Atlantic Richfield Company

Anthony R. Brown
Project Manager, Mining

4 Centerpointe Drive
La Palma, CA 90623-1066
Office: (657) 529-4537
Fax: (714) 228-6749
E-mail: Anthony.Brown@bp.com

April 18, 2017

Ms. Lynda Deschambault
US EPA Region 9
75 Hawthorne Street (SFD-7-2)
San Francisco, CA 94105

RE: Leviathan Mine Site: Update on Limited Access Season Site Conditions April 5 - 12, 2017

Dear Lynda:

This letter report summarizes actions taken and observations made by Atlantic Richfield Company at the Leviathan Mine Site between April 5, 2017 and April 12, 2017 in response to (i) higher-than-normal flows conditions through the Aspen Seep Bioreactor (ASB), and (ii) weather-related damage to the overflow pipe-riser assembly in Pond 4 (near the HDS Treatment Plant). Based on laboratory results for collected samples and continuous pH monitoring in Leviathan Creek, Atlantic Richfield does not believe that either condition constituted an emergency situation that presented an immediate threat to public health or the environment.

Atlantic Richfield personnel performed the activities described in this letter report in accordance with its site-wide Health and Safety Plan and Winter Access and Operations Plan, which were previously reviewed and approved by EPA.

April 5, 2017 – High Water Level Observed at Aspen Seep Bioreactor, Pond 4

Atlantic Richfield personnel continuously monitor water levels in the ASB ponds using the remote camera. On April 5, 2017, personnel observed that water levels in ASB-Pond 4 were rising above typical levels for that pond. This was attributed either to a blockage at the effluent launder or influent flows into the ASB that exceeded the hydraulic capacity of effluent piping, or both. As of April 5, 2017, ASB-Pond 4 still had approximately 75,000 gallons of storage available.

At 7:07 PM PDT on April 5, 2017, Atlantic Richfield notified EPA by email of the elevated water level in ASB-Pond 4. Atlantic Richfield also described its plan for equalizing the effluent flow rate out of ASB-Pond 4 with the influent flow rate into the ASB by replacing the 1-inch effluent piping with larger diameter 2-inch piping. As stated in the email, these plumbing modifications

were not expected to affect Atlantic Richfield's ability to control ASB system components or the overall performance of the ASB.

April 6, 2017 – ASB Pond 4 Plumbing Modifications

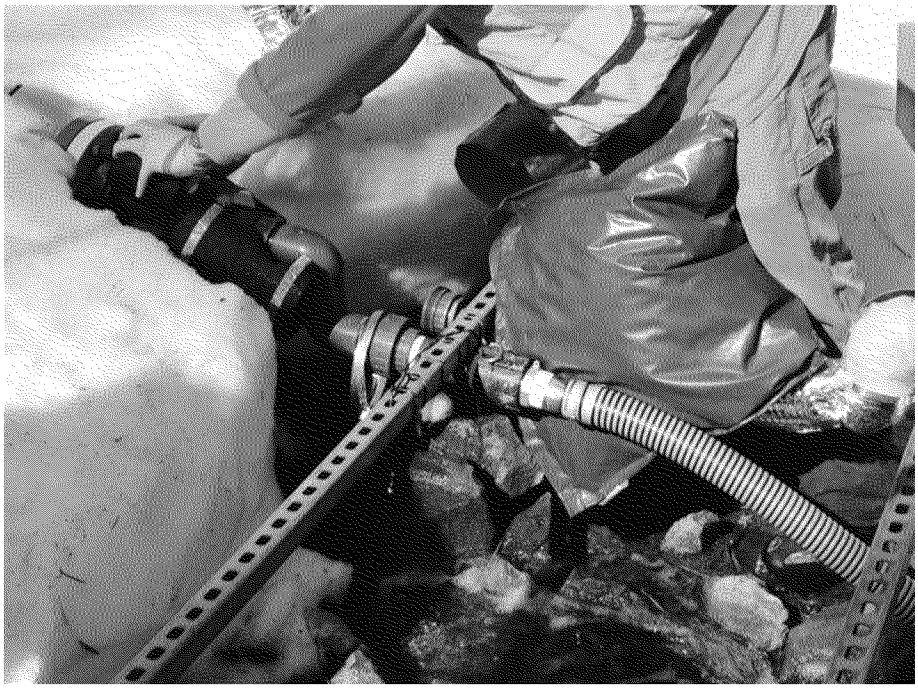
Copper Environmental personnel accessed the ASB on April 6, 2017. Personnel cleared debris from the Pond 4 effluent launder, increased the diameter of the outlet piping from 1-inch to 2-inch, and disconnected the 1-inch in-line flow meter. They also pumped approximately 21,000 gallons of treated water out of ASB-Pond 4 to the aeration channel to lower the pond water level. Treated effluent continued to discharge from ASB-Pond 4 to the aeration channel following these modifications.

