

Nicole E. Granquist
ngranquist@downeybrand.com
916/520-5369 Direct
916/520-5769 Fax

621 Capitol Mall, 18th Floor
Sacramento, CA 95814
916/444-1000 Main
916/444-2100 Fax
downeybrand.com

April 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: *First Quarter 2014 Status Report – June 27, 2013 Amended Water Code section 13267 Order, Order No. R2-2013-1005-A1, Directive 10.b . - Selenium Impact Assessment Study (Study).*

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 1st Quarter 2014 Status Report for the Selenium Impact Assessment Study pursuant to Directive 10.b. of that Order.

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: April 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 1, 2014 Report

Introduction

This memo summarizes results from samples collected in Quarter 1, 2014, 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 (Q1 2014)

Permanente and Stevens Creeks were sampled on January 15, February 10, and March 20. The following summarizes the sampling events.

January 15, 2014

- The weather was clear, sunny, and warm. The event commenced at 9:00 a.m. and was complete by 12:35 p.m.
- The background station, Wild Violet Creek (WVC) was inaccessible due to earthwork/construction in the quarry. Given that little to no rain had occurred in the watershed since early December/late November, and the history of dry conditions at this sampling site, WVC was likely dry. Thus, a water sample would not have been collected from the site even if it had been accessible. 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, with the exception of PER060 and PER010. As required by the Work Plan, water samples are always collected at PER010. Emergent groundwater was sampled at PER060 to verify high Se concentrations at this site reported from December. Site STE040 was also visited to observe flow conditions. The site was dry.

- Water samples were collected at Pond 13, Pond 14, PER060, and PER010.
- Sediment was collected at PER010, as described in the Q3 2013 report.
- No flow measurements were taken.

February 10, 2014

- The weather was partly cloudy and moderately cool. The event commenced at 10:00 a.m. and was complete by 2:15 p.m. Rainfall had occurred on 2/6/14 through 2/9/14, although conditions were drier than expected due to less rain on 2/8 and 2/9 than forecasted, and exceptionally dry conditions prior to the storm.
- The background station, WVC, was dry. There was no flow into or out of Pond 13 from Permanente Creek, although 3-5 gpm was entering the pond from groundwater seepage along the north bank. In general the pond level was up 1-2 feet since 2/7/14, and the pond was turbid. A turbidity plume was coming from the groundwater seep along the bank. At Pond 14 the water level was up, with low flow into the pond through the two inlet culverts. PER060 and PER070 were flowing. West Permanente Creek was dry at PER080. Downstream of the Open Space, PER045 was dry. Thus, downstream of the Open Space, Permanente Creek was hydrologically disconnected from the facility's discharge.
- Water samples were collected at Pond 13, Pond 14, PER070, PER060, and PER010.
- Sediment samples were not collected.
- Flow was estimated at Pond 14 and PER060.
- pH and DO loggers were deployed prior to the sampling event on 2/5/14.

March 20, 2014

- The weather was clear, sunny, and warm. The event commenced at 9:38 a.m. and was complete by 4:20 p.m. Rainfall had occurred on 2/26/14, but little rain had occurred since then.
- The background station, WVC, was dry. There was flow into Pond 13 from Permanente Creek. The level of the pond was up with water spilling over the dam. The groundwater seepage along the north bank could not be observed, as the area where it previously occurred was below the water level. The turbidity of the pond was still high, although noticeably less turbid than observed on 2/10/14. At Pond 14 the water level was up, with measurable flow into the pond through the two inlet culverts. PER060 and PER070 were flowing. Additional reconnaissance showed that flow in Permanente Creek was flowing at Fremont Ave., but 0.5 miles downstream the creek was dry at PER045. Thus,

downstream of the Open Space, Permanente Creek was hydrologically disconnected from the facility's discharge. Small pools of muddy water had collected at West Permanente Creek, but flow ceased and went subsurface at the PER080 sampling site. The low water at PER080 prohibited the collection of a water sample.

- Water samples were collected at Pond 13, Pond 14, PER070, PER060, PER010, STE020, and STE010.
- Sediment samples were collected at WVC, Pond 13, PER060, PER045, PER035, PER010, STE020, and STE010.
- Flow was measured at Pond 13, Pond 14, and PER060.
- pH and DO loggers were collected prior to the sampling event on 3/15/14.
- Field duplicate water and sediment were collected at Pond 13. Pond 13, Field Duplicate, and PER060 sediment and water samples were split for selenium analyses by both Applied Speciation and Consulting, as well as Brooks Rand Labs.

Issues Encountered in Sampling/Analysis

As described in the Q4 2013 report, the sediment sample at PER010 that was indicated in the work plan to be collected in December 2013 was collected in January 2014. This sample was held at $\leq -20^{\circ}\text{C}$ by Applied Speciation and Consulting for analysis along with the sediment samples collected on March 20, 2014. The results from this sample are reported herein.

As described in the Laboratory Report from Alpha Analytical, water samples for Pond 13, FD Pond 13, and Pond 14 from March 20, 2014 were out of preservation and hold time for many parameters. Field sampling staff from Robertson-Bryan, Inc. scheduled a courier pick-up for these samples at the Lehigh facility on March 20, 2014 so that the chlorophyll *a* hold time could be met given that these samples are among those collected earliest in the day. The cooler for these samples was stocked with wet ice and sealed with a custody seal prior to leaving the cooler for courier pickup at the entrance gate to the Permanente Facility. Staff at Alpha Analytical miscommunicated and the samples were not collected until April 1, 2014 (12 days after sampling), when the courier did not notice the seal of custody prior to checking the cooler for samples. The samples were then conveyed on ice to Alpha Analytical and analyzed for the analytes listed on COC accompanying the samples.

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, Q3, and Q4 2013).

- WVC was not visited on February 10, 2014 because the site was not accessible due to earth work at the Permanente Facility. The quarry manager is now contacted ahead of sampling events to determine if the site is safely accessible. However, based on hydrologic conditions, it is very unlikely there would have been flow at WVC to sample.

