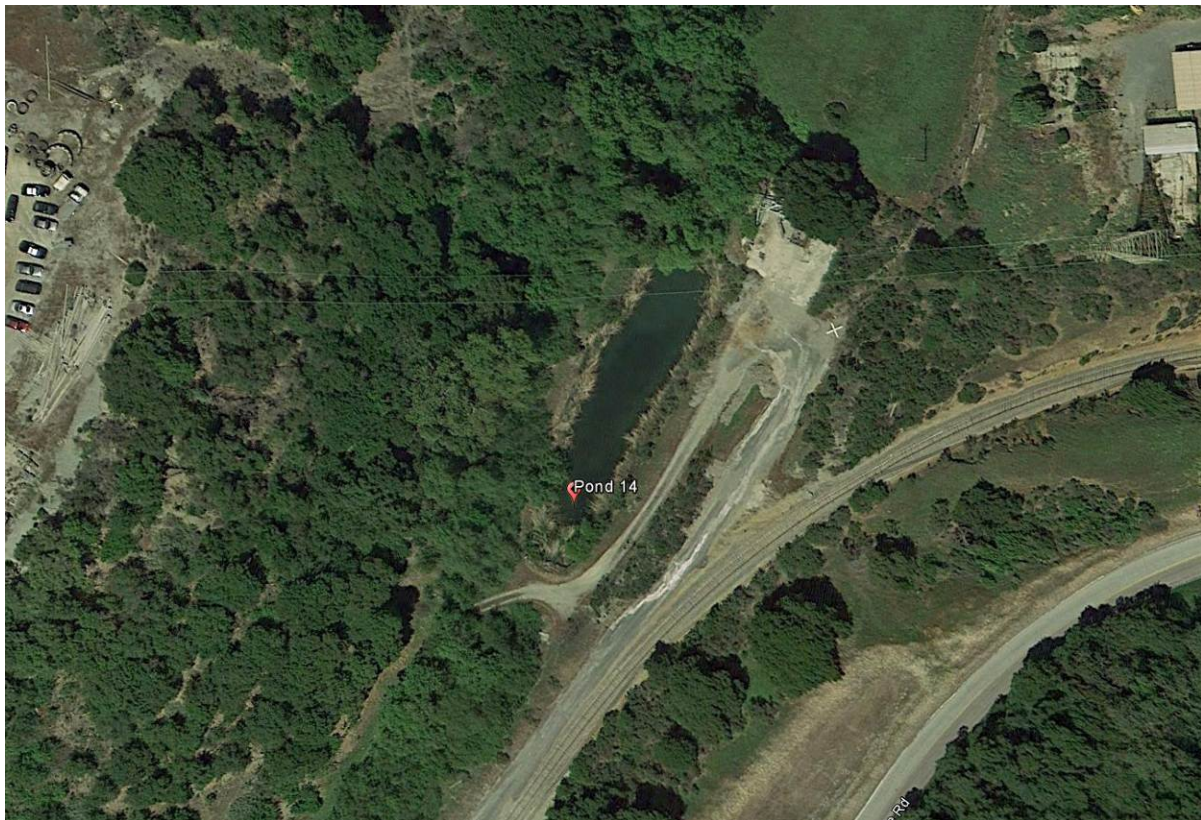


Figure A 9. Pond 14 sampling station.

