United States Department of the Interior

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April 6, 2009

In Reply Refer To:
1703 (2064) AA-081686

Memorandum

To: FOR RECORD

From: Larry Beck
Environmental Protection Specialist

Subject: Red Devil Mine Site Meeting Notes

On February 18, 2009 a meeting was conducted at the BLM Anchorage Field Office to discuss the "Data Gaps" listed in the February 1, 2008 letter from the Alaska Department of Environmental Conservation to BLM concerning the Red Devil Mine Site. The purpose of this meeting was to formally discuss each data gap, come to consensus on which items are resolved, and which items will be addressed in the Remedial Investigation / Feasibility Study to be initiated by BLM during FY-09.

Participating in the meeting were Larry Beck, BLM Project Manager; Brent Lewis, BLM National Operations Center; and Anne Marie Palmieri, ADEC Red Devil Mine Project Manager.

Attached are the meeting notes. Each data gap, extracted from the 2008 letter, is listed first. BLM comments provided to/discussed with ADEC on various dates during the period between receipt of the letter and the 2/18/09 meeting follow each data gap. Those comments are shown in blue and shades of green font indicating date of comment. Initials of the comment author are shown at the top of the first page next to the comment date. Results of the meeting follow in maroon color font. For some of the data gaps, information provided by BLM resolved the issues and will not be further pursued (marked "Withdrawn by ADEC"). Data gaps not resolved by available information are to be addressed in during the RI/FS process.

Attachment: 2/18/09 Meeting Notes

BLM Red Devil Mine
Data Gaps

LB 3/13/08
LB 3/17/08
LB 3/18/08
BL 2/12/09
BL& LB Meeting Notes 2/18/09

Kuskokwim River

Are there any impacts to Kuskokwim River from the site?

- Need upgradient and downgradient sediment and surface water samples for mercury, arsenic, antimony, and methyl mercury.
    - Sampling has been done several times – 1971, 1979, 1988 (twice), 1999, & USGS studies. ***Data Usability of Historical Data: look for consistency in values and methods. Obtain and assess GTC data and KR Baseline data.***
- Identification of ecological receptors.
    - Spatial Distribution of Chemical Constituents in the Kuskokwim River, USGS Water Resource Investigation Report 99-4177 says Red Devil creek does not increase mercury concentration in the Kuskokwim River

Historical data suggests there have been releases of COCs from the Mine to the River and this is most noticeable in the sediment data. A primary objective of the RI/FS will be to assess the current conditions by assessing sediment and surface water quality in upstream River locations, at the confluence of RD Creek and downstream River locations. The River sampling objectives will assess spatial trends in the data via intra- dataset comparison, and comparisons against AK table standards and risk-based values. In addition, future performance monitoring will be implemented to assess the effectiveness of future remedial action(s) by establishing a monitoring/sampling program that will include the collection of River sediment and water quality samples. The actual components of such a monitoring program cannot be determined until after the completion of the RI/FS.

Objectives of the RI/Fs and other details will be developed through the EPA's DQO process. The downstream distance to be characterized will be presented in the RI/FS Work Plan. This characterization objective is problematic; however, since other mines exist downstream from the RDM and the distinction of what is background for the local mineral deposit. The DQOs for this issue may need further discussion to better define the distance downstream and the methodologies that will be used. The historical data set (years referenced above) is of questionable use due to unknown QA practices; however, the use of the more recent report will be assessed and may possibly assist in defining spatial/extent objectives but not utilized for any risk objectives. Risk objectives will be resolved with the RI/FS data results.

Identification of ecological receptors will occur as part of the RI/FS process. Although the exact references will be provided in the future, the general approach will consist of a literature search and interviews (e.g., Jim Simon, 459-7317, Elizabeth Bailey USGS).

Red Devil Creek

What are the impacts to Red Devil Creek? ***Sediment, surface water and groundwater impacts***

Objectives of the RI/Fs and other details will be developed through the EPA's DQO process. Through this process the locations and numbers of samples necessary to satisfy study objectives will be presented. Based upon current knowledge, sediment; soil; surface water and groundwater samples will be collected in order to determine potential COC contribution of each on-site source and the risk to receptors as presented in the Conceptual Site model. The study area will include the segment of RD creek from upgradient of the mine to the distal portion of the delta. Samples will be collected in a density that will assist in assessing contribution from each of the on-site sources (retorts, tailings, shops, spring, ponds, ASTs and site a whole). Additional areas will be studied to determine background values for each of the pathway media. The background study area is currently considered to be the Larsen Dyke area. All values will be compared to background, AK table standards and risk-based values.