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 (<0.4 mg/L) or below the reporting limit (0.01 mg/L) at all sites in January, February, and March.
- Hardness ranged from 438-698 mg/L as CaCO₃ at all sites with the exception of STE010 during January, February, and March. In March, STE010 yielded a measured hardness of 2240 mg/L CaCO₃.
- Sulfate concentrations at sites influenced by the facility's discharge (Pond 13, Pond 14, PER070, and PER060) from January-March ranged from 370-500 mg/L as SO₄²⁻. Sulfate at PER010 and STE020 ranged from 110-180 mg/L, while the concentration at STE010 in March was 830 mg/L.
- Total alkalinity measured in samples from January-March ranged from 95 mg/L as CaCO₃ at Pond 14 to 380 mg/L at PER010 and PER060.
- TOC concentrations at sites influenced by the facility's discharge (Pond 13, Pond 14, PER070, and PER060) from January-March ranged from 0.99-5.67 mg/L. Sulfate at PER010 and STE020 ranged from 1.34-6.71 mg/L, while the concentration at STE010 in March was 3.13 mg/L.
- The TSS concentration at STE010 was 51 mg/L (in March), and this was the highest among all sampling sites. Across all other sites, concentrations ranged from below the reporting limit of 1 mg/L to 21 mg/L.
- Total and dissolved Se concentrations were consistently greater in reaches affected by the facility discharge compared to those downstream and hydraulically disconnected (except for PER060, as described below).
- Overall, total and dissolved Se concentrations at sites influenced by the facility discharge increased from January through March. Total Se measured in March, by far the wettest period yet observed during the study, were greater than those observed February. Some precipitation had been received prior to the February event and samples from February yielded total Se greater than observed in January.
- Total Se concentrations for sites not influenced by the facility discharge ranged from 0.90-3.13 µg/L during the January-March sampling events.
- PER060 yielded total Se concentrations of 15.9 and 18.0 µg/L in January and February, respectively, and these were much higher than concentrations measured upstream at Pond

14 (0.90 and 7.0 µg/L, respectively). PER060 was not hydraulically connected to the facility discharge in January, and thus, the flow at that location was emergent groundwater. These results are consistent with measurements and observations from December 2013, when PER060 was not hydraulically connected to facility discharge, yet showed total Se concentrations greater than those measured at Pond 14 or Pond 13. It is currently unknown why the concentrations of total Se were greater at PER060 than at locations upstream.

- The proportion of Se in the dissolved form was greater than 85% during the January-March sampling events.
- Selenite concentrations (as Se) ranged from 0.106-1.64 µg/L (0.5-31% of dissolved Se).
- Selenate concentrations (as Se) ranged from 0.078-51.1 µg/L (6-94% of dissolved Se), and variation in levels of selenate were primarily correlated with changes in total and dissolved Se.

Sediment

- As previously observed, the sulfate levels at Pond 13 (360 mg/kg) and at the tidal site, STE010 (1500 mg/kg), are greater than measured at WVC, PER060, PER045, PER035, and PER010 (13-180 mg/kg). STE020 was also elevated (310 mg/kg), but on a dry weight basis was not substantially different than other downstream sites.
- Total Se (dw basis) in sediment was highest in Pond 13 (6.62 mg/kg, and 5.91 mg/kg in the Pond 13 field duplicate). All other sites had total Se of ≤ 3.51 mg/kg.

Loggers

Temperature, pH, and DO loggers were deployed on a buoy in Pond 13 from 6:00 p.m. on 2/5/14 through 8:30 a.m. on 3/14/14. Logger data is shown in Figure 1 and Figure 2 for the period of 2/6/14 through 3/13/14. The pH varied between 7.2 and 7.4 from 2/6/14 through 2/21/14. The pH then rose and experienced greater variation until the rain event on 2/27/14. During this period, temperatures had also been ~50 °F, which may have aided the growth of algae which were present on March, but were not present in February. The presence of algae results in daily pH swings as algae respire and produce CO₂ during the night (lowering the pH), and photosynthesize and take up CO₂ during the day (raising the pH). Dry weather conditions and operations at the Lehigh-Permanente Facility resulted in very little discharge from the quarry to Permanente Creek prior to the 2/26/14 rain event. After the rain event, regular discharge from the quarry to Permanente Creek ensued, concomitant with a rise in water level at Pond 13. The rise in pH from 7.4 to 7.9 between 2/26/14 and 3/13/14 is associated with the increase in quarry discharge.