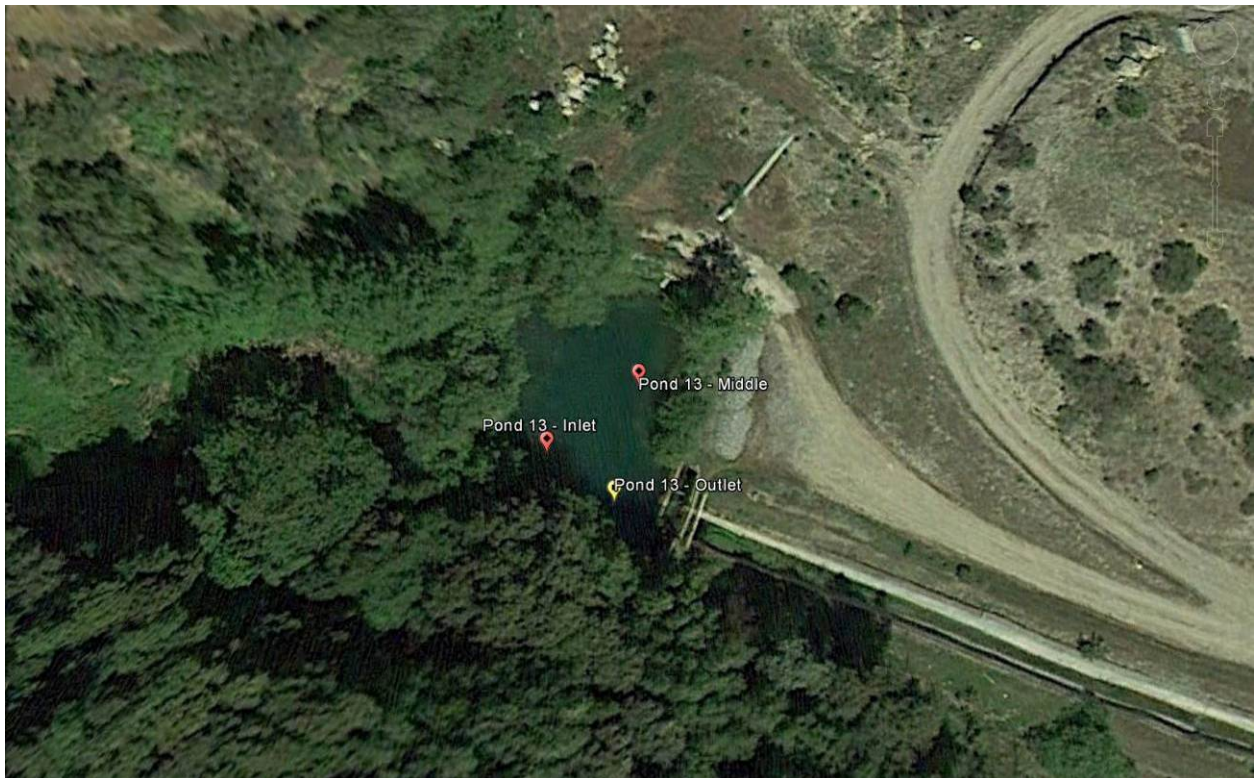


Figure A 10. Pond 13 sampling station.



Figure A 11. WVC sampling station.

Appendix B



Field Data

Table 1. Field Measurements and Data Collected on November 4, 2013.

Sample ID	Date Collected	Begin Time	End Time	Flow Condition	Water Collected	Sediment Collected	Continuous Water Column	Flow Measured	Flow (cfs)	pH	Temp (°C)	EC (μS/cm)	DO (mg/L)	DO (%)	ORP (mV)	Notes
WVC	11/4/2013	9:20	9:30	No Flow	No	--	--	--	--	--	--	--	--	--	--	WVC was dry.
Pond 13	11/4/2013	10:15	10:25	No Flow	Yes	--	--	No	--	8.05	10.8	1201	11.85	111.9	120	Limited / no surface algae. Pond level down. No flow. Field duplicate for water.
Pond 14	11/4/2013	11:15	11:25	No Flow	Yes	--	--	No	--	7.73	13.5	1676	6.59	65.1	152	Very little surface algae. No inflow.
PER 080	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
PER 070	11/4/2013	--	--	--	No	--	--	--	--	--	--	--	--	--	--	Site not visited
PER 060	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
PER 045	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
PER 035	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
HAL 010	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
PER 010	11/4/2013	12:15	12:23	Flow	Yes	--	--	--	--	8.28	16.1	1139	11.25	117.2	146	Slightly turbid, floating scum on water surface. Wind or flood tide causing upstream flow.
STE 040	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site visited. No flow.
STE 020	11/4/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
STE 010	11/4/2013	--	--	--	No	--	--	--	--	--	--	--	--	--	--	Site not visited

-- No data to report.

Table 2. Field Measurements and Data Collected on December 9, 2013.

