

STATE OF ALASKA

SEAN PARNELL, GOVERNOR

**DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
CONTAMINATED SITES PROGRAM**

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January 19, 2010

Mr. Mike McCrum
Bureau of Land Management
222 West 7th Avenue #13
Anchorage, AK 99513

Re: *2010 Limited Sampling Event* Report Comments
Red Devil Mine, Red Devil, Alaska

Dear Mr. McCrum:

The Alaska Department of Environmental Conservation (DEC) has received and reviewed the *2010 Limited Sampling Event (LSE) Report* for the Red Devil Mine, prepared for the Bureau of Land Management (BLM) by Ecology and Environment, Inc. (E&E) and dated December 2010. Please find attached comments prepared by Earl Crapps, Marty Brewer, and myself on this report.

In general, we find this report to be of limited usefulness. We stated during discussions with BLM, EPA, and E&E during the development of the work plan as well as in written comments on the draft work plan that the LSE report needed to encompass more than simply a presentation of the data. The sampling results needed to be evaluated with conclusions drawn and recommendations made to steer sampling efforts for the next phase of the Remedial Investigation field work. However, not only did the report contain only a presentation of data, but the presentation itself was incomplete and due to that incompleteness was somewhat misleading. There were several issues which limited the usefulness of the report, including that the data tables were not provided in a manner which was easily referenced or reviewed. Other issues are the lack of discussion of contaminants of concern other than arsenic, antimony, and mercury as well as other analyses performed on the samples such as Toxicity Characteristic Leachate Procedure (TCLP), Synthetic Precipitation Leachate Procedure (SPLP), and Sequential Sequestration Extraction (SSE). The narrative that was provided about these results was brief and without sufficient detail to provide any conclusion. Providing the sample results on the figures was beneficial, however given that antimony, arsenic, and mercury were provided on separate figures, this presentation makes it more difficult to compare concentration trends for all contaminants at the various source areas. Additional general comments about the report are included in the comment tables.

Although the field work described in this report was not conducted under an approved work plan,

a work plan was reviewed and agreed to following E&E's demobilization from Red Devil. At that time, E&E proposed to submit this report as a final document only with comments resolved through a resolution memorandum which would either provide additional information or resolve the comment during the RI work plan or RI report, itself. The rationale for this proposal was so that E&E could focus its efforts on the drafting of the RI work plan rather than fixing this report. At the time, both DEC and EPA agreed to allow only one report. The attached comments are provided so that modifications to this information can be made prior to its use in the RI work plan and RI report as well as to set an expectation for the RI report.

Given the issues with the report noted in this letter and in the attached comment tables, DEC can not approve this report as a site characterization report under 18 AAC 75.335.

If you have any questions, please do not hesitate to contact me at 766-3184.

Sincerely,



Anne Marie Palmieri
Environmental Specialist

Attachments

cc: Matt Wilkening, EPA (via electronic mail)

Alaska Department of Environmental Conservation
Contaminated Sites Program

Marty Brewer - Comments on:

2010 Limited Sampling Event Report Remedial Investigation/Feasibility Study December 10, 2010

Comment No.	Page	Section	Comment / Recommendation
1.	1-1	1.1	Although Red Devil Mine is relatively remote to Anchorage and Aniak, there are nearby villages. Please include these villages and their proximity to the former mine site, including Red Devil village.
2.	1-1	1.1	The LSE FSP did not provide detailed information on sampling techniques to be employed during the 2010 field effort, but merely described the field activities to be conducted.
3.	1-2	1.3	Since the RI/FS Work Plan has not been finalized, what is the purpose of the "memorandum?" All comments, especially regarding data gaps should be addressed in the RI/FS work plan to be approved by the department prior to 2011 field work
4.	2-2	2.1.1	Please include discussion of all COPCs, not just Arsenic, Antimony, and Mercury and a comprehensive summary of all historical site data.
5.	2-4	2.2.1	ADEC considers surface soil 0-2ft bgs. Are additional surface soil samples proposed to reach this depth and further if necessary to determine the vertical depth of contamination?
6.	2-5	2.2.1	Why was only one background soil type sampled for during the 2010 field effort? Are additional background soil samples be collected in 2011? A discussion of how background soil levels will be determined and how site samples shall be compared to them should be included in the RI/FS.
7.	2-5	2.2.1	Please provide the rationale for the selection of the subset of samples to analyze for SSE, As speciation, SPLP, TCLP, SVOCs, DRO, and RRO.
8.	2-6	2.2.3	Text indicates that not all of the proposed Kuskokwim River samples were collected during the 2010 field effort. Are additional river sediment samples proposed for 2011?
9.	2-7	2.2.4	Please specify the analyses per well.
10.	2-10	2.3.3	Please include details of the river sampling (depths, distance from bank)

