CDM Smith

Memorandum

To: *Mike Cirian, USEPA*

From: *Sean Coan, P.G.; Curt Coover, P.G.; Erin Formanek; Teddy Marcum; Damon Repine, CSP*

Date: *October 5, 2015*

Subject: *Draft Comments – Remedial Investigation/Feasibility Study Work Plan; Phase 1 Site Characterization Sampling and Analysis Plan, Former Primary Aluminum Reduction Facility, Columbia Falls, Montana*

CDM Federal Programs Corporation (CDM Smith) at the request of the United States Environmental Protection Agency (USEPA), has reviewed the *Remedial Investigation/Feasibility Study (RI/FS) Work Plan* (RI/FS Work Plan) and the *Phase 1 Site Characterization Sampling and Analysis Plan* (SAP) prepared by Roux Associates, Inc. (Roux) on behalf of the Columbia Falls Aluminum Company LLC (CFAC) for the Former Primary Aluminum Reduction Facility (Site), located in Columbia Falls, Montana. Comments are organized in General and Specific Comments. Specific Comments are organized by corresponding section(s) of the document(s).

General Comments

1) Geophysical Survey – This section of the SAP lacks sufficient detail to determine appropriateness of the proposed geophysical surveys. This section needs further development including a list of source areas with the proposed survey types as well as source areas where no geophysical surveys are proposed and the reasoning for conducting a survey or not at each source area.

2) Background Soil Sampling – Although the Site Assessment report included background soil sampling results, these are insufficient for a remedial investigation. Background soil samples should be collected from surface and subsurface soils from at least eight additional locations thought to be un-impacted by solid or liquid waste. When selecting locations, areas potentially impacted by aerial emissions from the site should be excluded.

3) Impacts of Aerial Emissions – According to air permits for the facility, allowable emissions included total fluoride and polycyclic organic particulate material. The background soil sampling task should consider and include these contaminants of potential concern (COPCs). If locations thought to be background have elevated or outlier concentrations of these COPCs, additional soil sampling should be conducted to determine the extent of soil impacts from fugitive emissions.

4) Existing Well Logs – Please include an appendix containing logs for all site wells and soil borings with identifiers, a table of location coordinates and well completion intervals, and a map with all wells/borings posted.

5) Main Plant Area – This portion of the facility has significant potential to be a source area; however investigation is limited to dry wells. A subsurface investigation should be conducted within the building footprint in areas with significant potential for discharge or release of site contaminants to soil and ground water.

6) Investigation Derived Waste – A plan for disposition of investigation derived waste (IDW) must be included in both the RI/FS Work Plan and the SAP.

7) Evaluation of potential soil boring locations is identified in RI/FS Work Plan Section 5.2.2, but is not carried into the SAP.

8) The sections in the work plan describing risk assessment approaches (Sections 6.1, 6.2, and 6.3) are very general and brief. Although the RI/FS Work Plan specifies that Baseline Human Health Risk Assessment (BHHRA) and Ecological Risk Assessment (ERA) work plans are to be prepared after completion of the Phase I Site Investigation, sufficient detail regarding the Conceptual Site Model (CSM) are not provided in these sections to support the collection of data for risk assessment needs or to fulfill the risk assessment objectives identified in the Executive Summary.

9) The data quality objectives (DQOs) in the SAP should identify the Remedial Investigation (RI) areas (e.g., source area and operational area) that will be investigated. The areas identified should be consistent with those identified in the RI/FS Work Plan. The RI/FS Work Plan lists six RI areas and does not separate source area soil from operational area soil.

10) Any revisions requested in the SAP should also be incorporated into the RI/FS Work Plan as applicable and vice versa.

Specific Comments

1) RI/FS Work Plan and Sampling and Analysis Plan – Change "chemicals of potential concern" to "contaminants of potential concern" throughout the documents.

2) RI/FS Work Plan and Sampling and Analysis Plan – Add Target Compound List (TCL) to the list of acronyms and spell it out the first time it is used in each document. Change the headings in SAP Table 7 to use TCL for organic compounds.

3) RI/FS Work Plan Section 2.0, page 3 - Include a section that describes land use in the vicinity of the Site. For example: what is the distance to the nearest residence and nearest groundwater wells used for drinking water; are onsite wells used for potable water; is the area near the site used for recreational purposes such as fishing or hunting; etc.