Sample ID	Date Collected	Begin Time	End Time	Flow Condition	Water Collected	Sediment Collected	Continuous Water Column	Flow Measured	Flow (cfs)	pH	Temp (°C)	EC (µS/cm)	DO (mg/L)	DO (%)	ORP (mV)	Notes
WVC	12/9/2013	8:35	8:45	No Flow	No	Yes	--	--	--	--	--	--	--	--	--	WVC was dry. Flow on Permanente Creek downstream of WVC.
Pond 13	12/9/2013	10:15	10:30	No Flow	Yes	Yes	pH & DO	No	--	8.95	3.3	1207	18.81	158.1	128	Pond 13 frozen 2.25 inches thick. Clear water, no color. Sediment field duplicate collected.
Pond 14	12/9/2013	11:30	11:50	No Flow	Yes	--	--	No	--	7.62	8.3	1587	6.27	56.1	145	Slightly cloudy. No flow into pond. Pond level is up.
PER 080	12/9/2013	12:25	--	No Flow	No	--	--	No	--	--	--	--	--	--	--	PER 080 was dry.
PER 070	12/9/2013	12:15	--	No Flow	No	--	--	--	--	--	--	--	--	--	--	PER 070 was dry.
PER 060	12/9/2013	12:40	13:15	Flow	Yes	Yes	--	No	See Notes	7.52	12	1489	6.54	61.9	167	Intermittent low flow. No surface flow upstream of bridge, ~0.2 cfs downstream of bridge. Clear water.
PER 045	12/9/2013	13:20	13:35	No Flow	No	Yes	--	No	--	--	--	--	--	--	--	PER 045 was dry.
PER 035	12/9/2013	13:41	13:50	No Flow	No	Yes	--	No	--	--	--	--	--	--	--	PER 035 was dry.
HAL 010	12/9/2013	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site not visited
PER 010	12/9/2013	14:12	14:28	Flow	Yes	No	--	No	--	8.04	10.1	1197	8.47	79.3	165	Water is slightly cloudy/turbid. Channel is at bankfull and flowing. Flow was higher than observed in November.
STE 040	12/9/2013	12:45	--	No Flow	No	No	--	No	--	--	--	--	--	--	--	STE 040 was dry.
STE 020	12/9/2013	13:00	13:05	Flow	Yes	Yes	--	No	--	8.06	12.6	1048	9.69	91.7	169	Low flow. Clear water, macrophytes along banks. Field measurements were taken on grab sample at 15:00.
STE 010	12/9/2013	13:45	13:55	Flow	Yes	Yes	--	No	--	8.38	11.9	1133	9.92	93.19	192	Silty, brown water. Tide was going out and water level was low. Fish and ducks were stirring up bottom sediments. Field measurements were taken on grab sample at 15:00.

-- No data to report.

Appendix C



Selenium Data

Table 3. Selenium Results for Water Samples Taken on November 4 and December 9, 2013.

Sample ID	Date Collected	Units	Total Se	Diss. Se	Se(IV)	Se(VI)	SeCN	Additional Se Species (n)
Pond 13	11/4/2013	µg/L	2.72	2.07	1.19	0.157 J	< 0.021 U	0.141 (2)
FD-Pond 13	11/4/2013	µg/L	2.54	2.08	1.21	0.126 J	< 0.021 U	0.108 (2)
Pond 14	11/4/2013	µg/L	1.85	1.66	0.626	0.181 J	< 0.021 U	0.112 (2)
PER010	11/4/2013	µg/L	0.46	0.37 J	0.061 J	0.231 J	< 0.021 U	0.020 (1)
Pond 13	12/9/2013	µg/L	2.61	2.75	0.994	0.755	< 0.014 U	0.288 (3)
Pond 14	12/9/2013	µg/L	3.64	3.33	0.716	1.60	< 0.014 U	0.234 (3)
PER060	12/9/2013	µg/L	23.8	23.7	0.135 J	20.4	< 0.014 U	0 (0)
PER010	12/9/2013	µg/L	2.42	2.25	0.083 J	1.81	< 0.014 U	0.068 (1)
STE020	12/9/2013	µg/L	3.20	2.68	0.271 J	2.24	< 0.014 U	0.035 (1)
STE010	12/9/2013	µg/L	4.23	2.96	0.244 J	2.18	< 0.014 U	0.080 (1)

U = Sample concentration is below the estimated method detection limit (eMDL)

J = Sample concentration is between the eMDL and the reporting limit (RL)

SeCN = Selenocyanate

Additional Se Species = Sum of all additional Se species observed by IC-ICP-MS

n = number of unknown Se species observed

FD = Field Duplicate

Table 4. Selenium Results for Sediment Samples Taken on December 9, 2013.