The result of these efforts is increased effluent flow out of the bioreactor – to better match the influent rate (measured at 25 gpm on April 5, 2017 and 28 gpm on April 10, 2017) – and a substantially lowered Pond 4 water level. These efforts prevented any uncontrolled overflow from Pond 4 and overtopping of the Pond 4 berm. Atlantic Richfield does not anticipate any erosion or the need for other contingencies to prevent an overflow at the present time.

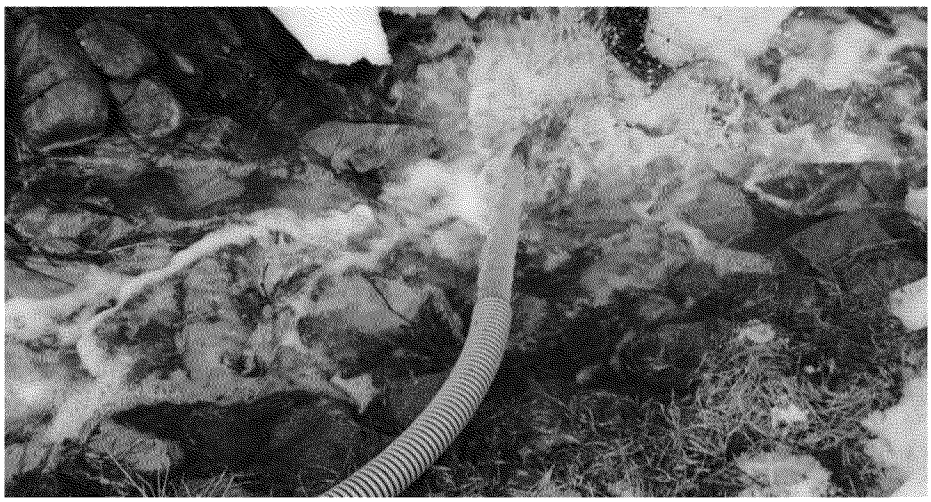
Photographs showing the ASB-Pond 4 water level before and after the plumbing modifications, the new larger diameter effluent line, and the post-modification discharge of the ASB effluent to the aeration channel are included below:

April 6, 2017: ASB-Pond 4 before piping modificat ions and siphoning.

April 6, 2017: ASB-Pond 4 after piping modifica tions and siphoning.



April 6, 2016: Replacement 2-inch effluent line d ischarging to aeration channel.



April 6, 2017: ASB-Pond 4 treated effluent discharged through 2" pipe to aeration channel.

ASB Feed Rate Adjustments, Monitoring, and Performance

In addition to the effluent plumbing modifications, Atlantic Richfield has been adjusting the ethanol and sodium hydroxide feed rates to the ASB to keep pace with the seasonally high influent flow rates. Monitoring results for samples collected on March 20 and April 10, 2017 confirm that these adjustments are maintaining the effluent pH within the target range. Effluent metals concentrations were below discharge criteria on both dates, with the exception of dissolved iron. Similarly elevated dissolved iron concentrations in the ASB effluent have been observed in prior years during spring, high-flow runoff conditions.