4) RI/FS Work Plan Section 2.6 – Add Montana Species of Special Concern with potential to be at the site. It is expected that this will include western toad, westslope cutthroat trout, and bull trout.

5) RI/FS Work Plan Section 2.8, pages 16 to 23 – Please ensure that, when using historic regulatory screening and action levels that these levels are qualified by the date they were established. For example, on page 23, the 3rd bullet in section 2.8.14 states that the USEPA Tapwater Regional Screening Level (RSL) for cyanide is 1.5 µg/L. In the June 2015 RSL table the Tapwater RSL for cyanide is listed as 0.15 micrograms per liter (µg/L). If the Tapwater RSL that is quoted in the text (1.5 µg/L) was from an earlier version of the RSLs, please state so.

6) RI/FS Work Plan Section 2.8.1, page 16, 2nd paragraph, 2nd sentence – Change reported units for cyanide and fluoride in soil samples from milligrams per liter (mg/L) to milligrams per kilogram (mg/kg).

7) RI/FS Work Plan Section 2.8.14, page 22 - Given that this investigation is very recent, it is suggested that more detail about the investigation be provided.

8) RI/FS Work Plan Section 2.8.15, page 23 - Please provide more details about the residential water well sampling. How many wells were sampled? It appears that these data may be described in more detail in Section 3.1.3; if this is the case please reference this section. Please also provide more detail about the Whole Effluent Toxicity Test. What is the relationship of the test between the Seep and the Flathead River? Also revise the sentence describing the results ("The ground water discharging to the Flathead River and the Flathead River passed the WET tests indicating no acute toxicity").

9) RI/FS Work Plan Section 3.1.3, page 30 -The statement that the site-related COPCs are not impacting ground water quality in the residential area is not substantiated.

10) RI/FS Work Plan Section 3.1.4, page 31 - Identify what chemicals exceeded Montana Aquatic Life Acute and Chronic criteria in surface water from the percolation ponds. Clarify the statement: "Five of the samples were collected within surface waters that may be potential receptors (four from the Flathead River and one from Cedar Creek)."

11) RI/FS Work Plan Section 3.1.5, page 32 - The RI/FS Work Plan should discuss if pesticides were used on the Site and if pesticides detected in sediment could be Site-related.

12) RI/FS Work Plan Section 3.3.2.2, page 50 – Add sediment porewater to the section of the CSM that addresses surface water and sediments.

13) RI/FS Work Plan Section 3.4.2 – Add a subsection describing in situ treatment of ground water as a remedial alternative for the FS.

14) RI/FS Work Plan Section 3.6.1, page 56 - RSLs do not provide screening values for soil vapor concentrations. Please provide an appropriate (applicable, relevant and appropriate requirement (ARAR) or to-be-considered (TBC) for soil vapor.

15) RI/FS Work Plan Section 3.6.2 – Please ensure that any ARARs or TBCs pertaining to underground injection of water are addressed.

16) RI/FS Work Plan Section 4.0, page 59 - The second paragraph states that the DQOs are presented in the quality assurance project plan (QAPP). They are presented in the SAP with numerous revisions needed. If they are also presented in the QAPP (this document was not available for review), changes required in the SAP should also be reflected in the QAPP.

17) RI/FS Work Plan Section 4.1, page 59 - This section identifies data needs for the RI. Although implied, the specific need to obtain data adequate for risk assessment purposes is not acknowledged. This section also identifies that one of the goals of the RI is to identify potentially complete exposure pathways (considering current and also potential future land use) and evaluate current and future human health and ecological risks posed by COPCs present at the Site. The RI/FS Work Plan does not sufficiently identify procedures to fulfill this goal in the following sections.

18) RI/FS Work Plan Section 4.1, page 60 and SAP Section 6.5.3, page 33 – A data need for landfills includes a topographic survey; however, the SAP does not include a task for conducting a survey. Please add a section to the SAP to collect the needed data.

19) RI/FS Work Plan Section 4.1, page 61 and SAP Section 6.5.3, page 33 – A data need for landfills is to characterize the physical characteristics of the existing cap; however, the SAP does not include a task for collecting these data. Please add a section to the SAP to collect the needed data.

20) RI/FS Work Plan Section 4.1, page 61 and SAP Section 6.5.3, page 34 – A data need for Site hydrogeology includes hydraulic properties of the various hydrogeologic units at the Site; however, the SAP does not include any activities to gather these data. Please inventory existing data and develop a section in the SAP to collect additional data to fulfill the data needs for the RI.

