Washoe Tribe of Nevada and California

August 14, 2009

Kevin Mayer
Remedial Project Manager
U.S. Environmental Protection Agency
Region 9
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VIA ELECTRONIC MAIL

SUBJECT: Review of ***"Remedial Investigation/Feasibility Study Program Work Plan (PWP) Leviathan Mine Site Alpine County, California" Submitted on behalf of Atlantic Richfield Company (ARCO)***

Dear Mr. Mayer:

This letter and the attached memorandum together are the Washoe Tribe of Nevada and California's comments on the document referred to above. The Tribe's comments were developed by staff and the Tribe's consultant AESE, Inc., and they attempt to focus on issues relevant to the RI/FS and the selection of the final remedy for the Leviathan Mine Site.

1. The Program Work Plan should contain a list of potential treatment alternatives/scenarios being considered for long-term treatment of the entire site in accordance with the Unilateral Administration Order (UAO) and explain how the PWP fits within the RI/FS process. The lack of clear delineation of long-term treatment scenarios is a fatal flaw in the PWP; as suggested on page 6, paragraph 2, and sentence 2, which states: ***"The identification of technologies and alternatives is necessary to help ensure that the data needed to evaluate these technologies is collected."***

2. The PWP continues to refer to safety issues in regards to year-round access, particularly referencing snow accumulation data. This is not consistent with the requirements for year-round treatment in the UAO. In addition, if conclusions are to be stated regarding the safety and year-round access, there is necessary data missing. For instance both access roads need to be studied and mapped for any seep areas, slopes, and potential slide areas, and a more complete safety study that includes identification of weather data contacts and local assessment of access. All available meteorological data in the regional area needs to be

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referenced including the east slope, approximate 7000 foot elevation meteorological site contact and data.

3. Anecdotal references to sightings of fish should be limited and instead a viable plan for a scientifically defensible quantification of fish populations should be completed.

4. Any release should include plans to meets or develop a TMDL plan including meeting Bryant Creek water quality standards.

5. All "Study Area" boundaries should be watershed based.

6. Page 2; Paragraph 3, Sentence 1: Explain further the work done or planned towards the reference here to, *"...testing the effectiveness and reliability of year-round ARD treatment"*.

7. Page 2; Section 1.1. Order Requirements; second paragraph; first sentence, *"This FRI work plan fulfills the U.S. EPA requirement of the above conditional approval to submit a topographic mapping work plan of the site and downstream areas by June 22, 2009."*

   The EPA requirements were not limited to just "topographic mapping ". The PWP should include a more complete planned mapping work plan that contains designs for overlays of geology, vegetation, slope analysis, existing rain/snow gages, and proposed meteorological sites to refine estimates using the isohyetal methodology important to optimizing treatment operations, access, and safety issues.

8. Page 13; 2.1.1 Surrounding Property Ownership and Land Use, Paragraph 1, should include that the Washoe Tribe has several parcels in the Bryant Creek watershed as do Tribal members.

9. Page 18, Paragraph 1.

   Better meteorological data is needed and regional data should be used. Numerous data is available that is not identified or used. New stations on each road just before entry to the site would help clarify safe conditions within the November through May period that ARCO assumes is inaccessible. USGS reports that **PRISM tends to overestimate by about 90%** in this regional area.

The remainder of the Tribe's comments is in the attached memorandum. If you have any questions or would like to discuss the Tribe's comments further, please feel free to contact me at 775/265-8600, Ext. 1155 or by email at Lynelle.Hartway@washoetribe.us.

Sincerely,

Lynelle Hartway
General Counsel/Resource Policy Program Coordinator
Washoe Tribe of Nevada and California

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MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: August 5, 2009

SUBJECT: Review of ***"Remedial Investigation/Feasibility Study Program Work Plan Leviathan Mine Site Alpine County, California" AMEC Geomatrix, Inc. Rancho Cordova, California, July 2009***

CC: Joy Peterson, Hydrogeologist, WTNC
Dr. Harper
File

This memo constitutes a review of the aforementioned document. General comments are followed by a section of Specific Comments.

General Comments

1. Like most mine sites, overland flow and resuspension of floodplain sediments and mine wastes have been long known to be the source of suspended contaminants measured in down stream surface water. Site affected Groundwater has long been known to be the source of dissolved contaminants measured in surface water during baseflow. Ultimately alternative remedies will be developed realizing the need to clean the basin from the "top-down" in order to minimize recontamination (much like when someone washes their car). As stated before by the Tribe in simplistic terms, "Since we rely on clean water, ARCO needs to keep their surface water out of our surface water for all time periods and under all conditions". Otherwise recontamination is likely to trigger periodic legal actions in perpetuity.

   Successfully segregating ARCO's surface water from our surface water under all conditions can only be accomplished via year-round pump and treat. Contrary to what ARCO leads one to believe, year-round pump and treat is a task that is not technologically insurmountable nor cost prohibitive (especially when considering the numerous likely future legal actions). Participating governments other than the Washoe also realize the need to break the ground-water to surface water flowpath portrayed in the CSM and also realize that ARCO and others have done little to characterize the hydrogeology of the site. This point is driven-home in Table 44 that lists the EPA-filtered comments on the preliminary data gaps report. The preponderance of comments listed in Table 44 fall into the single category of "inadequate hydrogeological characterization".