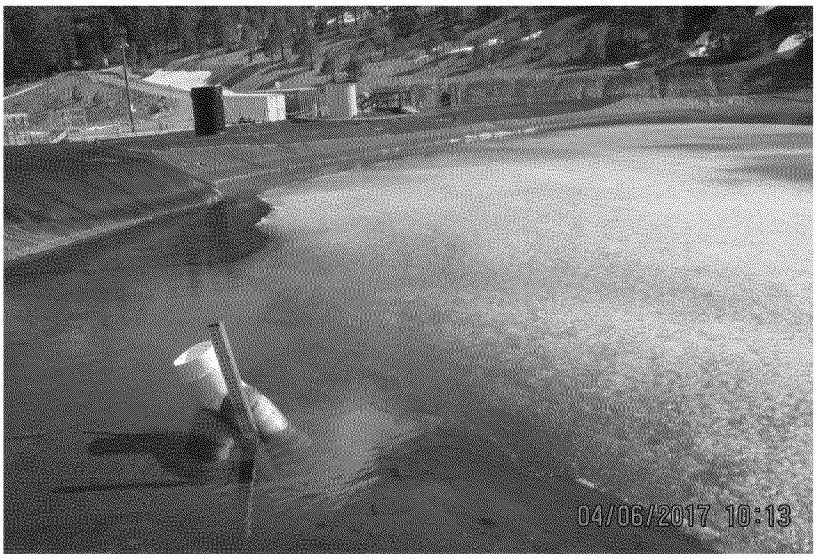
The plumbing modifications made to increase the diameter of the ASB effluent line did not result in any discharge of untreated Aspen Seep water or adversely affect the functionality of the bioreactor. The plumbing modifications simply allowed the effluent rate to equilibrate with the influent rate. ASB performance is more directly related to the recirculation rate within the bioreactor and the feed rates for sodium hydroxide and ethanol, which, again, have been adjusted to keep pace with the higher influent flow rate.

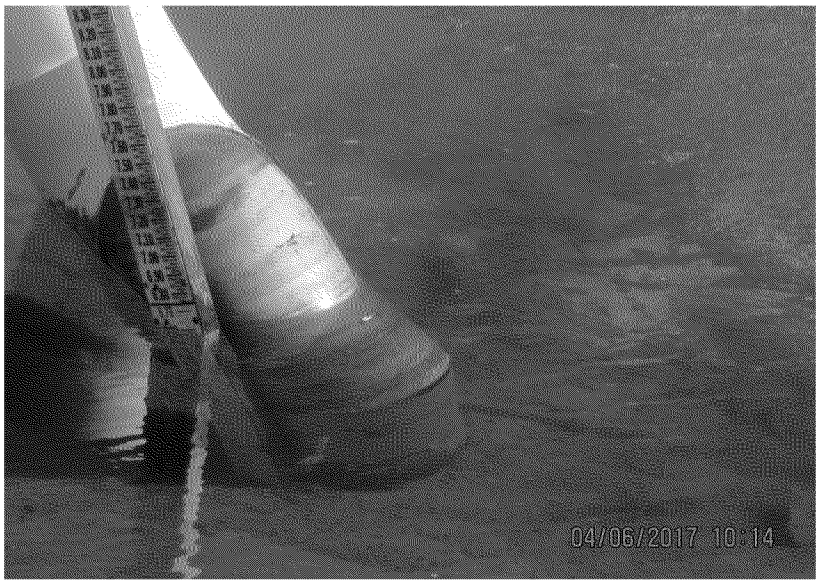
Higher-than-normal seasonal influent flow rates into the ASB do not appear to be adversely affecting the health of the bioreactor cells. Since the ASB treatment system is normally operated in recirculation mode, influent bypasses the two bioreactor cells. Therefore, the residence time of the bioreactor cells is controlled by the recirculation flow rate and remains within the design parameters. The current residence time for Ponds 3 and 4 combined is estimated between 3 and 3.5 days. The primary purpose of Ponds 3 and 4 are to provide settling of solids, and we are currently observing clear effluent (see photo above). At this time, we do not believe that changes to the pond residence time are warranted or feasible.

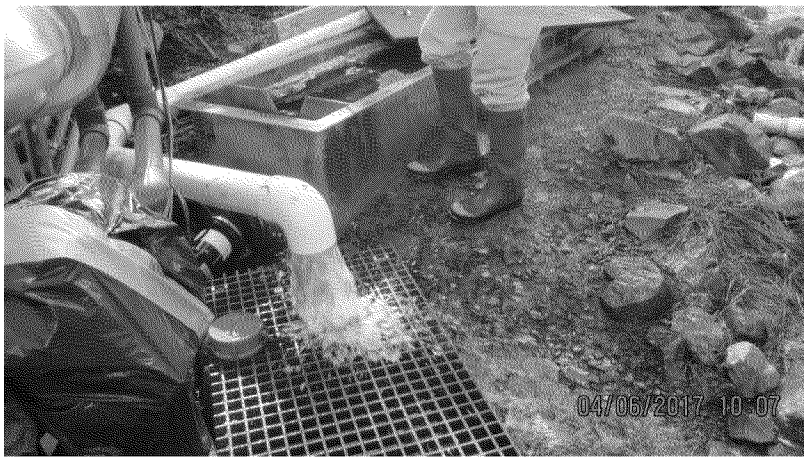
April 6, 2017 – Notification of Pond 4 Discharge