21) RI/FS Work Plan Section 4.1, page 62 and SAP Section 6.5.3, page 34 – Please change "…to confirm the presence, if any, of CPOCs" to "…determine the concentrations of COPCs".

22) RI/FS Work Plan Section 4.1, page 63 and SAP Section 6.5.3, page 35 – A data need for ground water quality is geochemical data for a fate and transport evaluation. The specific data needed are not identified in the RI/FS Work Plan or SAP. Please add a section to the SAP to identify the specific data needs and, if appropriate, add a section to collect the needed data.

23) RI/FS Work Plan Section 4.1, page 62 – Add sediment porewater to the section identifying data needs for surface water and sediments.

24) RI/FS Work Plan Section 4.1, page 62 –A data need for surface water quality is to evaluate seasonal variations. The RI/FS Work Plan and SAP lack specificity on obtaining the needed data. Please add text to SAP section 4.9 detailing the sampling frequency to collect the needed data.

25) RI/FS Work Plan Section 4.2, page 64 - This section states the results of the Phase I Site Characterization will be used to prepare the Risk Assessment Work Plan. Risk assessment data needs should be considered as one of the primary goals of the Phase I Site Characterization so that any additional effort required in the planned Phase II investigation is minimal. Data currently exists to develop data sampling plans sufficient for risk assessment needs. Goals of the Phase II Investigation are not clearly defined, but should include provisions for any data gaps identified in the Phase I investigation. This section also states that "At the conclusion of the Phase 2 Risk Assessment, the approach to analyze the data and draw conclusions will be based upon accepted Risk Assessment methodology to be specified in the Risk Assessment Work Plan in accordance with applicable USEPA guidance." This statement is vague and does not provide substantial information. Provide major USEPA and Montana Department of Environmental Quality (MDEQ) risk assessment guidance sources or reference Section 6.0. Also, what is the Phase 2 Risk Assessment?

26) RI/FS Work Plan Section 5.2.4.1, page 70 and SAP Section 4.5, page 11 – Please describe how the soil gas sampling point will be sealed. Also, to test for potential short-circuiting of the surface seal, a tracer like helium gas should be used.

27) RI/FS Work Plan Section 5.3.1, page 72 – Collection and analysis of landfill cap soil samples are indicated and this section states that "The details regarding each of the above elements are provided in the SAP"; however, there is no accompanying section in the SAP.

28) RI/FS Work Plan Section 5.3.2, page 73 and SAP Section 4.6.1, page 14: At deep boring or well locations where shallow contamination is known or evident based on field observations and analyses, the boring shall be cased or otherwise sealed to prevent cross-contamination into the deeper water-bearing zones. Make consistent with SAP section 4.7, page 18.

29) RI/FS Work Plan Section 5.3.2, page 73 and SAP Section 4.6.1, page 14 - If contamination is evident in the 10 to 12-foot interval soil sample, drilling and sampling shall proceed until contamination is no longer evident in the soil samples, until ground water is encountered, or the limit of the equipment has been reached.

30) RI/FS Work Plan Section 5.3.3, page 74 and SAP section 4.10, page 22 – At least three additional dry wells should be evaluated by drilling and sampling via a soil boring.

31) RI/FS Work Plan Section 5.4, page 75 – In addition to the investigation proposed, a less intensive soil sampling strategy should be developed for other areas of the facility where

operations may have occurred, but the likelihood of spills and disposal operations are lower. This generally includes most unforested areas at the site.

32) RI/FS Work Plan Section 5.5 – Please add a section describing sampling of sediment porewater.

33) RI/FS Work Plan Section 5.5.2, page 77 and SAP Section 4.8, page 19 – Selected wells should be fitted with pressure transducers and data loggers to document the seasonal fluctuations of ground water levels.

34) RI/FS Work Plan Section 5.5.2, page 77 and SAP Section 4.8, pages 18 and 19 – The RI/FS Work Plan indicates that wells will be sampled quarterly for one year while the SAP omits this information. Please clarify in the SAP that ground water samples will be collected quarterly for a year. Additionally, site production wells should be sampled where possible to obtain data from the deeper water-bearing units.

35) RI/FS Work Plan Section 5.5.2, page 78 – Nutrients should be included in the analyte list for ground water.