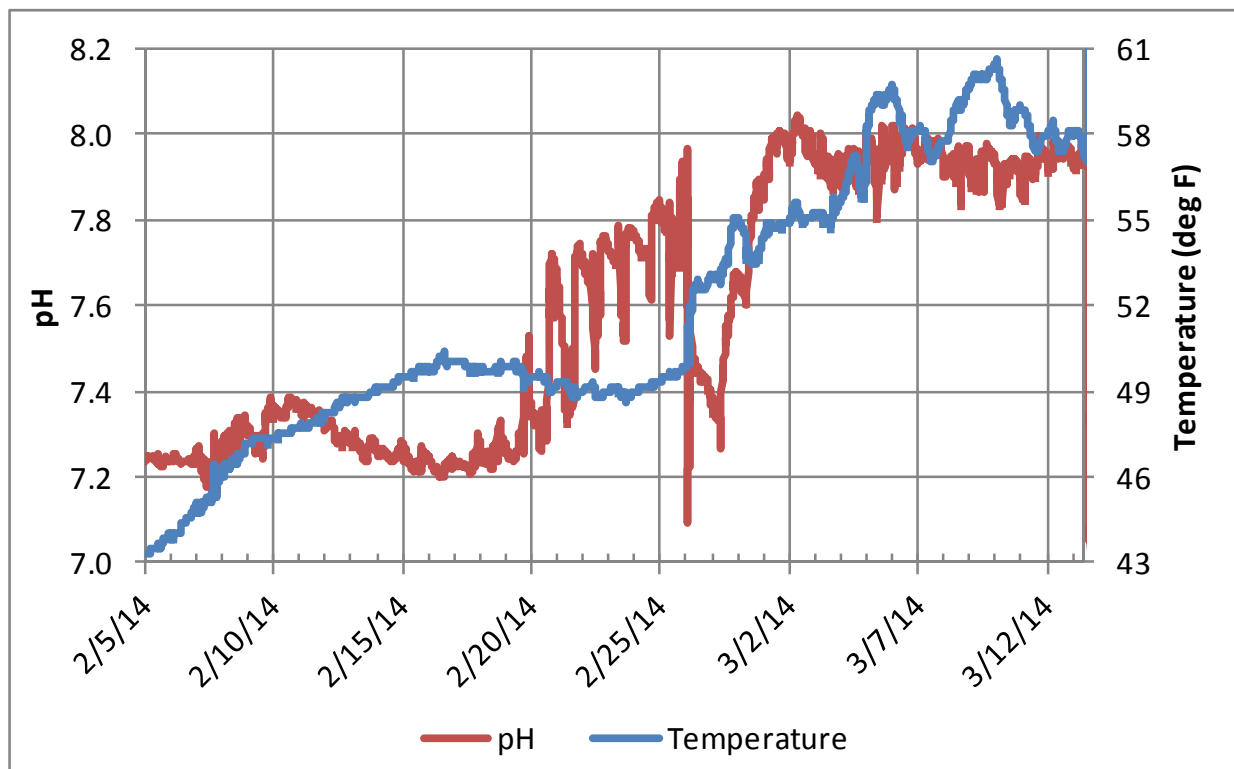


Figure 1. pH and temperature in Pond 13 from the time logging started at 18:00 on 2/5/14 until 8:30 on 3/14/14.

DO concentrations in the pond were initially high (~10 mg/L), but starting 2/7/14 levels decreased to a low of 1 mg/L over a period of 1-2 days. The cause of the drop in DO during this period is likely related to the rain received in the watershed from 2/6/14 through 2/9/14. During logger deployment on 2/5/14, Pond 13 was exceptionally turbid even though there was no inflow to the pond via Permanente Creek. At the time, the only apparent source of turbidity was a groundwater seep along the north bank of the pond halfway between the outlet and the inlet, and this seep could have been a source of low DO water to the pond.

After this initial drop, DO levels then rose to ~8 mg/L by 2/11/14, declined to 5-6 mg/L, and then proceeded to rise to 14 mg/L by 2/16/14. The rise in DO may have been associated with an increase in algae and the production of oxygen from their photosynthetic activity. The rain event on 2/26/14 caused a sudden decrease in DO. DO levels rose to 8-9 mg/L by 3/2/14, and were stable from there to the end of the logging period. The stable DO levels in Pond 13 from 3/3/14 through 3/13/14 was a result of the relatively constant discharge from the Quarry to the Pond via Permanente Creek.

The DO logger was verified to be working properly following the logger deployment. Within a few days after the DO logger was collected, it was checked for their ability to measure low DO levels using a 0 mg/L DO solution. The logger was apparently functioning as designed, as the instrument accurately responded to rapid changes in DO concentrations.

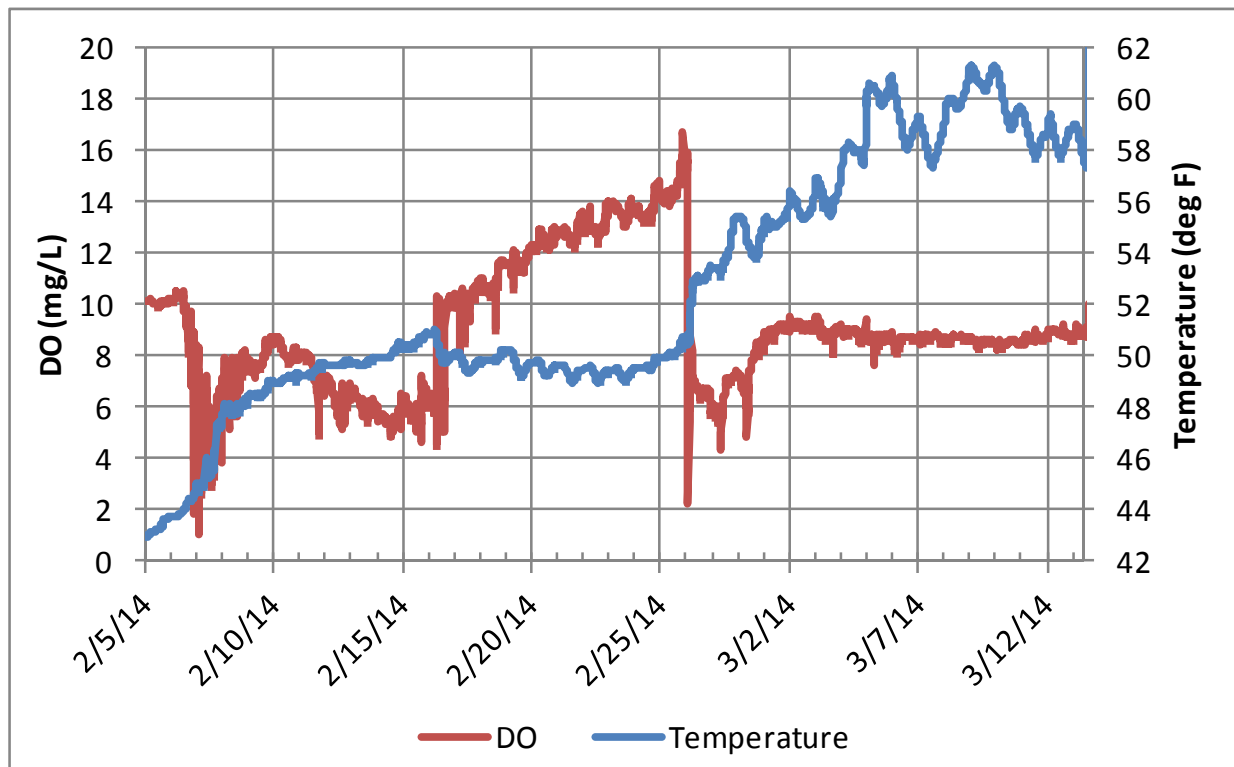


Figure 2. Dissolved oxygen (DO) and temperature in Pond 13 from the time logging started at 18:00 on 2/5/14 until 8:30 on 3/14/14.