11.	2-13	2.4.1.4	A complete copy of all field logbooks and forms must be provide in the RI/FS report.
12.	2-14	2.4.1.5	No photographs are provided in the report.
13.	2-16	Table 2-1	Freezing to <-18 C is not acceptable for AK102/103 or SVOCs.
14.	2-19	2.6.1	How was dedicated sampling equipment disposed of?
15.	2-20	2.6.2	What became of the decontamination solution used for cleaning dedicated sampling equipment and personal protective equipment? Were rinsate samples analyzed of this solution before its disposal?
16.	2-27 and 2-28	2.10.1.3 and 2.10.2	Although Red Devil Creek is not listed as an anadromous stream by the Alaska Department of Fish & Game, it is important to note the fish species recently observed there (Dolly Varden, Grayling, Coho Salmon). This is a significant previously unknown or undocumented site issue especially given the fact that they have been consumed by local residents.
17.	2-28	2.10.1.5	Recommend including details from the benthic survey completed in 2010.
18.		Figure 2-7	Please include groundwater contours and flow direction on this figure.
19.	3-2	3.1.2	LCS and LCSD are accuracy DQIs. These should be evaluated, discussed, and data flagged appropriately.
20.	3-2	3.1.6	What is the basis for the 35% RPD flagging criteria? Section 2.7.1.1 states 30% (water) and 50% (soil/sediment) criteria.
21.	3-2	3.1.7	What became of the decontamination water used for durable sampling equipment and personal protective equipment and was it sampled as a rinsate?
22.		Tables	It would have been helpful to provide at least summary data tables in the text.
23.		Chart 4-1, 4-2	Data points do not appear to support the “in general” statements.
24.	4-4	General Comment	Please state how many samples were collected from each area for which summary results are discussed.
25.	4-5	4.2	While the correlation supports the XRF as a field screening tool for identifying tailings and/or areas of concern, only laboratory analytical results will be considered definitive. Remove the statement “and that the XRF data can be considered definitive.”

26.	4-5	4.2	<p>Please provide or direct the reviewer to the field and lab data correlation calculations.</p> <p>Please describe the correlation of laboratory and XRF field screening data in regard to potential bias. For instance, the 3rd bullet states that laboratory mercury concentrations less than 200mg/kg tended to be higher than the corresponding field XRF result which suggests that the field screening procedure is biased low in measuring mercury below 200mg/kg.</p> <p>Considering this low bias, is the XRF an effective field screening technology to adequately characterize the extent of mercury contamination to project screening levels?</p>
27.	4-5 and 4-12	4.2 and 4.3.4	<p>Please clarify whether discrete field screening results were correlated to laboratory results or averages as presented in Table 4-1.</p>
28.	4-9	4.3	<p>Please specify where the fourteen surface soil samples from the Main Processing Area were collected and identify the total mercury sample it corresponds to.</p>
29.	4-9		<p>Please provide laboratory SOP for the SSE extraction and analysis.</p>
30.	4-9	Table	<p>F0 extractant should be the headspace gas for volatile (vapor equilibrium) fraction. Typical compounds would be volatile mercury (Hg⁰). If DI water was used for both F0 and F1, how are the volatile and water soluble fractions determined? Similarly, F6 (HF extractant) is generally considered residual.</p>