36) RI/FS Work Plan Section 5.5.3, page 80 and SAP Section 4.9, page 20 – Whenever possible, discharge should also be measured. This includes Cedar Creek, Cedar Creek overflow and any other flowing water. For the Flathead River, the provisional instantaneous discharge measurement from USGS Station 12363000 should be recorded. The on-site staff gages should be surveyed and correlated to USGS station 12363000.

37) RI/FS Work Plan Section 5.5.3, page 80, last paragraph and SAP Section 4.9, page 21 – Change "Prior to sample…" to "As a part of sample…" and change "screened" to "analyzed."

38) RI/FS Work Plan, Section 5.5.4, page 80 – Gravel and larger sized grains shall be removed from the sample prior to analysis.

39) RI/FS Work Plan Section 6.0, page 81 - This section does not provide sufficient detail regarding the approach that will be used to evaluate potential threats to human health and the environment. Because the Phase I investigation will provide substantial data that will be used in the risk assessments it is vital to develop investigation objectives that will support risk assessment. It would therefore be beneficial to supplement this section with additional discussion of the preliminary site conceptual model discussed in Section 3.3. This section should be revised to clarify what steps will be provided in the BHHRA Work Plan versus what steps will be provided in the BHHRA. This section should provide a general description of how and what criteria will be used to identity COPCs, describe current and potential future land uses, identify preliminary exposure areas and media of concern, and potential exposure pathways of concern. Because the actual methodology for the BHHRA is not described, there is concern for how the data from the Phase I Site Investigation will be interpreted to select COPCs, determine exposure areas, and estimate exposure point concentrations.

40) RI/FS Work Plan Section 6.1, page 81 - This section provides a general list of guidance that will be used in the BHHRA .The list of Risk Assessment Guidance for Superfund (RAGS) guidance should also include RAGS Part F. The rationale used for the list of additional sources listed should be provided.

41) RI/FS Work Plan Section 6.1, page 82, 2nd paragraph - Revise to clarify how existing data and data from the Phase I Site Characterization will be combined and used in the BHHRA. For example the paragraph states "The BHHRA will include a summary and evaluation of existing data and selection of COPCs for each media. The evaluation of existing data will also identify additional data required to complete the BHHRA so that any data needed can be collected as part of the Phase 2 Site Characterization program." Because the BHHRA Work Plan will be prepared after the Phase I Site Investigation it appears that an initial data evaluation is required in the BHHRA Work Plan to identify any additional data needs.

42) RI/FS Work Plan Section 6.1, page 82, 3rd paragraph - Revise to differentiate tasks that will be completed in the BHHRA Work Plan versus those that will be completed in the BHHRA. As described, the BHHRA Work Plan essentially comprises the majority of the steps of the BHHRA including: exposure analysis, data evaluation, selection of COPCs, toxicity assessment, and a description of the methodology for risk characterization and uncertainty analysis. Only the calculation of risks will not be included. Therefore, it is essential to provide data adequate for risk assessment in the Phase I Investigation. Comments were made on the SAP that are relevant to data needs for the BHHRA. In order to provide all of the information identified in this section (e.g. selection of COPCs) the dataset that will be used should be as complete as possible to evaluate potential exposures.

43) RI/FS Work Plan Section 6.2, page 82 - The description of the ERA approach provided in this is section is very basic and does not provide details about specific tasks that are necessary for the ERA such as ecological characterization, habitat characterization, and identification of threatened and endangered species. However, Appendix B provides a very detailed description of the Screening Level Ecological Risk Assessment (SLERA) process and should be summarized in this section.

44) RI/FS Work Plan Section 6.3, page 83 - This section identifies a Baseline Risk Assessment Work Plan (BRAWP) which seems to be a different document from the BHHRA Work Plan and the ERA described previously. Does this mean that the BHHRA Work Plan and the Baseline Ecological Risk Assessment (BERA) Work Plan (if warranted) will be produced in one document?

45) RI/FS Work Plan Section 8.1.2, page 88 - At a minimum, it is expected that the datasheets will document the unique sample identifier assigned, provide information on whether the sample is representative of a field sample or a field-based quality control (QC) sample (e.g., field blank, field duplicate), provide information regarding the sample media, sample date, sample location, sample global positioning system (GPS) coordinates, associated logbook number, and sampling

team members for every sample (i.e., all samples will have a datasheet). All datasheets must be entered into electronic format. Field sample information is critical to any site database and this is where that information is derived. Perhaps it is true that not all information will be entered, but it is expected that at least some information for each sample will be entered into an electronic format.