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

- The samples taken on 3/20/14 on the Lehigh property were out of preservation and hold-time requirements for several parameters. The case narrative from the report issued by Alpha Analytical reads:

- Robertson Bryan Consulting scheduled a courier pickup on 3-19 to Robbie Phillips (Laboratory Project Manager). The pickup confirmed for 3-20 (by Alpha Labs) never got routed on a courier truck. The samples sat at the pickup site until 4-1 when our courier noticed this set of samples while performing a separate project pickup at the same location. The COC inside the cooler, as well as staff from Robertson Bryan, indicated that a custody seal had been left on the cooler. The custody seal was not received during receipt of samples. It was either not present or the Alpha Labs courier broke the custody seal to verify COC and confirm samples. The samples were out of temperature requirements and many of the analyses were passed their method hold time during the 12 days sitting idle. The samples were consolidated into another ice chest during transit and were received at the laboratory @ 4.4c temperature. We notified the client (Robertson Bryan Consulting) immediately and decided to analyze the samples and flag the issues accordingly.
- The affected data includes, for Pond 13 and Pond 14:
 - Out of preservation requirements: calcium, magnesium, chlorophyll a, TSS, alkalinity, hardness, TOC, and sulfate
 - Out of hold time: calcium, magnesium, chlorophyll a, TSS, alkalinity, hardness, and sulfate
- All field duplicates of water yielded RPDs within the measurement quality objective of 25%, with the exception of TSS of Pond 13 in March, which is likely either due to the hold-time being exceeded, or the fact that the TSS on the lab control duplicate was out of the lab's allowable RPD in March.
- Recovery of calcium in matrix spike and matrix spike duplicates was below acceptable limits in several of the sample batches. This is due to the spike level being much lower than the native concentration. Because the lab control spikes yielded acceptable recoveries, and calcium is not a parameter of primary importance to the study, no action was taken.
- With regards to selenium species, 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.
- BRL encountered a number of minor QA/QC issues with samples associated with waterborne selenium analyses that are documented in their report, but none of these issues were determined to be significant enough to call into question the validity of the data.

Sediment

- Unlike in past sediment sampling events, the RPD for total Se of the Pond 13 field duplicate (FD Pond 13) sample from March (10.7% at both ASC and BRL) was within the measurement quality objective of 25%.
- All recoveries and relative percent differences for laboratory QC samples (laboratory control spike, matrix spike, matrix spike duplicates, reference material) were within acceptable limits at both ASC and BRL.

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 Dissolve 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. Dissolved Se measurements were in agreement between the two labs, yielding RPDs less than 25% for all samples. When detected, BRL generally reported higher concentrations of selenium species in water than ASC. In general, results from BRL validate ASC measurements.

Sub-samples of the Pond 13, FD Pond 13, and PER060 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). The results from ASC and BRL from this event showed acceptable agreement for the Pond 13 and FD Pond 13 samples, as indicated in Table 2. The %RPD for PER060 was above the data quality objective of 25% for total Se (dry wt). The low concentrations, relative to the method detection/reporting limits are likely responsible for the discrepancy. Neither lab indicated QA/QC problems for any of the sediment analyses.

Table 1. Results of Selenium Analyses on Split Water Samples Taken on March 20, 2014. Concentration Units are in µg/L.

Analysis	Pond 13			FD Pond 13			PER060		
	ASC ^a	BRL ^a	RPD (%) ^b	ASC ^a	BRL ^a	RPD (%) ^b	ASC ^a	BRL ^a	RPD (%) ^b
Total Se	50.7	63.3	24.9	51.8	63.6	22.8	20.8	23.1	11.1
Diss.Se	54.1	63.6	17.6	55.6	64.1	15.3	20.4	23.8	16.7
Se (IV)	1.61	3.38	109.9	1.64	2.57	56.7	0.774	1.63	110.6
Se (VI)	51.1	46.5	9.0	49.9	47.8	4.2	17.8	15.7	11.8
SeCN ^c	<0.058 U	<0.3 U	NC	<0.058 U	<0.3 U	NC	<0.058 U	<0.3 U	NC
Additional Se Species ^d	0.118	0.431	265.3	0.092	0.475	416.3	0.076	<0.15 U	NC

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

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

^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 Sediment Samples Taken on March 20, 2013.

Sediment Sample ^a	Total Se (mg/kg)		RPD (%) ^c	% Solids	
	ASC ^b	BRL ^b		ASC ^b	BRL ^b
Pond 13	6.62	5.36	19	58.3	64.16
FD Pond 13	5.91	6.19	4.7	60.5	60.82
PER060	1.54	0.68	56	69.8	74.49