- Mapping locations and depths of tailings in Red Devil Creek (*Site Investigation*, 1989)
    - Needed…augment drilling with geophysical methods. ***Background??***
- What is the location of the 35' high tailings pile next to the creek (*Site Investigation*, 1989); are the tailings still present?
    - The 1989 report uses 35" once. States they are deposited into the creek. This is one of many inaccuracies describing the site in the report. Sect 7.1 Tailings volume states 10", 25" and 5' depths.
    - Examples or errors:
        - There were 5 AST's not 3.
        - There was no large drum area adjacent to pond 3
        - Bldgs are not arrayed correctly
            - Chemical sheds next to mill
            - Housing
        - Collapsed adit is not plotted correctly
    - Creek <u>does</u> cut through tailings, and there is erosion
        - Tails are about 15-20 feet high on both sides
        - ***Area was originally sluiced and much of tailings gone***
- Have the creek tailings been affected by the Kuskokwim River floods of 1971, 1987, or 1991; highest flood stage was 212' in 1971 and lowest elevation of the mine is 279' (*Retort Building Demo*, 2001) which does not include migration of tailings downstream.
    - MW6 is closet to the river – at 246'
    - MW3 is at 258'
    - Tailings and facilities are above this level
- Sediment and surface water samples along creek, mercury, arsenic, antimony, and methylmercury. ***And DRO***
    - Sampling has been done several times – 1971, 1979, 1988 (twice), 1999, & USGS studies. ***Data Useability of Historical Data: look for consistency in values and methods. We know there is an impact, but Risk needs to be defined.***
- Identification of any ecological receptors.

Because they [tailings] are the most spatially extensive source, a primary objective of the RI/FS will be to map the 3D extent and volume of the tailings. The DQOs will detail these objectives and what data are necessary to satisfy the information expectations. The DQO process will also define the study area which will include the mine site and extending to the distal portion of delta. The tailings will be sampled for the COCs and selected samples for SPLP (EPA method 1312) in order to assess their leachate generating ability.

<u>Groundwater</u>

- Need to determine background concentrations of metals in groundwater.
    - Samplng Done in 2000 from the 5 wells
    - Was before monofill construction – 2001-2002
- Current well locations do not show the extent of contamination (metals).
    - As in a groundwater map? ***Additional wells are needed and will be used for performance monitoring in the future.***
- Petroleum may exist in the groundwater in the AST area; current well locations are not ideal for determining if contamination is present.
    - MW3 & 6 sampled for petroleum in 2007 (Result was ND)
    - AST5 investigation will include more wells to determine if groundwater is impacted – not yet funded ***Sample Creek for DRO***
- Need to evaluate how long it will take for groundwater to naturally attenuate.
    - ***We know GW and Creek are impacted, but need to quantify with Background study and Risk.***
    - ***Performance monitoring will be necessary for any Remedial action taken and modeling can be used as a mgt tool. If we want to pursue a no action alternative, a groundwater model based upon correct parameters (unlike the previous model) can be developed.***
- Current wells are installed in highly mineralized areas or tailings (MW04 screened at 30' bgs in tailings per boring log, *Retort Building Demo*, 2001) – is contamination due to area-wide groundwater contamination or localized contamination from well locations?
    - Unknown. ***The groundwater pathway will be investigated and the placement of each well will be based upon potential sources and the migration pathway leading to the River. This is one of the Primary Objectives of the RI phase.***
    - ***Preliminary Sources: ASTs, ponds, Retorts, Piles, Total Mine Site.***

A primary objective of the RI/FS will be to characterize the groundwater pathway from an area extending from upgradient of the site to the delta. The well network will be designed to assist in assessing contribution from each of the on-site sources (retorts, tailings, spring, ponds, ASTs, the site as a whole, and performance monitoring of past removal actions (monofills). As a whole, the network will be capable of assessing the entire site and its contributions to the Creek and the River; and the potential risk it poses. An additional objective will be to build toward being able to accurately model the groundwater pathway in order to support future management decisions. Additional areas will be studied to determine background values for each of the pathway media identified in the development of the Conceptual Site Models (CSMs). The tentative background groundwater study area is the Larsen Dyke area, but additional areas may be recognized as the RI/FS develops. Depth to

water in the immediate location of the dyke may be deeper than that occurring on-site and additional background well(s) located at a lower elevation may also be needed in the background area in order to assess natural trends in the groundwater pathway. All groundwater values will be compared to background values, AK table standards and risk-based values to answer the information expectations detailed through the DQO process of the RI/FS. The general COCs list for the RI/FS, unless otherwise provided, will include Hg, methyl-Hg, Sb, As, Cu and Ni.

New well installations will target the unconfined aquifer; however, to assess the vertical hydraulic gradient a deeper well(s) may be needed. This deeper well(s) would also be used to assess the COC contribution of the mine workings. Although several of the previous wells are installed in tailings material and have some saturated conditions, the RI/FS will focus new installations in the alluvial aquifer as much as possible. However, because the natural alluvial/colluvial profiles may not longer exist, and may have been replaced with tailing material, it may be necessary to complete a well in primary tailings material to better understand the dynamics of the aquifer so the future remedial actions can be properly designed.