On April 6, 2017, at approximately 3:30 PM PDT, Atlantic Richfield received word from the LRWQCB that a connection on the overflow riser pipe assembly in Pond 4 (near the HDS

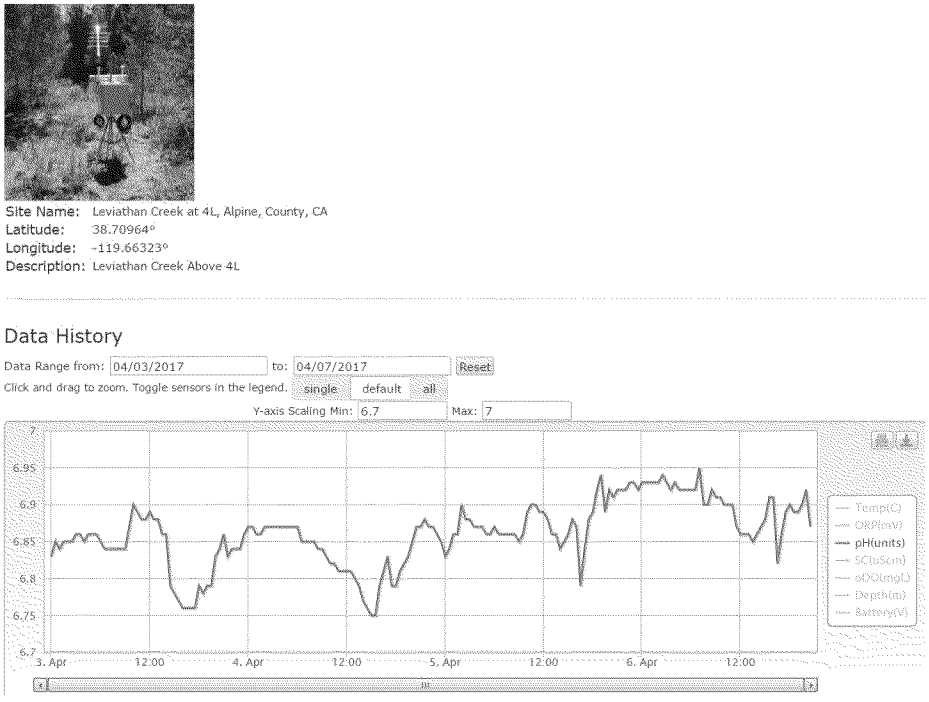
treatment building) had separated a few inches below the water line, and as a result, water was discharging through the overflow pipe to Leviathan Creek. Photographs sent by the LRWQCB are shown below:







It appeared from the photos that the separation may have resulted from ice pushing against the riser pipe asasembly. Atlantic Richfield does not normally have personnel at the site at this time of year, and the pipe separation was not the result of any human-caused activity. It also appeared that there were only a few inches of standing water in Pond 4 above the pipe separation, and the section of pipe below the separation was intact. According to Doug Carey, LRWQCB Board crews who were at the site earlier in the week did not observe any discharge from the Pond 4 overflow pipe, so we assume the separation occurred sometime between April 4 and April 6, 2017. pH measurements from EPA's data sonde in Leviathan Creek at 4L did not suggest that the resulting discharge from Pond 4 was having any significant effect on surface water quality during this time:



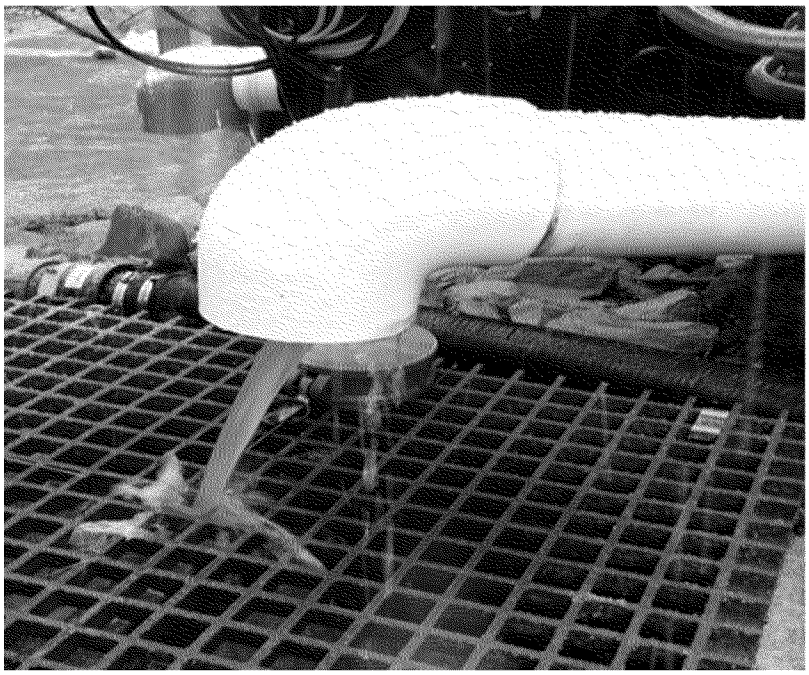
At 5:49 PM PDT on April 6, 2017, Atlantic Richfield notified EPA of these conditions by email. Atlantic Richfield also described its plan for repairing the pipe separation by sending field personnel to the site the following day, weather permitting.

April 7, 2017 – Initial Repairs to Pond 4 Pipe Riser Assembly

On April 7, 2017, Copper Environmental field personnel entered the site, despite poor weather conditions (sleet and snow). Personnel waded into Pond 4 and re-set the overflow pipe riser assembly into the lower pipe receiver as best they could. Personnel also placed temporary sandbags around the pipe riser assembly in an attempt to stabilize the piping. Discharge from Pond 4 through the discharge pipe increased briefly while the piper rise assembly was being removed and then reset. After resetting the assembly, the discharge rate decreased, but flow was not completely stopped. As a result, Copper began formulating plans for additional, more permanent repairs to the pipe riser assembly to be made the following week.

Photographs taken by LRWQCB and Copper personnel during the repair work on April 7, 2017 are shown below:

April 7, 2017: Overflow pipe discharge while Pond 4 pipe riser assembly was being removed and re-set.



April 7, 2017: Overflow pipe discharge after re-setting of the Pond 4 pipe riser assembly.

A water sample was collected on April 7, 2017 from Pond 4 and shipped to Test America's lab for expedited analysis. Analytical results are presented in attached Table 3. Copper also collected a field pH measurement of 2.13 s.u. in Pond 4 just below the surface near the overflow pipe.

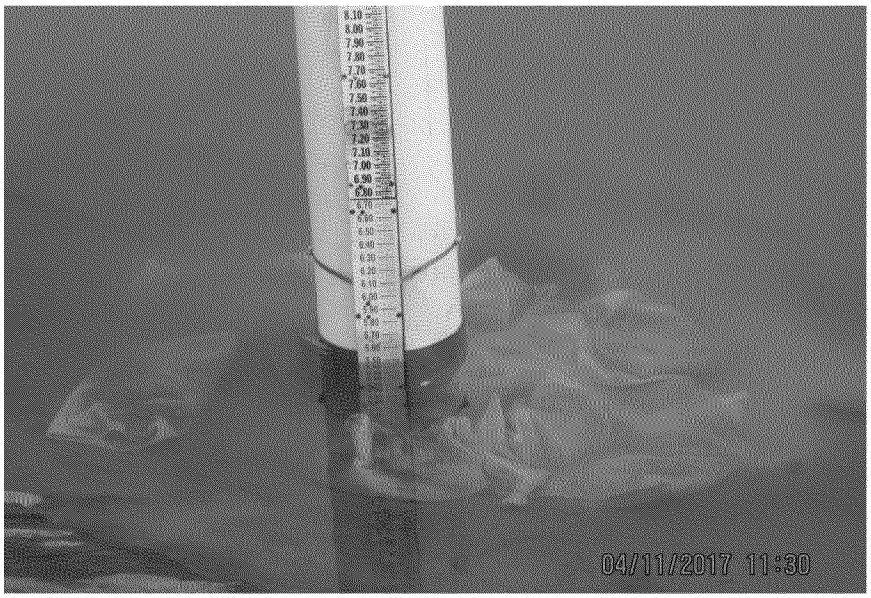
April 10, 2017 – Site Visit and Sample Collection at ASB and Pond 4

Copper personnel returned to the site on Monday, April 10, 2017 to collect monthly compliance samples at the ASB and to collect additional samples from Pond 4 and the discharge pipe outlet. Analytical results from these samples are presented in Tables 2 and 3. The ASB influent flow rate was measured at 28 gpm. The ASB effluent pH was measured in the field at 6.36 s.u. Dissolved iron was 10.6 mg/L (field measured).