31.	4-9	4.3.1	<p>A more in depth discussion of the SSE results and how they may correspond to bioavailability is warranted. Additionally, more recent literature indicates that strongly complexed phases of mercury may be significantly bioavailable. A literature review of Hg SSE and bioavailability should be performed before the data is evaluated and conclusions proposed for approval.</p> <p><u>Environ Sci Technol.</u> 2006 Jun 15;40(12):3794-9. <u>Zhong H, Wang WX.</u></p> <p><i>Metal-solid interactions controlling the bioavailability of mercury from sediments to clams and sipunculans.</i></p> <p>Atmospheric, Marine, and Coastal Environment Program and Department of Biology, The Hong Kong University of Science and Technology (HKUST), Clear Water Bay, Kowloon, Hong Kong.</p> <p>Abstract</p> <p>The bioavailability of sedimentary Hg(II) and methylmercury (MeHg) was quantified by measuring the assimilation efficiency (AE) in the clam <i>Ruditapes philippinarum</i> and the extraction of the gut juices from the sipunculan <i>Sipunculus nudus</i>. Three factors (Hg concentration in sediment, Hg sediment contact time, and organic content of sediments) were modified to examine metal-solid interactions in controlling Hg bioavailability. The Hg AEs in the clams were strongly correlated with the extraction from the sipunculan gut juices for both Hg species. The bioavailability of both Hg(II) and MeHg generally increased with increased sediment Hg concentration but decreased with sediment metal contact time and increasing organic content (except that MeHg was not influenced by organic content). Hg(II) speciation in sediments, quantified by sequential chemical extraction (SCE), was dependent on geochemical conditions and greatly controlled the mobility and bioavailability of Hg(II) in sediments. <u>Most bioavailable Hg(II) originated from the strongly complexed phase (e.g., Hg bound up in Fe/Mn oxide, amorphous organosulfur, or mineral lattice), whereas Hg bound with the organocomplexed phase (Hg humic and Hg₂Cl₂) was not bioavailable.</u> Hg bound with the other geochemical phases (water soluble,</p>
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			HgO, HgSO ₄ , and HgS) contributed very little to the bioavailable Hg due to their low partitionings. Further, the amount of bioavailable Hg was inversely related to the particle reactivity of Hg with the sediments. Detailed analyses of metal-solid interactions provide a better understanding of how Hg in sediments can predict Hg concentration and therefore bioavailability in benthic invertebrates.
32.	4-10	4.3.1	Please provide the sample locations and results for TCLP.
33.	4-12	4.3	Please provide a table with background concentrations and statistics in the text of the RI/FS report. A discussion should be included of how background levels compare to project screening levels and site samples results.
34.		4.5	Sediment results should be compared to ADEC recommended screening levels (See ADEC's 2004 Technical Memorandum - Sediment Quality Guidelines)
35.	5-1	5	What did the 2010 field effort specifically provide to inform the RI/FS?
36.		Figures	Please specify what analyses were performed per each sample location. Please identify results as compared to project screening criteria instead of arbitrary ranges (0-100, 100-500, etc.)
37.		Figures 1-1 thru 1-3	Inclusion of surface contours may be helpful to understand potential migration of contaminants.
38.		Figure 2-2	No sample locations are provided on figure.
39.		Table 4-3	Please include ADEC Table B1 Migration to Groundwater criteria for all COPCs.
40.		Table 4-7	Please include groundwater screening criteria (ADEC's Table C) for all COOCs as appropriate.
41.		App A	Please provide <u>complete</u> laboratory reports and ADEC Laboratory Data Review Checklists as required.
42.		App X	All field logbooks/forms should be included as an appendix to the report.
43.			-end-