46) RI/FS Work Plan Section 8.1.3, page 88 - Sample identification numbers must also be included on field datasheets. Comments were made on the SAP about the sample naming nomenclature; please refer to those comments.

47) RI/FS Work Plan Section 9.7, page 91, 6th bullet – The bullet states that the RI Report will include a contaminant fate and transport evaluation. Please add a section to the RI/FS Work Plan describing the methodology that will be used to evaluate fate and transport of COPCs.

48) RI/FS Work Plan, Table 1 – The longitude for well W1 – PW7 is missing. Please revise the table to include this value.

49) RI/FS Work Plan Figure 10 - This preliminary CSM should be refined per the following:

- The CSM should distinguish between complete, incomplete, and potentially complete exposure pathways.
- The CSM does not distinguish between current and future human receptors and potentially complete exposure pathways. Future land uses should be identified to the extent possible. The community of Columbia Falls has expressed an interest in the redevelopment of the site and the RI should identify these possible future uses (e.g. future recreational uses).
- Onsite groundwater wells could be used as a drinking water source for onsite workers; therefore, this pathway should be identified as potentially complete.
- The CSM should include possible food chain exposures pathways for humans. Consumption of Site-impacted fish is a potentially complete exposure pathway since the river near the site is used for fishing. Is consumption of site-impacted game animals a possibility?
- Is ground water used for livestock watering or irrigation for crop or gardens? These may be additional exposure pathways.
- The CSM should include possible food chain exposures pathways for ecological receptors. Consumption of site-impacted plants and prey are potentially complete exposure pathways.
- The SAP describes a soil gas survey. Is there a potential for onsite soil vapor intrusion which should be included in the CSM?
- Inhalation is identified as a complete exposure pathway for residents of Columbia Falls. Clarify if this is inhalation that may occur during domestic use of groundwater (e.g.

showering) or if this is vapor intrusion. It was not clear in the RI/FS Work Plan if volatile organic compounds (VOCs) may be Site-related contaminants of concern.

- It may be appropriate to break soil exposure pathways into surface and subsurface soil exposures.
- Add permitted discharges to the Source box described as Plant Drainage System.

50) SAP Section 3, page 5: Sediment and sediment porewater should be added to the second bullet outlining the media types for which nature and extent of COPCs will be determined. Having data for these media types is useful in evaluating risks to benthic invertebrates.

51) SAP Section 4.1, page 7 - Identify the risk-based screening levels that are to be used to identify areas for further investigation. Screening levels are identified on tables and should be referenced here. This section states that soil gas surveys will be performed and should reference Section 4.5 which provides more detail on where the soil gas surveys will be conducted. Neither the SAP nor the RI/FS Work Plan provide adequate discussion of suspected sources of VOC contamination and what the suspected contaminants are. The RI/FS Work Plan does not develop inhalation exposure pathways associated with volatiles although historical disposal of solvents in landfills is mentioned; however, the solvents disposed of were not identified. The potential for VOC contamination should be incorporated into the CSM and Section 6.0 of the RI/FS Work Plan.

52) SAP Section 4.1, page 8 - Identify the soil intervals to be investigated in the incremental sampling approach. There is not a Section 4.4.2 in the SAP: please provide the correct reference. Additionally, please provide the EPA reference for the incremental sampling approach methodology.

53) SAP Section 4.2, page 8 – Please revise the 3rd bullet to state that soil gas will be sampled passively. Also, add sediment, sediment porewater, and landfill gas to the bullet list and section.

54) SAP Section 4.3, page 9 - The bullet list includes identification of habitat areas for further evaluation in the SLERA. Please describe how this will be performed and if appropriate specialists (e.g. biologist) will identify these areas.

55) SAP Section 4.6.1 Source Area Soil Investigation, page 14 - This section states that soil samples from unpaved areas for laboratory analysis will be collected from the top two inches of soil, from 0.5 to 2 feet below ground surface and from 10 to 12 feet below ground surface. These soil intervals may not be as useful for risk assessment purposes as the depth interval from 2 to 5 inches below ground surface. Also these intervals may not be sufficient for the determination of the nature and extent of contamination. Please describe how the indicated sampling depths will be useful for risk assessment and to determine the nature and extent of contamination.

56) SAP Section 4.6.1, page 15 – Please describe how x-ray diffraction (XRF) data will be used.