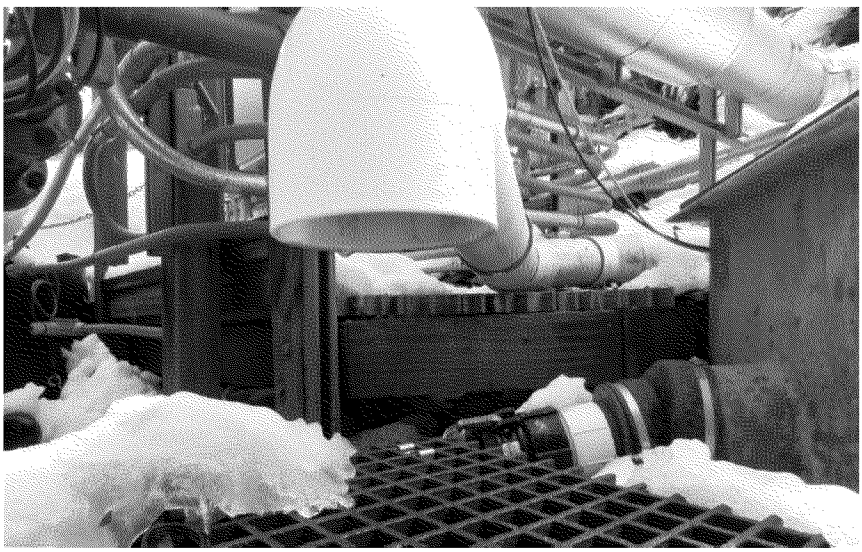
No field activities were planned on April 8 and 9, 2017 (weekend) that would have required returning to the site on those days.

April 11, 2017 – Follow-Up Repairs to Pond 4 Piper Riser Assembly

On April 11, 2017, crews returned to the site to complete more permanent repairs to the Pond 4 pipe riser assembly. A new stand pipe was inserted into the lower pipe receiver and better stabilized with appropriate fittings and clamps. The pond water level staff gage was also re-set, and some of the sand bags were removed. Following these additional repairs, no flow was observed from the discharge pipe outlet. Photographs showing conditions following these additional repairs are provided below:



April 11, 2017: Repaired pipe riser assembly. Pond water level at 5.50'.



April 11, 2017: Discharge pipe outlet following re pairs to pipe riser assembly.

April 12, 2016 – ASB Monthly Maintenance

Copper Environmental personnel accessed the ASB again on April 12, 2016 to perform regularly schedule monthly maintenance. The sodium hydroxide feed rate was increased based on field measurements. Observations confirmed that the water level in ASB-Pond 4 is holding at the lowered elevation, and adequate freeboard is being maintained.

Quantity/Quality of Water Discharged from Pond 4

Flow measurements from the Pond 4 discharge pipe were not collected between April 6 and April 12, 2017. The Pond 4 discharge pipe is not equipped with an in-line flow meter. Based on staff gage readings on April 6, 2017, when the pipe separation was first observed (~6.5'), and

April 11, 2017, when the second round of repairs were completed (~5.5'), the water level in Pond 4 decreased by approximately one foot. Amec Foster Wheeler estimated that this water level decrease would equate to about 200,000 gallons, based on surveyed pond dimensions and bank slope.

Any water in Pond 4 at the time of this discharge would have been precipitation (snow melt and rain) and passive drainage from the seep drains that the Water Board installed south and east of the pond during initial pond construction. None of this water came from the CUD or Delta Seep, other than the very small residual volume left in the pond at the end of the 2016 treatment season. Any sediment that may have been stirred up and discharged during these repairs would be primarily made up of residual treatment solids (lime sludge) that settled out when Pond 4 was used as a settling pond for effluent discharged from earlier configurations of the treatment system.

According to EPA continuous monitoring, pH measurements in Leviathan Creek at 4L and Station 15 remained above 6.0 and 7.0, respectively, between April 6 and April 17, 2017.

Atlantic Richfield will continue to monitor conditions at the ASB and Pond 4 as preparations for mobilization to the site and commencement of Spring 2017 Limited Access Season Operations proceed in accordance with our March 27, 2017 Request for Authorization.

Please contact me if you have any questions concerning the information presented in this letter.