REVIEW COMMENTS

PROJECT: BLM Red Devil Mine

DOCUMENT: Limited Field Sampling Report

DATE: 1/5/11

REVIEWER: Anne Marie Palmieri

PHONE: (907) 766-3184

Item No.	Location (page, par., sen.)	COMMENTS
1.	Section 1.0, last sentence	Given that the work plan was submitted after the field work was completed, it is understandable that there were no deviations. However, in the future when the work plan is submitted and approved prior to the field work, a section describing deviations from the work plan should be included in the report.
2.	Section 2.1, last paragraph	For this report, which is really just a "data dump", it is acceptable to reference field-screening procedures from the description in the work plan, however for the RI/FS report, the actual procedures need to be described.
3.	Section 2.1.1, paragraph 1	In the RI/FS report, do not cite the 8-20-10 draft RI/FS work plan. If information is present in that document which needs to be used in a future work plan or report, it should be included in the document rather than having a reference to a non-approved work plan which is going to be revised and resubmitted.
4.	Section 2.2.1, bullets	Bulleted list states how the sample results will be used, however it would be beneficial if there was additional discussion in the narrative as to what the results were and an analysis of how they address each bullet and if additional data is needed during the June 2011 field event.
5.	Page 2-5, para 2	What is the recommendation regarding if additional effort is needed to identify and collect samples of the loess.
6.	Page 2-5, para 3	It would be helpful if the samples that were analyzed for TCLP, SSE, etc. were identified in a small chart and on a figure – especially since the data tables were not included in hard copy format within the report.
7.	Section 2.2.4	What were the water level measurements? Was groundwater flow direction calculated?
8.	Page 2-8, paragraph 1	It would be helpful to have a small chart showing analytes sampled in each well. (similar comment to #6)
9.	Page 2-10, Section 2.3.3	1) How were the samples from the Kuskokwim taken – from standing on the riverbank? What about the deltas? How deep was the water at each sampling location? Sample 10KR02, 10KR03, and 10KR 07 (Fig 4-16) seem to be further into the river than the others. 2) paragraph 4: Where is the information related to the physical characteristics to the samples within this report? What conclusions can be drawn from this information in comparison to analytical results?
10.	Section 2.4.1.4	A copy of the field log book should be included with the report; preferably as a pdf.
11.	Section 2.3.1.5	Photographs need to be included in the report.
12.	Section 2.5	What is the rationale for limiting the notation of the field-screening result to As, Hg, and Sb? All additional metals for which the field-screening results exceeds the respective default cleanup level should be recorded in the field notebook.
13.	Section 2.10.1.2, para 1	Include the common names for the rare and sensitive plant species.

REVIEW COMMENTS**PROJECT:** BLM Red Devil Mine**DOCUMENT:** Limited Field Sampling Report**DATE:** 1/5/11**REVIEWER:** Anne Marie Palmieri**PHONE:** (907) 766-3184

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14.	Figure 2-2	There are no sample locations shown on this figure.
15.	Figure 2-8	Is the Un-marked Drum really located near this seep? Section 2.10.2 text states that it is upstream of the Main Processing Area – this location is not upstream. Confirm location of drum.
16.	Section 3	ADEC guidance states that an ADEC laboratory data quality checklist should be completed for each batch of samples and included with the report. E&E performed a data quality review using a different form which contained the same information so the review is acceptable.
17.	Section 4	1) Paper copies of the sampling results tables need to be included in the report.
18.	Section 4.1.1	Photographs would be helpful here.
19.	Chart 4-1	Are you certain that the labels on these charts are correct? From looking at the data, it would seem that the average concentrations for the blue dots would be lower than the pink dots. Compare to the same type of data set on Chart 4-2 and the averages there. Also, text in section 4.1.1. states that there were fewer instances of red porous rock visible in the samples than not.
20.	Page 4-10, Section 4.3.1	<p>1) Include a discussion about SPLP results.</p> <p>2) Include a discussion about the how the SSE results correspond with the visual observations of red porous rock and mineralized veins.</p> <p>3) It would be helpful to have a discussion about the SSE results where the areas of the samples with mercury vapor or organ-complexed fraction mercury were identified and discussed. These samples should be identified in a small table here and also shown on a figure to determine if any conclusions can be drawn regarding location, potential extent, and future sampling recommendations.</p> <p>4) It would also be beneficial to have more discussion about the TCLP results, specifically identifying the sample locations where the results exceeded the TCLP criteria, potential extent and recommending future sampling for summer 2011.</p> <p>5) There also needs to be a discussion about any other metals that were found to be present exceeding the soil screening levels. The discussion should not be limited to only As, Hg, and Sb. If there aren't any other metals with exceedences, then that needs to be stated.</p> <p>6) There needs to be some conclusions drawn from the results of the arsenic sampling and recommendations made for 2011 sampling.</p>
21.	Section 4.3.2	See Comment 20.
22.	Section 4.3.3	See Comment 20.