57) SAP Section 4.6.1, page 16 - Borings must be abandoned using grout or bentonite chips in accordance with Roux SOP 10.3.

58) Section 4.6.2, page 16 - The incremental sampling approach is not clearly defined and does not appear to consider risk assessment needs in the decision unit grid cell sizes. Decision units for incremental sampling have not considered ecological receptors and potential home ranges for receptors with small home ranges. Please discuss whether the areas where incremental sampling will be conducted provide little habitat for ecological receptors.

59) SAP Section 4.6.2, page 17 – Please address why the 2 to 5 inch soil interval is not included in the soil sampling intervals. In Table 1, soil intervals are listed as 0 to 0.5 feet and 0.5 to 2 feet below ground surface. Also, please be specific about the number of soil borings that will be completed in the operational area or give an estimate.

60) SAP Section 4.7, page 17 – Well screens should be shorter (e.g., 10 feet) unless there is a documented need for long screens.

61) SAP Section 4.7, page 18 –Monitoring wells should be fitted with an exterior lockable metal cover. It is necessary only to lock the exterior cover.

62) SAP Section 4.7, page 19 – Well development should proceed until the discharge water meets a field turbidity value to 10 formazin nephelometric units/nephelometric turbidity units (FNU/NTU) or less or until the field turbidity does not improve for a period of two hours during active development.

63) SAP Section 4.9, page 20 – Add surface water sampling locations where Cedar Creek and Cedar Creek overflow exit the site. Sediment porewater sampling should be added to this section. Also, please identify the location(s) of the seep(s).

64) SAP Section 4.9, page 21 - The importance of sampling in the wet season is recognized, but sampling in the dry season also has utility (provides information for seasonal fluctuation in concentrations), provides additional information on ground water-surface water interaction under dry conditions to inform actual seasonal influence, etc.). Please include sampling in the dry season in this phase of sampling.

65) SAP Section 4.9, page 22 - Please clarify what is meant by "Sediment samples will be collected from the same locations as surface water samples to evaluate within source areas and groundwater receptors".

66) SAP Section 4.10, page 22 - Because so many types of samples are being collected it is recommended that sample types be defined so that database users can easily distinguish between samples that may be used in the risk assessment and those that are more useful for determination of the nature and extent of contamination. For example, sediment samples that are collected in a drain must be clearly identified.

67) SAP Section 5.1, page 23 - Add a SOP for sampling of sediment porewater, the collection of GPS information, and the handling of IDW (in the event disposable equipment is used).

68) SAP Section 5.2, page 24 - Add "PW" (porewater) as a sample media type. Also, the sample media type seems redundant with the information in the Sampling Location Type. Please clarify what is to be gained by including this. Frequently in data analysis, samples are retrieved by sample type. Please describe how a user will be able to differentiate between these pieces of information (e.g., how will a sediment sample from a drain or creek be differentiated without separating the dataset by sample location?).

69) SAP Section 5.2, page 24, bullet 3 – Existing monitoring wells should retain their historically used identification.

70) SAP Section 5.2 Sample Designation Procedures, page 25 - It is not recommended to use "/" in creating sample designations. Special characters are often problematic when used in queries and other database functions. It is suggest that the first example be revised to be "CFSB-001-1012" or "CFSB-001-10-12". This revision reflects the comment above and the removal of "/". Furthermore, the SAP should provide the unique identifiers that will be used for trip blanks and field duplicates.

71) SAP Section 5.2, page 25, bullet 5 – Please specify that the depth increment should be in feet.

72) SAP Section 6.4, page 30 - The last paragraph needs to include all media types that will be sampled (e.g. sediment and sediment porewater).

73) SAP Section 6.5.1, page 31 - This section needs to explicitly state that data will be used for risk assessment purposes. Please include the following statement: "It is necessary to understand the types, extent, and concentrations of the COPCs that have resulted from former Site operations for the adequate evaluation of current and future human health and ecological risks".

74) SAP Section 6.5.1, page 31, 2nd paragraph – This paragraph in the section should be moved as it does not function in the definition of the problem, but mentions the RI/FS Work Plan and CSM.

75) SAP Section 6.5.2, page 32 - Decision questions/estimation questions and statements need to be added that will adequately achieve the goals of the study. See below for an example:

- Decision Question 1: Do concentrations in Site surface soil, subsurface soil, surface water, sediment porewater, sediment, and ground water exceed project screening levels?
- Statement: Determine if concentrations in Site surface soil, subsurface soil, surface water, sediment porewater, sediment, and ground water are above screening levels and should be identified as COPCs.