^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

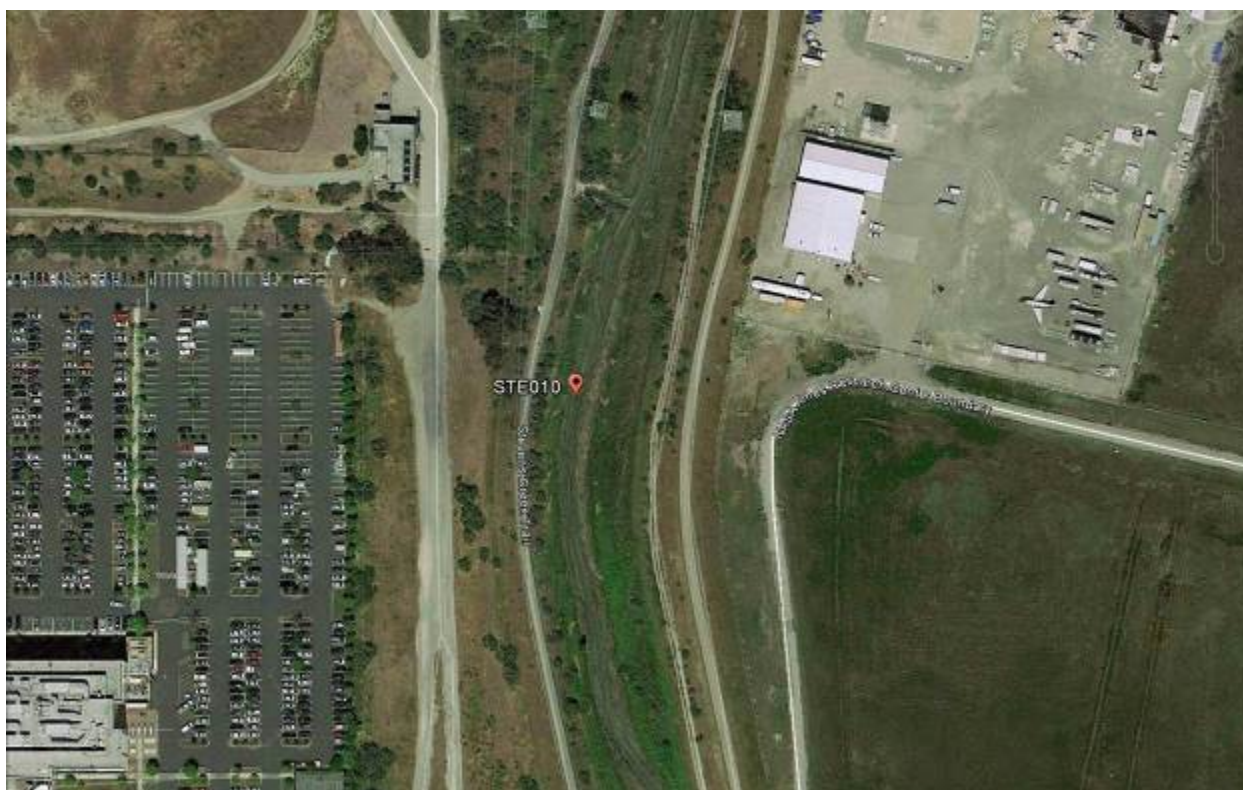


Figure A 1. STE010 sampling station on Stevens Creek.



Figure A 2. PER010 sampling station on Permanente Creek.



Figure A 3. PER035 sampling station on Permanente Creek.

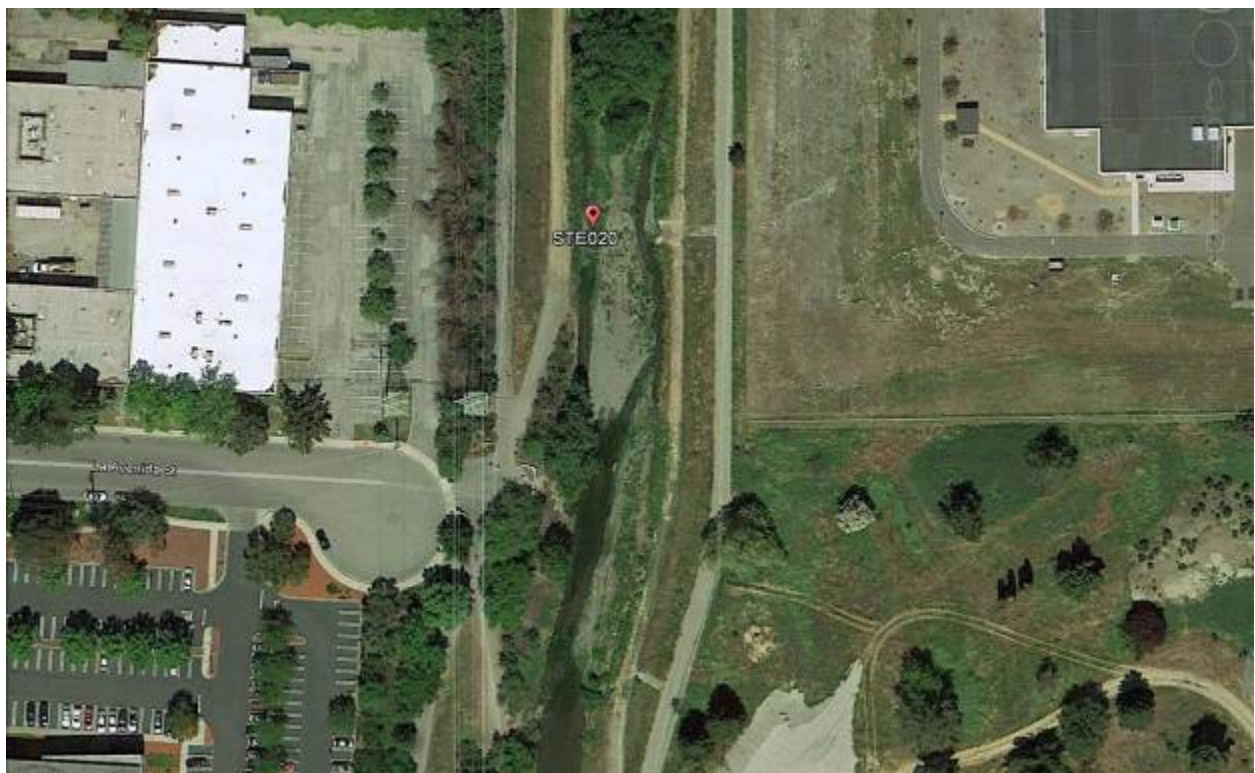


Figure A 4. STE020 sampling station on Stevens Creek.