Sincerely,

Tony Brown
Project Manager

cc: Ronald Halsey, Atlantic Richfield Company
Nathan Block, BP
Brian Johnson, Atlantic Richfield Company
Reginald Ilao, Atlantic Richfield Company
Adam Cohen, Esq., Davis Graham & Stubbs LLP
Dave McCarthy, Copper Environmental Consulting
Marc Lombardi, Amec Foster Wheeler Environment & Infrastructure, Inc.
Sandy Riese, EnSci, Inc.

TABLE 1

ASPEN SEEP BIOREACTOR TREATMENT SYSTEM - COMPLIANCE SAMPLE RESULTS
MARCH 2017 MONTHLY SUMMARY
Draft - Provisional Data

Parameter	Basis	March 20, 2017 264ASPINF904 ASB Influent mg/L	March 20, 2017 264ASPEFF903 ASB Effluent mg/L	Maximum Discharge Criteria[2] (mg/L)	Average Discharge Criteria[2] (mg/L)
pH (s.u.)[1]	Field/Lab	2.72	6.84	-	6.0 - 9.0
Aluminum	Dissolved	34	0.15	4.0	2.0
Arsenic	Dissolved	0.00093 J	< 0.0010	0.34	0.15
Cadmium	Dissolved	0.0012	< 0.0010	0.009	0.004
Calcium	Dissolved	280	170	-	-
Chloride	Total	2.9	2.3	-	-
Chromium	Dissolved	0.0037	< 0.0020	0.97	0.31
Copper	Dissolved	0.57	0.0026	0.026	0.016
Hardness	Dissolved	950	580	-	-
Iron	Dissolved	90	**7.9**	2.0	1.0
Lead	Dissolved	< 0.0010	< 0.0010	0.136	0.005
Magnesium	Dissolved	62	38	-	-
Nickel	Dissolved	0.34	0.057	0.84	0.094
Phosphorous	Dissolved	< 0.20	< 0.20	-	-
Selenium	Total	0.0014 J	< 0.0020	NP	0.005
Sulfate	Total	1500	750	-	-
Zinc	Dissolved	0.47	0.048	0.21	0.21
Acidity	Total	460	< 2.0	-	-
Alkalinity (Bicarbonate)	Total	< 4.8	140	-	-
Alkalinity (Carbonate)	Total	< 2.4	< 2.4	-	-
Alkalinity (Hydroxide)	Total	< 1.4	< 1.4	-	-
Alkalinity (Total)	Total	< 4.0	110	-	-
Total Dissolved Solids	Total	2200	1300	-	-
Total Suspended Solids	Total	10	22		

Notes:
1. pH values are from Test America lab EDD and are reported in standard units
2. Discharge criteria and basis for maximum and average values are listed in the Request for Approval of Modifications to the Removal Action at the Leviathan Mine Memorandum (U.S. EPA, 2008)
3. Values in **Bold** are effluent concentrations greater than the maximum or average discharge criteria.

Abbreviations
< - Constituents that were not detected are listed as "<" and the reporting limit is shown.
J - Results noted with "J" are an estimated value or were less than the reporting limit but greater than or equal to the method detection limit
mg/L - milligrams per liter
NP - Not Promulgated
s.u. - standard unit

TABLE 2
ASPEN SEEP BIOREACTOR TREATMENT SYSTEM - SAMPLING RESULTS[1]
APRIL 2017 MONTHLY SUMMARY
Draft - Provisional Data

Parameter	Basis	April 10, 2017 265ASPINF908 ASB Influent (mg/L)	April 10, 2017 265ASPEFF907 ASB Effluent (mg/L)	Maximum Discharge Criteria[2] (mg/L)	Average Discharge Criteria[2] (mg/L)
pH (s.u.)	Field	2.84	6.36	-	6.0 - 9.0
Aluminum	Dissolved	53	0.12	4.0	2.0
Arsenic	Dissolved	0.0020	<0.0010	0.34	0.15
Cadmium	Dissolved	0.0026	<0.0010	0.009	0.004
Calcium	Dissolved	340	260	-	-
Chloride	Total	4.5 J	2.4 J	-	-
Chromium	Dissolved	0.015	0.0035	0.97	0.31
Copper	Dissolved	1.6	0.0066	0.026	0.016
Hardness	Dissolved	1200	890	-	-
Iron	Dissolved	91	8.2	2.0	1.0
Lead	Dissolved	<0.0010	<0.0010	0.136	0.005
Magnesium	Dissolved	73	58	-	-
Nickel	Dissolved	0.45	0.15	0.84	0.094
Phosphorus	Dissolved	<0.20	<0.20	-	-
Selenium	Total	0.012	0.0051	NP	0.005
Sulfate	Total	1800	1300	-	-
Zinc	Dissolved	0.64	0.040	0.21	0.21
Acidity	Total	570	<2.0	-	-
Alkalinity (Bicarbonate)	Total	<4.8	94	-	-
Alkalinity (Carbonate)	Total	<2.4	<2.4	-	-
Alkalinity (Hydroxide)	Total	<1.4	<1.4	-	-
Alkalinity (Total)	Total	<4.0	77	-	-
Total Dissolved Solids	Total	2,600	2,000	-	-
Total Suspended Solids	Total	<10	<10		