<u>Background Soil Determination</u>

- A statistical background determination, in accordance with EPA guidance, needs to be conducted. Previous background samples have been single sample locations.
    - USGS established a background level in 1997 study (RDV Source Area Removal & Investigation, 2001, 3.2.1.1
        - 0.10 to 0.39 mg/kg Hg ***Can build upon this dataset, if there is an agreement on the quality and location. Can design statistical tests to screen out outliers. Need GW, SW Sed and Soils***

A primary objective of the RI/FS will be to characterize the background conditions of the RDM site for each of the pathways (surface water, stream sediment, soils, and ground water). The EPA guidance for background characterization will be used; however, deviations are common due to site-specific conditions. BLM will openly discuss these issues with ADEC if they arise. The tentative background study area is the Larsen Dyke area, but additional areas may be recognized as the RI/FS work plan develops. For example, a wind rose of the area needs to be assessed to ensure vapor from the retort stacks have not impacted the soils of the proposed background area. In addition, depth to ground water in the immediate location of the dyke may be deeper than that occurring on-site and additional well(s) maybe necessary at lower elevations in the background area to better understand naturally occurring changes in COC concentrations within the background pathway. All on-site groundwater results will be compared to background values, AK table standards and risk-based values to answer the information expectations detailed through the DQO process of the RI/FS.

<u>Conceptual Site Models/Risk Assessment</u>

- How is site used currently?
    - Area closed by gate. Occasional trespass for shooting, hunting, OHV riding

- What types of subsistence resources are used – aquatic/terrestrial animals, wildfoods.
    - Maybe hunting Spruce Hen, Wolf, Ermine, Beaver
    - No fish
    - Poor Blueberry picking
    - Ferns?
- What ecological receptors are present?
    - Listed above
- What is the most likely future use of the property?
    - Calista has indicated interest to resume Mining (As, Au)
- What types of institutional controls have been or could be placed on the property?
    - ***Restricted use in the Land Use Plan etc.***
- How bioavailable are the metals in the naturally-occurring soils and in the tailings?
    - Unknown ***Can use USGS report, if not, need to know what is wrong so problems are not repeated.***
- Develop both human health and ecological CSMs.
    - ***Yes. This is a major part of the DQO steps in the RI/FS process.***

- Streamlined Risk Assessment conducted without DEC oversight or report approval and did not follow DEC guidance. Calculations are based on previous data which may or may not be appropriate. The Risk Assessment needs to be redone with updated data and DEC risk assessor involvement. ***Agree***

The Conceptual Site Models (CSMs) will address each potential release and exposure pathway in order to support the characterization and risk (human and eco) determination strategies. The CSM and risk assessments will consider future land uses, subsistence resources, ecological and human receptors and bioavailability of the COCs. The previous bioavailability study performed by the USGS will be reviewed by BLM and ADEC in order to prohibit past mistakes/issues, as necessary, from being repeated in the methodology to be used for this RI/FS.

<u>Adits/Shafts</u>

Five shafts and one adit backfilled (*Retort Building Demo*, 2001). 1971 EPA inspection noted water found to be flowing from the mine entrance (*Site Investigation*, 1987); is any water flowing out of the former mine adits, shafts, or entrances? If so, what are the contaminant concentrations in the water and where is it flowing?

- No discharge observed from any former adit/shaft opening – all plugged by BLM AML program
- "Spring" coming from west tailings impoundment area, dumping into Red Devil Creek – ***analysis in 2008 GW report shows significant elevations of COCs***, and orange-brown sediment first noted by LB in 2006-2007 to be collecting on rocks is suspected to be metal precipitating out.
- Sampled by Mac Wheeler 1988
    - May be coming from a plugged shaft ("Adit") that may be about 20-30 feet away. ***Past SW samples indicate the Site is impacting the SW quality. Could be from water discharge from mine workings and/or***

leaching from tailings. SPLP analysis and RI characterization will answer this.

The objectives of the RI/FS will be detailed to ensure a comprehensive assessment of the nature and extent of contamination of the various sources, including the possibility that ground water is discharging from the underground mine working. The shafts and adit that were previously plugged will be located and the integrity of the plugging assessed for their effectiveness.

East Side of Red Devil Creek

Retort Building

Free-phase mercury present on western side of building (*Retort Bldg Demo*, 2001)

- Is it migrating?
  - MW sampling indicated Hg in groundwater is dropping from 2000 base year. ***And gw elevation is approx. 30ft to 40ft bgs of Monofill. Seasonal fluctuation of water table appears to be 2f-3ft.***
- Needs to be addressed/recovered.
  - Referring to the sample points that may have been missed/are outside footprint of the monofill cover? ***Need to determine Action Level based upon Risk and Background.***

Monofill placed on concrete foundation (*Debris Consolidation and Disposal Report*, 2003).