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.

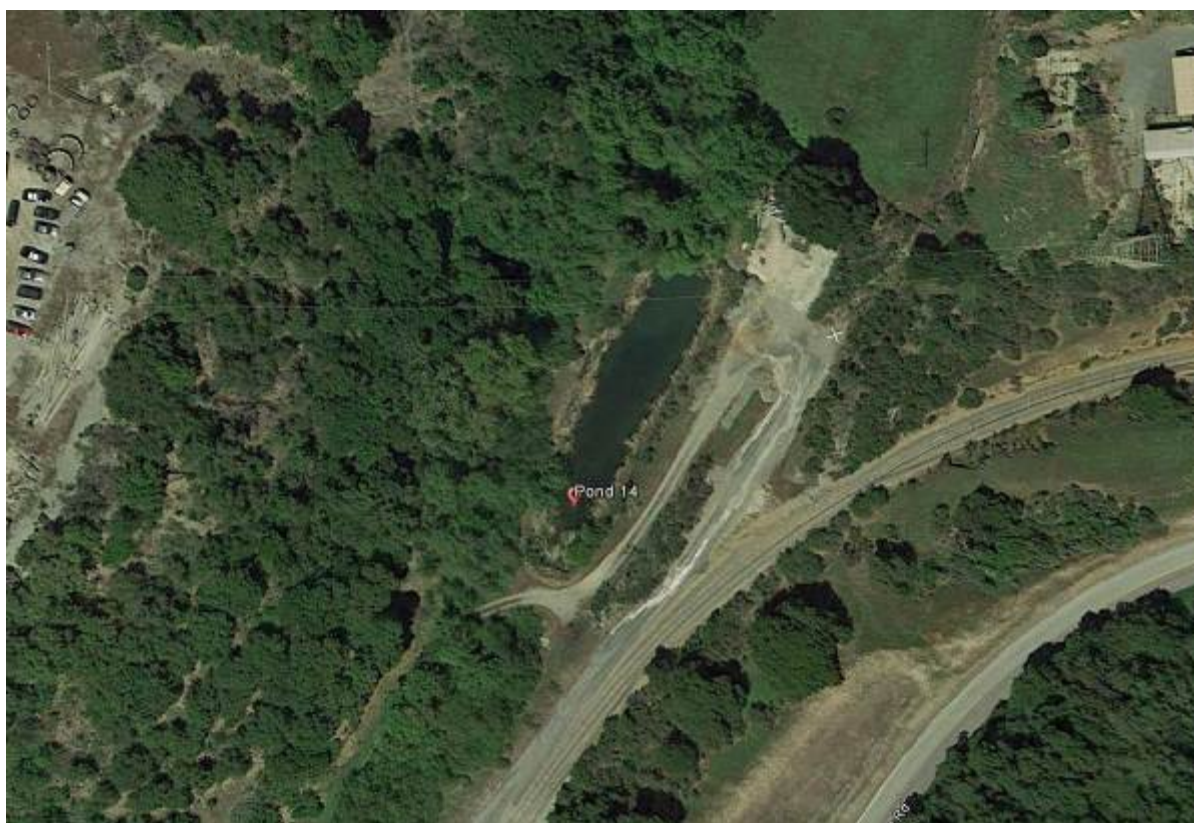


Figure A 9. Pond 14 sampling station.

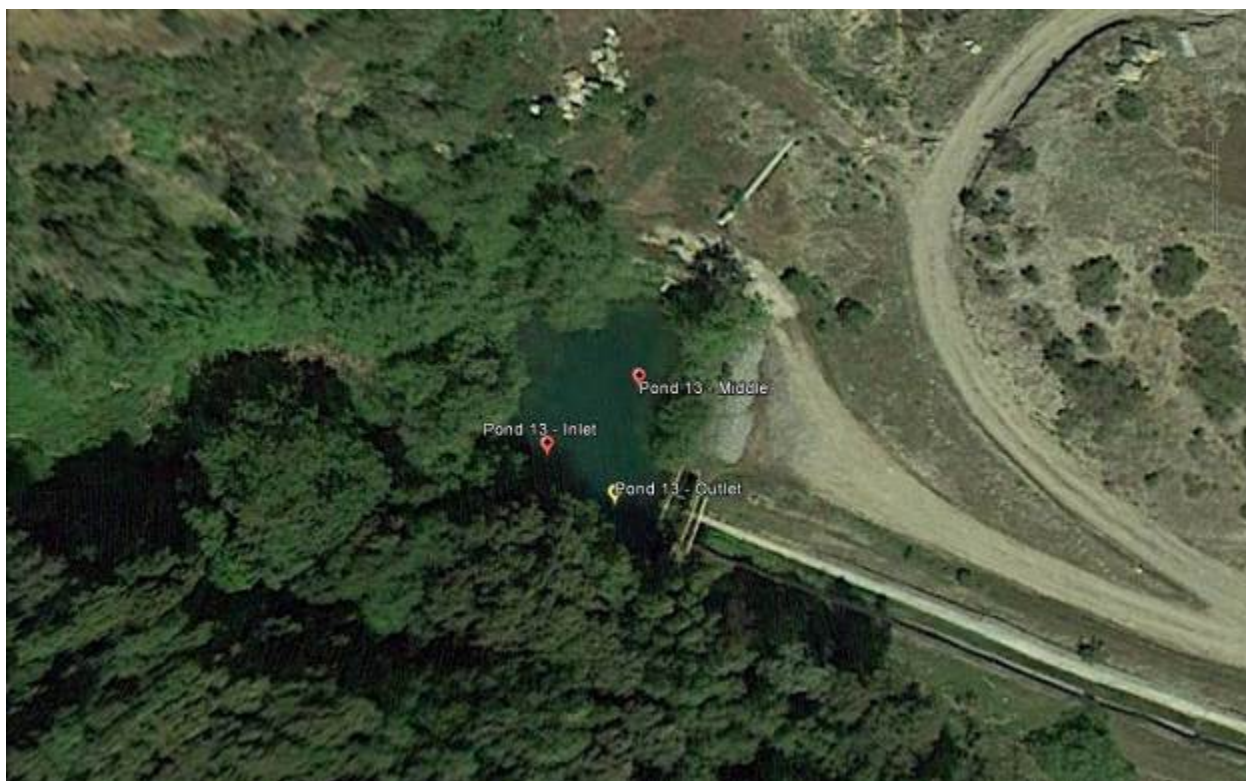


Figure A 10. Pond 13 sampling station.