Sample ID	Date Collected	Units	Total Se (WW)	Total Se (DW)	Percent Solids (%)
WVC	12/9/2013	µg/g	0.595	0.699	85.1
POND 13	12/9/2013	µg/g	9.77	19.2	50.8
FD POND 13	12/9/2013	µg/g	5.23	9.79	53.5
PER060	12/9/2013	µg/g	1.03	1.57	65.3
PER045	12/9/2013	µg/g	0.648	0.677	95.8
PER035	12/9/2013	µg/g	0.937	1.04	90.3
STE020	12/9/2013	µg/g	0.375	0.446	84.1
STE010	12/9/2013	µg/g	0.288	0.767	37.6

U = Sample concentration is below the estimated method detection limit (eMDL)

J = Sample concentration is between the eMDL and the reporting limit (RL)

WW = Wet Weight (As Received) Basis

DW = Dry Weight Basis

FD = Field Duplicate

Appendix D



Monitoring Data for Other Constituents

WVC Results

Wednesday, January 22, 2014

Date	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	150	8600
9/4/2013	17	16000
12/9/2013	22	34000

Pond 13 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	140	150	41	541	380	ND	1.29	ND	140	27000
9/4/2013	130	130	51	530	420	ND	5.87	ND	1600	39000
11/4/2013	130	140	61	588	390	0.0059	5.50	0.80		
12/9/2013	90	110	64	543	440	ND	4.43	1.2	1200	27000

Pond 14 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	160	140	48	548	410	ND	2.64	ND		
9/4/2013	240	140	62	602	430	0.029	6.33	1.7	1900	47000
11/4/2013	220	170	52	645	350	0.018	6.05	2.4		
12/9/2013	180	170	42	589	430	0.012	5.20	2.4		

PER080 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)
7/9/2013	320	70	45	360	46	ND	1.71	1.3
9/4/2013	340	69	48	371	41	ND	2.18	8.8

PER070 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)
7/9/2013	180	150	46	573	410	ND	1.28	ND

PER060 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	200	150	50	587	120	ND	0.750	1.9	75	8300
9/4/2013									220	12000
12/9/2013	240	180	59	696	420	ND	0.505	1.2	100	8300

PER045 Results

Wednesday, January 22, 2014

Date	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	19	4200
9/4/2013	60	8100
12/9/2013	20	5900

PER035 Results

Wednesday, January 22, 2014

Date	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	56	28000
9/4/2013	87	11000
12/9/2013	17	41000

PER010 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	300	80	58	440	150	0.012	3.43	1.5	74	9900
9/4/2013	260	64	48	359	130	0.12	4.85	4.0	85	20000
11/4/2013	310	98	55	471	120	0.030	3.28	18		
12/9/2013	390	120	61	554	130	0.0033	2.75	27		

STE020 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO3 (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO3 (mg/l)	Sulfate as SO4 (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)	Sediment Sulfate as SO4 (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	380	100	39	415	100	ND	1.10	1.6	50	7800
9/4/2013	320	92	39	390	100	ND	1.38	3.6	300	25000
12/9/2013	360	130	47	514	120	0.00044	0.737	0.60	33	4800

STE010 Results

Wednesday, January 22, 2014

Date	Total Alkalinity as CaCO ₃ (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Hardness as CaCO ₃ (mg/l)	Sulfate as SO ₄ (mg/l)	Chlorophyll-a (mg/l)	Total Organic Carbon (mg/l)	Total Suspended Solids (mg/l)	Sediment Sulfate as SO ₄ (mg/kg)	Sediment TOC (mg/kg)
7/9/2013	360	130	87	680	160	0.015	2.11	540	480	9300
9/4/2013	360	110	50	489	120	0.019	3.18	2800	780	20000
12/9/2013	360	120	53	524	140	0.013	1.56	1100	200	23000