- What are the concentrations of metals below the concrete?
  - Unknown, slab is on bedrock. ***Water table 30-40ft bgs.***
  - An attempt to determine conditions under the slab Oct 2001 failed
    - Drilling created high Hg As airborne dust
    - Apr 2001 Treatability Study
- Former sump present on southwestern side of the concrete foundation; is contamination present?
  - Need more info – can't find reference to this in records. ***Soil in area is contaminated and exposed, if not in Monofill. Need SPLP and vol. calculation***
- Building debris pressure washed on retort foundation and IDW water with elevated metals discharged on retort foundation migrating through cracks to the soil (*Retort Building Demo*, 2001). – 2.10.1 & 2.10.2
  - All IDW water was collected and filtered. After testing water quality it was discharged. Filter media was shipped to off-site disposal facility.
  - Filtering did not remove all contaminates down to MCLs
  - 1,850 gallons of filtered IDW water was allowed to percolate through cracks in retort foundation troughs**.** ***Although difficult to prove, this could cause flushing and the elevated levels of COCs in the gw results. Note MW-3 and MW-6 results.***

Currently, most investigative approaches of the free-phase Hg beneath monofill #2 are considered too destructive to the monofill's design. For the moment, the free-phase Hg beneath monofill #2 is assumed remain in-place. No indication of its migration is apparent in

the available groundwater data; however, the current well network isn't ideal for making this determination. Additional well(s) will be installed during the RI/FS that will provide a proper assessment of the monfill's design and its performance. The RI/FS will also propose an estimation of the "life expectancy" of the monofill's design to ensure that it complies with ARARs.

Elevated arsenic and mercury on western side of building, including ~390 cubic yards of arsenic and mercury characteristic hazardous waste. (*Source Area Removal*, 2001)

- Samples were collected prior to development of monofill; what are current concentrations at surface and at depth?
    - Unknown – mostly under cap, ***Confirm which sample locations remain outside of cap. Need SPLP and volume estimate are needed.***
- Arsenic TCLP results greater than 5.0 mg/L in 14 locations – were these all covered by the liner and monofill?
    - NW corner appears to not be under cap
        - No record of whether this area was excavated during construction of monofill 2
- Area has been covered with rock fill; need to sample the original surface.
    - Unsure what is being asked here? ***Primary goal of RI/FS will be to determine nature and extent and volume of material that is posing a risk.***
- Former sump present on southwestern side of the concrete foundation; is contamination present?
    - Need more info – can't find reference to this in records. ***Was sump for washing Hg off floor or rain water?***
- Building debris pressure washed on retort foundation and IDW water with elevated metals discharged on retort foundation migrating through cracks to the soil (*Retort Building Demo*, 2001).
    - All of the 2000 IDW water was discharged here. ***Although difficult to prove, this could cause flushing and the elevated levels of COCs in the gw results. Note MW-3 and MW-6 results.***

- What are the antimony concentrations here?
    - See Figure 21, Source Area Removal and Investigation, Mar 2001

Retort Exhaust Port - area of highest mercury concentrations (*Limited Waste Removal Action Report*, 1999);

- Some mercury ash removed – was the area addressed additionally or simply covered with the monofill? No samples were collected after the ash was removed.
    - Sidewalls removed, slab cleaned/ecobond, under cap

East and West Chemical Sheds:

- Elevated antimony, chromium, and mercury found to be present (*Limited Waste Removal Action Report*, 1999).
- Visible (free-phase) mercury was present at the East Shed (*Retort Building Demo*, 2001)
    - Footprint of retort bldg and chem sheds is under the cap.

- Were soils placed into the monofill or was the monofill simply placed on top of this area?
    - No Excavation - Ecobond and under cap liner
- Drum storage area noted on northern side of building (*Limited Waste Removal Action Report*, 1999); no samples were collected in this area.
    - No releases observed during drum removal

The RI/FS will assess the nature and extent of the COCs outside Monofill #2 and on its cover. The characterization strategy of the RI/FS will build upon the previous investigations with the primary objectives of assessing extent, migration, volumes and risk. Additional samples will be collected to assess if conditions have changed since the 2001 study and SPLP analyses will be preformed. The FS will assess and make recommendations as needed.