76) SAP Section 6.5.3, page 32 -This section should provide an overview of previous data usability and identify data gaps. Reorganization of this section is recommended so that text can be

presented to concisely address the decision questions and estimation questions that are yet to be developed as noted in the comment above. In addition to measured concentration data, evaluation of risks requires information on exposure parameters (e.g., exposure frequency and duration, ingestion rates) for human health risk as well as established toxicity values to quantify potential human health and ecological risks. Please add text to the section to include this information.

77) SAP Section 6.5.4, page 36 - Information regarding reference sampling locations should be included for each media type in the Spatial Bounds section. For example, "Reference sampling locations will be identified such that Site-related impacts are not expected to occur in the reference locations. In particular, for streams, reference locations will be identified upstream of the Site within the same stream. For terrestrial media, reference locations will be selected up-gradient of the Site in areas with similar soil characteristics (soil type, grain size, pH, etc.) and plant cover. As noted, it is expected that contaminant concentrations in surface water, sediment, and sediment porewater may also differ as a function of season. Similar to ground water, ideally, samples would be collected at multiple points throughout the year to allow for the calculation of year-round exposure estimates and provide information on the range of expected contaminant concentrations. However, if only one season can be sampled, surface water, sediment, and sediment porewater sampling activities should be conducted during the late spring, when groundwater levels are highest (maximizing the potential for the interaction of these media with ground water) and when surface run-off is expected to be greatest." The text should be revised to reflect this if only one sampling event is desired during this phase. Decision units and sampling units for each media type for Site and reference sampling should be explicitly described in this section.

78) SAP Section 6.5.5, page 37- Because data are to be used for risk assessment purposes, it is inappropriate to delay presentation of the analytical approach relative to risk assessment until later work plans are developed. The data collected as part of this phase should be collected and analyzed such that they are appropriate for use in risk assessment. This is an objective of this investigation as detailed on page 32. The text must be revised to present the screening levels for human health and ecological risk assessment and the sources and hierarchy used to derive these screening levels. Tables 7-10 present screening levels, but it appears that the sources considered may be incomplete or may be obsolete. Consensus on sources to be used in screening should be reached and revised values presented. Specific decision/estimation problem statements should be included for each question that is yet to be developed. For example, "If the maximum analyte concentration in Site surface soil, subsurface soil, surface water, sediment porewater, sediment, and ground water exceed their respective project screening levels, then the analyte will be retained as a COPC and evaluated further in the human and ecological risk assessment, otherwise the analyte will not be retained as a COPC". Define the detection limits that will be required to determine sample concentrations at or below the action/screening levels.

79) SAP Section 6.5.6, page 38 - This section is greatly lacking in detail and must be reorganized. The section should contain the following elements:

- Quality Assurance/Quality Control - This section should detail or refer the reader to another section in the document were the quality assurance/quality control (QA/QC) measures that will be implemented during the investigation. These measures should minimize variability, mitigate the potential for false positive and/or false negative error, and increase accuracy and defensibility of the collected data. It should contain a description of the laboratory QC samples that will be collected and analyzed, a description of the field quality assurance processes and procedures including any special training requirements for field personnel, and a description of the field quality control samples that will be collected. It is recognized that data quality indicators have been presented, care should be taken to ensure the criteria have been specified relative to the performance needs of the investigation (e.g., the necessary detection limits).

- Decision Error Limits and Uncertainty Evaluation – This section should present the tolerable limits on decision errors and/or the level of uncertainty associated with the data set being generated and/or evaluated, which are used to establish performance goals for the data collection design. Decision error limits and/or uncertainty expression (e.g., standard error, confidence interval/limit, tolerance interval/limit, prediction interval/limit), along with the methodology used to establish and evaluate those values should be presented for each decision question.

  See below for an example of this presentation:

- For Decision Question #1 (where the maximum concentration is compared to project screening levels), the null and alternative hypotheses are as follows:

  - H0: The maximum analyte concentration in Site surface soil, subsurface soil, surface water, sediment porewater, sediment, and ground water is greater than or equal to the screening level for that medium; the analyte is a COPC and retained for further evaluation in the risk assessment for that medium.