Figure A 11. WVC sampling station.

Appendix B



Field Data

Table 1. Field Measurements and Data Collected on January 15, 2014.

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	1/15/2014	9:00	--	--	No	--	--	--	--	--	--	--	--	--	--	No Sample. Site not accessible due to earthwork and construction in the quarry.
Pond 13	1/15/2014	10:00	10:05	No Flow	Yes	--	--	No	--	8.37	7.3	1148	15.95	132.4	108	No indication of dead aquatic life, including algae. Small patches of floating algae. Abundant submerged vegetation and algae insignificant dead algae. Extra DO samples taken around pond, all yielded DO > 15.5 mg/L (extra notes on field sheet).
Pond 14	1/15/2014	11:00	11:10	No Flow	Yes	--	--	No	--	7.61	10.4	1622	5.91	56	99	DO not at saturation and ORP lower than full DO.
PER 080	1/15/2014	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site was not visited.
PER 070	1/15/2014	11:30	11:30	No Flow	No	--	--	--	--	--	--	--	--	--	--	No flow and dry.
PER 060	1/15/2014	11:45	11:45	Flow	Yes	--	--	No	--	7.41	16.1	1535	6.54	66.2	162	Dry upstream of bridge. Emergent groundwater with low flow. Would not have sampled except to check on high Se concentrations at this site reported from Dec. 2013. Only Se sampled - no other constituents.
PER 045	1/15/2014	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site was not visited.
PER 035	1/15/2014	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site was not visited.
HAL 010	1/15/2014	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site was not visited.
PER 010	1/15/2014	12:27	12:35	Flow	Yes	Yes	--	No	--	8.22	15.4	1159	11.16	111.6	168	Downstream flow. Sediment was collected in addition to water samples.
STE 040	1/15/2014	12:00	--	No Flow	No	--	--	No	--	--	--	--	--	--	--	No flow and dry.
STE 020	1/15/2014	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site was not visited.
STE 010	1/15/2014	--	--	--	No	--	--	No	--	--	--	--	--	--	--	Site was not visited.

-- No data to report.

Table 2. Field Measurements and Data Collected on February 10, 2014.

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	2/10/2014	10:00	10:00	No Flow	No	--	--	--	--	--	--	--	--	--	--	Creekbed is dry. No evidence of runoff from recent storms.
Pond 13	2/10/2014	10:55	11:15	See Notes	Yes	--	--	No	--	8.40	12.3	1282	9.65	92.8	126	Pond level up 1-2 feet since 2-7-14. 3-5 gpm entering from groundwater seepage on N side of pond. No inflow from upstream, no downstream flow/spill from dam. Pond very turbid. Turbid plume coming from seepage inflow.
Pond 14	2/10/2014	11:40	11:50	Flow	Yes	--	--	See Notes	0.15	8.30	12.7	1474	7.82	75.8	143	Clear water, no odor. Level of pond is up and water is flowing into pond. Inflow through the N. and S. culverts was estimated using depth, width, and velocity data recorded on the field data sheet.
PER 080	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was dry.
PER 070	2/10/2014	12:25	12:30	Flow	Yes	--	--	--	--	8.40	12.5	1537	8.60	82.3	151	Clear water, no odor, stream flowing.
PER 060	2/10/2014	12:55	13:01	Flow	Yes	--	--	See Notes	0.37	8.40	13.4	1468	7.17	70.0	171	Flow was estimated in the field using depth, width, and velocity data recorded on the field data sheet.
PER 045	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was dry.
PER 035	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was not visited.
HAL 010	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was not visited.
PER 010	2/10/2014	14:10	14:15	Flow	Yes	--	--	--	--	8.32	15.9	1309	7.56	77.5	162	Slightly higher than past events. Greenish color.
STE 040	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was dry.
STE 020	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was not visited.
STE 010	2/10/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site was not visited.

-- No data to report.

Table 3. Field Measurements and Data Collected on March 20, 2014.

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	3/20/2014	9:38	9:45	No Flow	No	Yes	--	--	--	--	--	--	--	--	--	No flow and dry. No flow and dry.
Pond 13	3/20/2014	10:38	11:30	Flow	Yes	Yes	See Notes	Yes	0.59	8.36	18.3	1255	8.88	94.4	115	Pond is back up at dam spill level. Loggers collected earlier in March. Field duplicate water and sediment. Sample and field duplicate were split (water and sediment) between ASC and BRL.
Pond 14	3/20/2014	12:20	12:30	Flow	Yes	--	--	Yes	0.70	8.42	17.8	1411	9.40	98.7	133	Solids stirred up during access. TSS may be higher than in greater pond area.
PER 080	3/20/2014	13:25	--	No Flow	No	--	--	No	--	--	--	--	--	--	--	Site visited. Trickle of flow through small muddy pools which went subsurface at sampling site.
PER 070	3/20/2014	13:10	13:13	Flow	Yes	--	--	--	--	8.41	15.9	1471	9.20	95.2	141	Flowing
PER 060	3/20/2014	13:35	13:40	Flow	Yes	Yes	--	Yes	1.31	8.01	17.1	1496	8.73	90.6	173	Flowing water and connectivity with upstream is evident. Water and sediment samples split between ASC and BRL.
PER 045	3/20/2014	14:30	--	No Flow	No	Yes	--	No	--	--	--	--	--	--	--	Soft sediments collected along bank.
PER 035	3/20/2014	14:35	14:38	No Flow	No	Yes	--	--	--	--	--	--	--	--	--	No flow and dry.
HAL 010	3/20/2014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Site not visited.
PER 010	3/20/2014	16:20	--	Flow	Yes	Yes	--	--	--	8.48	22.1	1287	15.87	179.8	142	
STE 040	3/20/2014	--	--	No Flow	--	--	--	--	--	--	--	--	--	--	--	No flow and dry.
STE 020	3/20/2014	15:15	--	Flow	Yes	Yes	--	No	--	8.20	21.3	1021	13.21	150.5	160	Low, downstream flow. Clear water, no odor.
STE 010	3/20/2014	15:49	--	Flow	Yes	Yes	--	No	--	8.14	24.5	20460	9.00	107.9	99	Tide coming in. Scum on surface. Salinity out of meter range in field. Salinity measured on grab sample at RBI office on 3/21/14.