Hazardous Waste – Monofill 2 (*Debris Consolidation and Disposal Report*, 2003)

- Encapsulant was an added measure, but was not necessary to achieve the objective.
    - Primary objective was to place the contaminated debris in a "Repository" by creating a monofill with debris in it, as an engineered cap over the "Area of Concern".
        - TCLP or total Hg was irrelevant other than to determine what did not need to go into/under the cap.
        - (email from Nick Ceto, EPA Region X, 5 June 2001).
        - ***RI/FS goals will be to assess leachability of "Tailings" in order to design a likely repository. Propose SPLP analysis EPA method 1312***
- Is contamination migrating out of the monofill?
    - MW7, MW1, and MW3 are positioned to intercept migration from monofill
        - Monitoring shows Hg level has dropped in these wells.
    - Liner is on concrete slab. Slab is on bedrock. Two boring were made to install MWs at the monofill, ***but did not find water within 40 ft of the base of Monofill.***
- What type of sampling strategies will show if contamination is migrating?
    - Groundwater monitoring
    - No groundwater found when MW install attempted in 2000. ***Continued gw monitoring with additional wells.***
- What is the proposed lifespan for the monofill?
- Unknown There ***Should have been a design criteria in the EECA. There will be be a design criteria for life span in the ARAR analysis of the FS.***
- 3223 cy of tailings placed in monofill treated only with arsenic encapsulant; tailings need to be sampled for mercury TCLP.
    - Report for the 2002 project shows these tails were tested for Hg
        - 2.3.11 – 3 samples of processes mine tailings ND to .0304 mg/L TCLP
        - Therefore only treatment for As needed
            - TCLP analyses aren't necessary. Tailings determined Bevill exempt (EPA letter 6/2001). Therefore, need to understand the leachability of the "Tailings" to properly scope/design a possible repository. Propose SPLP EPA method 1312.

- No QA/QC samples were collected from material treated with Ecobond to ensure that it was applied correctly in the field; tailings inside and outside of liner need to be sampled for arsenic TCLP. Samples need to be collected for QA/QC purposes.
    - Treatability Study results said post-treatment confirmation sampling not required
- Retort bricks: Ecobond not applied consistently with lab study (study required crushing to 3/8"); need to be sampled for mercury and arsenic TCLP. Bricks not originally sampled for total mercury (*Retort Building Demo*, 2001).
    - Would require excavation of monofill 2
    - Groundwater monitoring indicates monofill 2 is not causing an increase in hg in local groundwater.
    - Per Apr 2002 Treatability Study:
        - Bricks from 3 locations were analyzed - Retort Bld, under Chem Storage Bldg, and from "unused bricks"
        - Table 5 indicates most of contam is surface only
        - Table 6 shows inside of bricks are clear of hg and lead, except for retort bricks
        - Reason not to crush bricks before ecobond treatment is in para 3 of section 5.5.2, and 5.6.2.
- RCRA requires that soil containing mercury concentrations greater than 260 mg/kg be re-retorted prior to landfilling; this was not done.
    - 40 CFR 268.40 LDRs say RMERC, however
        - Process mining wastes disposed of in AK before March 1, 1990 are subject to LDRs only if the wastes are actively managed; these wastes were disposed prior, so LDRs do not apply. (RDV Source Area Removal & Investigation, March 2001, 3.1.3)
    - Mercury waste shipped off-site to TSDF in 2000 (RDV Source Area removal and Investigation 4.5.1.
- Retort slag was not sampled; needs to be sampled for total metals and TCLP (*Retort Building Demo*, 2001). Slag was treated with mercury and arsenic Ecobond, but no QA/QC samples were collected (*Debris Consolidation and Disposal Report*, 2003).
    - Treatability Study results indicated confirmation sampling not required.
    - Monofill 2 is sealed

No indication of Hg migration is apparent in the available groundwater data; however, the current well network isn't ideal for making this determination. Additional well(s) will be installed during the RI/FS that will provide a proper assessment of its performance. The RI/FS will also propose an estimation of the "life expectancy" of the monofill's design to ensure that it complies with ARARs. The area surrounding the monofill and its surface cover (tailings) will be assessed, and the FS will propose the necessary alternatives/upgrades as needed if ARARs are not being achieved.

<u>Non-Hazardous Waste – Monofill 1 (*Debris Consolidation and Disposal Report*, 2003)</u>

- Tailings from west side of Red Devil Creek used as void filler and cover; no encapsulant treatment on tailings; need to sample the tailings.