  - HA: The maximum analyte concentration in Site surface soil, subsurface soil, surface water, sediment porewater, sediment, and ground water is less than the screening level for that medium; the analyte is not a COPC and not retained for further evaluation in the risk assessment for that medium.

A Type I error is the more severe decision error (i.e., an analyte would be dismissed as a COPC when it could be of potential risk); therefore, a small α is desirable. A Type II error has limited consequences, i.e., an analyte would simply be retained for further evaluation in the risk assessment, but it would not result in unacceptable risks if it were not a true COPC. When selecting COPCs, the probability of a Type I error should not exceed 5% (i.e., α is set equal to

0.05) and the probability of a Type II error should not exceed 20% (i.e., β is set equal to 0.2) when the true maximum concentration is within ½ of the project screening level.

80) SAP Section 6.5.7, page 42 -This section, at a minimum, must present an overview of the sampling design and provide detail if the investigation will be performed iteratively.

81) SAP Section 6.7.2, page 45 -At a minimum, it is expected that the datasheets will document the unique sample identifier assigned, provide information on whether the sample is representative of a field sample or a field-based QC sample (e.g., field blank, field duplicate), provide information regarding the sample media, sample date, sample location, sample GPS coordinates, associated logbook number, and sampling team members for every sample (i.e., all samples will have a datasheet). It is expected that all datasheets will be entered into electronic format. Field sample information is critical to any site database and this is where that information is derived. Perhaps it is true that not all information will be entered, but it is expected that at least some information for each sample will be entered into an electronic format.

82) SAP Section 7, page 46 - Add a photo documentation section to describe how photos will be collected and how the pertinent information will be maintained in project files. Add an SOP regarding photo documentation to Section 5.1.

83) SAP Section 7.3.2.2, page 47, 2nd paragraph, 5th sentence - Remove "In general," from the sentence: "~~In general,~~ Samples will be shipped or transported with sufficient time to meet all analytical holding standards".

84) SAP Section 7.5.1.1, page 52 - The text as written provides a description of a field split, not a field duplicate. Please revise the to include the following while retaining information regarding frequency:

- A field duplicate is a field sample that is collected at the same place and time as an original field sample. However, because of potential variation in field duplicate samples (even those from similar locations, especially for media such as soil, surface water, sediment, etc.), it is not appropriate to assume that field duplicate pairs must necessarily have the same concentration values. Rather, field duplicates help to evaluate variability due to small-scale media heterogeneity, along with analytical precision.

85) SAP Section 7.5.1.3, page 52 - The text as written provides a description of an equipment blank, not a true field blank. The text should be revised to include the following while retaining information regarding frequency:

- A field blank is a sample of the same medium as field samples, but which does not contain any contaminant. Field blanks are normally collected for air and water samples, but not for soil or sediment. A field blank for air shall be prepared by removing the sampling cassette from the box, opening the cassette to the air in the area where the investigative

samples will be taken, then closing the cassette and packaging for shipment and analysis. Field blanks for air will be collected at a rate of 1 per day that air sampling is occurring. A field blank for water shall be prepared by placing an appropriate volume of analyte-free reagent water (e.g., ASTM Type II) into a sample collection container. Field blanks for water will be collected at a rate of at least 10% (1 field blank per 10 field samples, or 1 per sample batch, whichever is greater).

The frequency of field blank collection should be one per day per media type. A separate heading for "Equipment Blanks" should be added to the text using the existing text for field blanks.

86) SAP Section 7.5.2.4, page 55 - The content from this section should be moved to Section 7.5.2.

87) SAP Section 7.9, page 58 – Please add use of meteorological data to the section to evaluate the potential impacts of precipitation events.

88) SAP Section 7.10, page 59 - Add that manual field measurements will also be recorded on field datasheets.

89) SAP Section 7.10, page 61 -Ensure that the list of media types is complete in the first bullet.

90) SAP Section 8.1, page 62 - Revise the text to include internal auditing of sampling for all media types to ensure that sampling procedures are being followed for all types of sample collection.

91) SAP Table 1 – There is a column labeled AQ General Chemistry 300, but it is not clear what this includes. Is this the same as the Anion group in Tables 8 and 9?

92) SAP Table 5 – It appears that the formatting has cut off some of the entries. Please reformat such that all entries are fully readable.

Attachments: EPA Region 8 QA Document Review Crosswalk, CFAC Phase 1 Site Characterization Sampling and Analysis Plan