-- No data to report.

Appendix C



Selenium Data

Table 3. Selenium Results for Water Samples Taken on January 15, February 10, and March 20, 2014.

Sample ID	Date Collected	Units	Total Se	Diss. Se	Se(IV)	Se(VI)	SeCN	Additional Se Species (n)
Pond 13	1/15/2014	µg/L	3.49	3.84	0.804	1.53	< 0.077 U	0.138 (1)
Pond 14	1/15/2014	µg/L	1.46	1.30	0.403 J	< 0.078 U	< 0.077 U	0.079 (1)
PER010	1/15/2014	µg/L	0.90	1.11	0.106 J	0.765	< 0.077 U	0 (0)
PER060	1/15/2014	µg/L	15.9	15.2	0.075 J	13.2	< 0.077 U	0 (0)
Pond 13	2/10/2014	µg/L	11.3	11.8	1.06	7.97	< 0.020 U	0.070 (1)
Pond 14	2/10/2014	µg/L	7.70	6.55	0.942	4.86	< 0.020 U	0.053 (1)
PER070	2/10/2014	µg/L	7.91	8.91	1.09	5.28	< 0.020 U	0.048 (1)
PER060	2/10/2014	µg/L	18.0	18.0	0.155 J	15.2	< 0.020 U	0 (0)
PER010	2/10/2014	µg/L	2.91	2.87	0.234 J	2.01	< 0.020 U	0.046 (1)
Pond 13	3/20/2014	µg/L	50.7	54.1	1.61	51.1	< 0.058 U	0.118 (2)
FD Pond 13	3/20/2014	µg/L	51.8	55.6	1.64	49.9	< 0.058 U	0.092 (2)
Pond 14	3/20/2014	µg/L	24.2	26.4	0.966	22.4	< 0.058 U	0.057 (1)
PER070	3/20/2014	µg/L	25.5	25.7	1.15	22.0	< 0.058 U	0.058 (1)
PER060	3/20/2014	µg/L	20.8	20.4	0.774	17.8	< 0.058 U	0.076 (2)
PER010	3/20/2014	µg/L	3.13	3.02	0.237 J	2.04	< 0.058 U	0 (0)
STE020	3/20/2014	µg/L	1.48	1.33	0.272 J	0.800	< 0.058 U	0 (0)
STE010	3/20/2014	µg/L	1.03	1.07	0.155 J	0.821	< 0.058 U	0 (0)

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 January 15,2014 and March 20, 2014.

Sample ID	Date Collected	Units	Total Se (WW)	Total Se (DW)	Percent Solids (%)
PER010	1/15/2014	µg/g	0.254	0.347	73.2
WVC	3/20/2014	µg/g	0.350	0.393	89.0
Pond 13	3/20/2014	µg/g	3.86	6.62	58.3
FD Pond 13	3/20/2014	µg/g	3.57	5.91	60.5
PER060	3/20/2014	µg/g	1.08	1.54	69.8
PER045	3/20/2014	µg/g	2.86	3.51	81.4
PER035	3/20/2014	µg/g	2.50	2.75	90.9
PER010	3/20/2014	µg/g	0.393	0.644	61.1
STE020	3/20/2014	µg/g	0.388	0.577	67.3
STE010	3/20/2014	µg/g	0.188	0.481	39.0

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

Tuesday, April 29, 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
3/20/2014	13	26000

Pond 13 Results

Tuesday, April 29, 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
1/15/2014	95	110	60	531	450	0.00090	5.67	ND		
2/10/2014	160	140	60	608	420	0.0060	3.77	21		
3/20/2014	160	190	44	657	500	0.00012	0.985	7.4	360	17000

Pond 14 Results

Tuesday, April 29, 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		
1/15/2014	240	160	47	589	410	0.025	3.85	9.8		
2/10/2014	160	140	33	476	370	0.0063	5.67	10		
3/20/2014	180	170	46	604	460	0.00098	2.50	8.8		

PER080 Results

Tuesday, April 29, 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

Tuesday, April 29, 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
2/10/2014	170	140	34	496	390	0.0036	4.51	ND
3/20/2014	190	160	45	579	480	0.00097	2.41	1.8

PER060 Results

Tuesday, April 29, 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
2/10/2014	220	180	58	698	420	0.00041	1.11	ND		
3/20/2014	380	100	67	528	480	0.00028	1.71	1.0	150	9200

PER045 Results

Tuesday, April 29, 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
3/20/2014	180	29000

PER035 Results

Tuesday, April 29, 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
3/20/2014	17	49000

PER010 Results

Tuesday, April 29, 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		
1/15/2014	380	120	65	556	120	0.0048	1.46	7.2	120	10000
2/10/2014	360	120	70	589	180	0.0069	6.71	13		
3/20/2014	200	170	48	614	160	0.019	2.97	5.2	89	8700

STE020 Results

Tuesday, April 29, 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	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
3/20/2014	340	110	40	438	110	0.0069	1.34	4.4	310	6400

STE010 Results

Tuesday, April 29, 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	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
3/20/2014	280	210	420	2240	830	0.040	3.13	51	1500	18000