    - Monofill 1 was not constructed in an area where As was known to exceed cleanup level per previous investigations. ***What were the Cleanup levels?***
    - Soil excavated when digging the monofill was used as filler and cover; no soil brought from elsewhere. (2002 2.3, 2.3.11 & 3.0)
- Monofill placed on former laboratory pad area; what were the concentrations of metals below the monofill? How deep are the tailings in this area?
    - Unknown RI/FS Drilling will occur in the area to confirm depth to gw and thickness of any "tailings".
- ***Withdrawn by ADEC…..***Five buildings (total 725cy debris) were sampled and found to contain TCLP lead > 5 mg/L. Subsequent samples show results below 5 mg/L. Debris placed in monofill without any treatment. Is lead leaching from the monofill?
    - 2002 report explains how CSWMP findings were found to be not completely accurate during 2002 field work (2.3.6)
        - 2000 EHS report indicates the inspector created a <u>composite</u> of each building by selecting samples of various components (TCLP Fail)
            - Workplan for the 2002 Debris Consolidation and Disposal Project states that the source of lead was not uniquely identified in previous investigations. No obvious paint or bulk lead was noted in the composite samples (workplan 2.3.6)
        - 2002 WEC collected wood samples for off-site TCLP (passed)
        - 2002 Specific lead containing articles were disposed off-site (2.3.6)
            - No LBP was found
        - Photos available show most mine bldgs were covered in tar paper or bare wood, "houses" had Transite Siding – removed and disposed off-site
            - No bldgs with exterior paint
- ***Withdrawn by ADEC…***Hundreds of suspected 'unused' bricks placed in monofill without treatment; bricks sampled with one composite where mercury = 1.7 mg/kg (*Site Investigation*, 1989). Was one sample representative? Are the bricks leaching mercury?
    - Unknown – assumed to be unused so therefore uncontaminated
    - The monofill itself serves as both an adequate containment cell and as a cap. It was determined that ecobond treatment was an added measure of safety; the lined sealed cell is all that was necessary to contain the Hg and As that may be in any of the wastes placed within, or under.

No indication of its migration is apparent in the available groundwater data; however, the current well network isn't ideal for making this determination. Additional well(s) will be installed during the RI/FS that will provide a proper assessment of its performance. The RI/FS will also propose an estimation of the "life expectancy" of the monofill's design to ensure that it complies with ARARs.

Material beneath the monofill will be assessed by drilling around its perimeter. The objectives will assess the thickness if tailings, if present and depth to ground water within the unconsolidated material. The cover material of the monofill will also be assessed if it is tailing material.

Drum Storage Area

- Elevated mercury present (*Limited Waste Removal Action Report*, 1999); is there still contamination present? If not, where did the soil go?
- DRO and RRO were not included in the analytes.
    - Unsure whether there has ever been a oil investigation or cleanup from any area except ASTs and pipelines. ***Can add to RI Scope for drilling other Fuel leak issues.***

The RI/FS will include DRO and RRO to the investigation of this potential source.

Gravel Pad

- Elevated mercury, lead, arsenic, and antimony present (*Limited Waste Removal Action Report*, 1999); is there still contamination present? Delineate lateral and vertical extents.
- Area used as work area in 2002 and mercury Ecobond applied to surface (*Debris Consolidation and Disposal Report*, 2003); no QA/QC samples collected to see if the Ecobond was applied correctly in the field.
- Some heat tracing with a bulk lead covering was stored here (*Addendum to the EE/CA*); where did that go?
    - Unknown
    - HW Manifest #0893B at App F of 2002 report – Lead Wire, 500 LBS

The RI/FS will include this area for characterization. It will be drilled and sampled to confirm its contents as being tailings or native gravel material. The general approach will focus on sampling for COCs and integrating the use of a field xrf for real-time field determinations as well as borehole logging to identify material.

Tailings (post 1955 retort area)

- Elevated mercury, arsenic, copper, nickel, and antimony present exceeding cleanup levels (*Limited Waste Removal Action Report*, 1999). What concentrations are now on the surface and subsurface?
- Tailings need to be mapped in location and depth around the site.
- It is unknown what tailings remain at the tailings borrow area location after some were placed in the monofill from (*Debris Consolidation and Disposal Report*, 2003); what are the concentrations of metals in these tailings?
    - Unknown. ***RI/FS will cover this issue.***
- Previous estimate of on-site tailings is 51,600 cubic yards (*Site Investigation*, 1989), is this a valid estimate?
    - Need to characterize entire tailings areas – both West and East of creek.
        - Likely significant mixing occurred by miners to create the level area

The RI/FS will fully characterize the extent and depth of tailings material in the mine's operation area (retort, shops etc.) and extending down to the distal portion of the delta. The general COCs list for the RI/FS, unless otherwise provided, will include Hg, methyl-Hg, Sb, As, Cu and Ni.

Settling Ponds

- Elevated mercury, arsenic, chromium, and antimony present (*Limited Waste Removal Action Report*, 1999). What concentrations are now on the surface and subsurface and what is the depth of the contamination? ***The RIFS will drill and sample the material in and below each Pond. The material will be analyzed for metals and possible frother agents (Pb and organics, DRO etc.)***
- Extent of downgradient contamination not determined (*Limited Waste Removal Action Report*, 1999).
- Have ponds been filled in or soils removed?
    - Two upper ponds have been covered over
    - Pond 1 was filled with tailings from retort discharge. These tailings were used in construction of monofill 2. ***<u>The material needs to be sampled.</u>*** Pond 2 is the pond visible and has MW3 on it's berm. Pond 3 is untouched/overgrown.