REVIEW COMMENTS**PROJECT:** BLM Red Devil Mine**DOCUMENT:** Limited Field Sampling Report**DATE:** 1/5/11**REVIEWER:** Anne Marie Palmieri**PHONE:** (907) 766-3184

Item No.	Location (page, par., sen.)	COMMENTS
23.	Section 4.3.4	1) Include discussion about TCLP and SPLP results. 2) How did the physical conditions of the background samples compare with the samples from the MPA and deltas? 3) Were there sufficient number of samples collected from the Kuskokwim group or will additional samples need to be collected in 2011. 4) Is there a need for additional effort to be expended to identify the loess and to collect samples from that rock type?
24.	Section 4.4	Were any other metals detected or exceed water quality standards? Please discuss.
25.	Section 4.5	1) Sediment concentrations should be compared to the NOAA TELs and PELs and the comparison discussed in this section. 2) There should be further discussion about the SSE results with a comparison to what was found in the surface soil samples. 3) Were other metals found to exceed screening levels? Discuss. 4) Discuss results for methyl mercury and As speciation.
26.	Section 4.5.2	See comment 25.
27.	Section 4.6	1) Pb has been a COC in the past. Were there exceedences? Discuss. 2) Discuss results for other analytes tested. 3) How do these results compare with results from previous sampling events?
28.	All figures	1) What is the basis for the color coding of the results? It seems as if these ranges were not selected on the basis of risk as even the green/less contaminated sample results could be significantly above the soil screening level. The arbitrary ranges selected could lead to misleading conclusions. 2) Why are As, Hg, and Sb separated for sediment, surface water and groundwater? It is understandable that there would be one figure per metal for soil as there are so many samples, however it would be simpler to have one figure for all results for the other medium. Having all results on one page makes it easier to see trends for high/low areas for all COCs.
29.	Figure 4-4	1) It would be helpful to show the samples that failed TCLP on this figure.
30.	Figure 4-13	What is the purpose of this figure? The title states "Sediment and Surface Water Results Arsenic", however not all of the results or sampling locations are shown. All sediment samples and results are shown on Figure 4-13a and surface water on 4-13b. Suggest removing this figure as incomplete, repetitive and non-essential.
31.	Figure 4-13b	1) Correct ug/L label in legend. 2) Again, what is the rationale for the color-coding?
32.	Figures 4-14 and 4-15	See comment 30.

REVIEW COMMENTS**PROJECT:** BLM Red Devil Mine**DOCUMENT:** Limited Field Sampling Report**DATE:** 1/5/11**REVIEWER:** Anne Marie Palmieri**PHONE:** (907) 766-3184

Item No.	Location (page, par., sen.)	COMMENTS
33.	Figure 4-15a and 4-18	Include the results for methyl-mercury on these figures.
34.	Section 5	It would be beneficial to state some conclusions as to what the data tells you for planning the June 2011 sampling event.
35.	Table 4-3 (east and west)	1) Soil sample results need to be screened against the default most stringent exposure pathway concentration in 18 AAC 75.341, Tables B1 and B2 until a site-specific cleanup level is determined by the Risk Assessment. Include migration to groundwater levels in the table and reevaluate to determine if there are additional exceedences. (sample 10MP48SS for lead at 3090 mg/kg > 400)
36.	Table 4-7	1) Make sure that all text in blacked out boxes is white so that it is visible.
37.	Table 4-6	1) Appropriate screening levels for sediment are the NOAA TELs and PELs. Screening levels for soil are not acceptable for comparison to sediment samples. Revise and reevaluate. 2) Hg SSE tab: correct percent values.
38.		--end--