Notes:
1. Results are preliminary
2. Discharge criteria and basis for maximum andaverage values are listed in the Request for Approval of Modification to the Removal Action at the Leviathan Mine Memorandum (MRAM) (U.S. EPA, 2008). As stated in the MRAM, the discharge criteria apply only to effluent from an operating treatment system, and they are not applicable during winter months when access to the site is limited.

Abbreviations
< - Constituents that were not detected are listed as "<" and reporting limit is shown.
J - Results noted with "J" are an estimated value or were less than the reporting limit but greater than or equal to the method detection limit.
mg/L - milligrams per liter
s.u. - standard unit

TABLE 3
POND 4 SAMPLING RESULTS[1]
Draft - Provisional Data

Parameter	Basis	April 7, 2017 237HDSP4698 HDS Pond 4[2] (mg/L)	April 10, 2017 238HDSP4700 HDS Pond 4[2] (mg/L)	April 10, 2017 238HDSOF701 HDS Pond 4 DP (mg/L)	Maximum Discharge Criteria[3] (mg/L)	Average Discharge Criteria[3] (mg/L)
pH (s.u.)	Field	2.13	3.40	3.13	-	6.0 - 9.0
Aluminum	Dissolved	20	20	47	4.0	2.0
Arsenic	Dissolved	0.00098 J	0.0013	0.0043	0.34	0.15
Cadmium	Dissolved	0.0025	0.0025	0.0062	0.009	0.004
Calcium	Dissolved	120	120	170	-	-
Chloride	Total	0.81	1.1	2.9	-	-
Chromium	Dissolved	0.010	0.0090	0.033	0.97	0.31
Copper	Dissolved	0.27	0.26	0.55	0.026	0.016
Hardness	Dissolved	430	440	590	-	-
Iron	Dissolved	2.4	2.3	5.4	2.0	1.0
Lead	Dissolved	<0.0010	<0.0010	<0.0010	0.136	0.005
Magnesium	Dissolved	33	33	42	-	-
Nickel	Dissolved	0.30	0.33	0.66	0.84	0.094
Selenium	Total	0.0077	0.0070	0.011	NP	0.005
Sulfate	Total	640	580	900	-	-
Zinc	Dissolved	0.13	0.13	0.22	0.21	0.21
Acidity	Total	150	120	300	-	-
Alkalinity (Bicarbonate)	Total	<4.8	<4.8	<4.8	-	-
Alkalinity (Carbonate)	Total	<2.4	<2.4	<2.4	-	-
Alkalinity (Hydroxide)	Total	<1.4	<1.4	<1.4	-	-
Alkalinity (Total)	Total	<4.0	<4.0	<4.0	-	-
Total Dissolved Solids	Total	900	840	1,300	-	-
Total Suspended Solids	Total	<20	<10	<10		

Notes:
1. Results are preliminary
2. Pond 4 samples were collected 5 feet northwest of overflow pipe approximately 6 inches under the water surface.
3. Discharge criteria and basis for maximum and average values are listed in the Request for Approval of Modification to the Removal Action at the Leviathan Mine Memorandum (MRAM) (U.S. EPA, 2008). As stated in the MRAM, the discharge criteria apply only to effluent from an operating system, and they are not applicable during winter months when access to the site is limited.

Abbreviations
DP - Discharge Pipe
< - Constituents that were not detected are listed as "<" and reporting limit is shown.
J - Results noted with "J" are an estimated value or were less than the reporting limit but greater than or equal to the method detection limit.
mg/L - milligrams per liter
s.u. - standard unit