The above comments about the ponds was shown to be incorrect during a 9/18/08 inspection of the Site. The large, easily visible pond is Pond 1. Ponds 2 and 3 are heavily overgrown but still identifiable. Investigation of all three is needed.

- Drums were noted to be present northeast of the ponds (*Site Investigation*, 1989); was this area investigated?
    - Numerous scattered empty drums removed from area North of Ponds, between ASTs and creek during 2005 AST excavations
    - Large area of drums shown in 1989 Weston SI were not found to be there in 2003 – just a few scattered
    - Scattered drums removed during 2005 – empty/rusted
    - This appears to be a diagramming error in 1989 (along with several others) – the actual drum area was north of the retort (89 drums in 1999).
        - Drum contents characterized/disposed in 1999
        - Empties disposed in 2002 (monofill 1)
            - ***Wells to be installed downgradient of this location will be analyzed for DRO and frother agents, and COCs***
- Materials for the flotation unit came down a "chute" into the settling ponds – what are the contaminant concentrations along the chute pathway? What material was the chute made of (i.e. wood, metal, dirt)? Where is it now? (*Site Investigation*, 1987)
    - Chute was a wood structure. It was collapsed in-place and buried during 2002 project
    - Path through tails was excavated in 2002
        - Went into monofill 2
- Lead acetate was used in the tanks which discharged to the ponds (*Site Investigation*, 1987); was this investigated?
    - 2007 GW monitoring shows lead elevated from ND in 2000 to 19.7ug/L in MW3
        - ***Pond contents will be drilled and sampled. New downgradient wells will be include all possible COCs***

The ponds will be thoroughly characterized during the RI/FS. Each of the three ponds and its surroundings will be drilled and sampled to determine its contents and potential contaminant

volumes. The general list of COCs will be used but with the addition of the possible frother constituents. A list of possible constituents of Dowfroth 250 has been found and further determination of its compounds will be assessed and added to the characterization of this source if needed. Additional wells will be installed to characterize the groundwater pathway downgradient of the ponds. The COCs plus Dowfroth compounds and their breakdown products, e.g., sulfate,; and DRO and RRO. All additional downgradient wells from the Ponds down to the delta will have the expanded list of COCs (metals, frother constituents and DRO and RRO). The results will be compared to AK table standards, background and risk based criteria.

<u>West Side of Red Devil Creek</u>

<u>Shop Pad</u>

- Elevated arsenic, mercury, antimony present (*Limited Waste Removal Action Report*, 1999); is there still contamination present? If not, where did the soil go?
- Drum area not evaluated.
- Samples were not collected on three sides of the pad; there was contamination on one side which was sampled.

<u>Shop Building</u>

- This area was discussed in *Limited Waste Removal Action Report*, 1999, however not evaluated with collection of samples.
- Batteries noted to be stored on west side, but no samples collected in this area.
    - Stored on concrete slab of Shop Pad (2.3.2 1999 report) or on Wooden floor – no soils to sample

<u>Shop Building, Pad A</u>

- Elevated lead was found to be present at the whole and broken battery storage area (Bldg A) (*Limited Waste Removal Action Report*, 1999); is there still contamination present? If not, where did the soil go? Contamination needs to be delineated vertically and laterally and sampled for lead and other metals and TCLP.
    - Samples show 13,500 mg/kg at whole and broken battery storage area (Bldg A), and 1,080mg/kg at gravel storage pad (where batteries where removed from vehicles.
    - No further investigation done

<u>Shop Building, Pad B</u>

- No samples collected, (*Limited Waste Removal Action Report*, 1999); were there any fuel tanks used or materials stored here which would give a reason to believe that there might be contamination present?
    - It appears from photo search that all of the bldgs on the west side of the creek were fueled by 55 gallon drums on stands. Believe they were filled in-place by pumping from a mobile source.
        - Two photos found showing drums on a stand, plumbed together.

Steam Plant

- Drums noted to be present, but no samples collected (*Site Investigation*, 1989)
    - Sample collected 1999
- No samples collected, (*Limited Waste Removal Action Report*, 1999); were there any fuel tanks used or materials stored here which would give a reason to believe that there might be contamination present?
    - Some investigation done in 1999
        - Steam Plant powered by pipeline from ASTs – no tank at bldg

This facility is actually on the East side of the creek, near the "modern retort". MW7 is present there currently. The RI/FS will characterize the above sources for the Hg, methyl-Hg, Sb, As, Cu, Pb and Ni. DRO and RRO will be added to the investigation of the Steam Plant. Boring and wells will be added as needed to satisfy the DQOs detailed in the RI/FS work plan, i.e, extent, volume and risk. The results will be compared to AK table standards, background and risk-based criteria.

Withdrawn by ADEC…Housing Complex

- Houses were painted with lead-based paint, however no lead samples were collected from soil.
    - What is the source for statement that the houses were painted with LBP?
    - No LBP actually found. Lead in "composite" samples taken by EHS in 2000 was probably from the sewer pipe seals – they were disposed off-site in 2002.
- Did each building have it's own fuel tank? No samples were collected for DRO/RRO.
    - No documentation of heat source for any of the bldgs exists.
    - Two photos found in BLM files show 55 gallon drums, stacked and plumbed together were used to supply fuel.
    - 3rd photo of stacked/plumbed drums at one the houses exists

Tailings

- Need to map locations and depths of tailings.
    - Agreed. ***A site-wide sampling effort will likely be a task within the RI/FS.***
    -
- Surface and subsurface samples need to be collected.
    - Agreed. ***A site-wide sampling effort will likely be a task within the RI/FS.***
- Pre-1955 Facility has been buried; were tailings used to bury the old buildings or was it waste rock or soil from some other location?
    - It appears in the various aerial photos that the entire area was re-contoured by miners. Materials that form the base of the West mine area are mixed, and of uncertain origins. ***A site-wide sampling effort will likely be a task within the RI/FS.***

The RI/FS will characterize the tailings through a site-wide approach of drilling and sampling for the COCs and their leachability via SPLP analysis; and estimation of volumes. The boundaries of the site will include the mine site, its retorts and other potential sources such as

the ponds, and extend to the distal portions of the delta. The results will be compared to AK table standards, background and risk-based criteria.

<u>Pre-1955 Facility (*Historic Source Area Investigation*, 2005)</u>

<u>Rotary Furnace</u>

- 13 samples were collected with elevated mercury and arsenic found; additional samples are needed to determine extent of contamination. Sample analyzed for mercury, arsenic, and mercury speciation only; antimony needs to be included in list of analytes and TCLP as well.
    - ***Because it is more appropriate for this site, the BLM proposes using SPLP instead of TCLP for assess leachate generation potential. Additional samples will build upon the previous Historic Source investigation and will include Sb. Sb is always a co-located COC and is assumed to be above Action Levels in these immediate areas.***

The RI/FS will characterize this source for the COCs and utilize the SPLP method to determine their potential leachability. This will be a subset of the overall site assessment as the overall RI/FS characterization will be a contiguous assessment of the COCs with additional COCs being added as dictated by the uniqueness of a potential source.

<u>Calcine (Burned Ore) Dump</u>

- Located northwest of retort area; no samples were collected (*Site Investigation*, 1987).
- No burned ore was visibly identified, but sample showed elevated mercury concentrations; additional samples are needed to determine extent of contamination. Sample analyzed for mercury, arsenic, and mercury speciation only; antimony needs to be included in list of analytes and TCLP as well.
    - ***See above comment. A site-wide sampling effort will likely be a task within the RI/FS.***

The RI/FS will characterize this source for the COCs and utilize the SPLP method to determine their potential leachability. This will be a subset of the overall site assessment as the overall RI/FS characterization will be a contiguous assessment of the COCs with additional COCs being added as dictated by the uniqueness of a potential source.

<u>Pre-1955 Retort Building</u>

- Individual firebricks were found and should be sampled for metals and TCLP.
    - Agreed
- Burned rock/ore stockpile – 1 sample collected showing elevated concentrations of mercury and arsenic. Additional samples are needed to determine lateral and vertical extent of contamination. Sample analyzed for mercury, arsenic, and mercury speciation only; antimony needs to be included in list of analytes and TCLP as well.

- 10 samples were collected with elevated mercury and arsenic found; additional samples are needed to determine extent of contamination. Sample analyzed for mercury, arsenic, and mercury speciation only; antimony needs to be included in list of analytes and TCLP as well.
    - ***See above comments. A site-wide sampling effort will likely be a task within the RI/FS.***

The RI/FS will characterize this source for the COCs and utilize the SPLP method to determine their potential leachability. This will be a subset of the overall site assessment as the overall RI/FS characterization will be a contiguous assessment of the COCs with additional COCs being added as dictated by the uniqueness of a potential source.

<u>Rotary Furnace Stack</u>

- In the Post-1955 area, the highest mercury and arsenic concentrations were found at the rotary furnace exhaust port. Is the exhaust port similar to the furnace stack?
- 1 sample was collected with elevated arsenic present, additional samples needed to define the lateral and vertical extent of contamination. Need to confirm location.
    - ***See above comment. A site-wide sampling effort will likely be a task within the RI/FS.***

The BLM will perform an in-house air model to assess the possible extent of impact of stack emissions. Input parameters will include, wind rose, height of stack, terrain, temperature of stack, and type of Hg etc. This information will assist on designing sampling locations and confirmation that the background locations are not impacted.