2. EPA and the participating governments identified numerous errors and omissions in the ***"Draft Data Quality Objectives Report: Remedial Investigation and Feasibility Study, Leviathan Mine Alpine County, California, AMEC Geomatrix, Inc., October 2008.*** Realizing that the DQO report was poor, EPA allowed ARCO to proceed with the RI/FS work plan, without revising the DQO report, in the interest of moving the project along and "not loosing another field season".

   However, the RI/FS work plan appears to be overselling the quality of the DQO report: ARCO inappropriately relies on the reports as it were a hallmark of science and effort (the DQO document is cited nearly 100 times in the IR/FS work plan) and is still inappropriately being relied upon to drive the process.

3. Even after lengthy comment offered by members of the participating governments, ARCO still does not understand the DQO process and how the DQO process is instrumental in the planning process (Washoe Tribe's Comments are attached as Attachment No. 1). The DQO approach employed is for developing DQO's for a ***single*** study, <u>once the study has been determined to be necessary</u> (Section 3.3.35

"**Step 1—Statement of the Problem.** Define the problem that necessitates the
study; identify the planning team, examine budget, and schedule.). However, comparison of existing data to DQO's developed as described below is the criteria used to determine if as study is necessary in the first place.

Therefore, the data gap analysis cannot be pushed-off until the FRI's are developed, because it is the data gap analyses <u>that identify whether or not an FRI is necessary.</u> This circular reasoning and lack of understanding of the fundamental scientific process underlying the DQO and project management process at this stage of the project is a major concern to the Tribe.

Step 1—Statement of the Problem. Define the problem that necessitates the
study; identify the planning team, examine budget, and schedule.

Section 2 V from the Tribes comments on ***"Draft Data Quality Objectives Report: Remedial Investigation and Feasibility Study, Leviathan Mine Alpine County, California, AMEC Geomatrix, Inc., October 2008,*** is reiterated below . The entire set of comments are attached (Attachment No. 1) as well as DQO Worksheet used by AESE and others during project design (Attachment No. 2)

V. Process to Determine Data Needs and DQOs.

A. As discussed in "II" , above. PCSMs are used as visual accounting tools to determine what studies would be necessary <u>in the absence of all historic data.</u> (Sometimes this dataset is referred to as study needs or data needs; however, we refer to them as study needs herein)

*B. DQO's are then derived as per EPA guidance for all of the studies that were identified from the PCSM in the absence of existing or historic data. DQOs, including experimental design parameters, must be developed and specified **prior** to reviewing the existing data, otherwise there is a tendency to attempt to make DQOs "fit" the data. The DQOs are akin to inflexible building codes/blueprints specified by the architect. One must design to meet code, not vice versa. This break in the logical order underlying the scientific process is demonstrated in throughout the draft where data evaluations are being performed prior to developing DQOs.*

C. Historic studies and their DQO's are compared to the list of studies and their DQOs determined in "V. B", above.

D. Holidays or study-gaps are identified directly on the PCSM. For example, the surface water to ground water pathway for an OU or an EA does not meet the numerical specifications of being "adequately characterized" over the temporal and spatial scopes specified in the DQOs that were developed for the HHRA.

E. DQOs described in VB may then be altered as per EPA guidance to design the new studies that fill the study gaps. Decisional flow charts (DFCs) are typically employed in this process depicting decisions necessary to each end-user (an example DFC for characterization of sediment for a human health risk assessor is included)

F. Revise PCSM. If there is agreement among technical experts, this is the point where COIs, pathways, and endpoints may be reduced and the PCSMs collapsed.

Perhaps the DQOs are being reserved for the SAP/FSP, but these need to be determined prior to evaluating the data for "usability". Otherwise there is a tendency to attempt to fit the DQO's to meet the existing data.

In summary, DQOs including objectives and decision rules are the "rules to the RI/FS and must be stated and agreed upon by the participating governments prior to attempting to propose work. As such the current draft makes unfounded, premature, judgments on the quality and usability of the data. If reserved for SAP/FSP, then these judgments regarding data quality should be reserved for those documents. However, the Tribe was told, during our last conference call, that this document would contain all of the requisite DQOs.

4. Conditions reported in the previous studies are likely different due to RAs. As describe in previous comments prepared by the Tribe years ago, implementation of these RAs, under EPA's purview, did not require development of statistically sound baseline conditions. Therefore, it could be very difficult attempting to tie current conditions to the historical reports. Since adequate baseline has not been determined as required under the NCP and since it is currently a "moving target", it also will be hard to evaluate actual or projected future benefits of further action.

   If conducted correctly, and acknowledging that current conditions are likely different from conditions when the previous studies were completed, the DQO process would have revealed that nearly all of the boxes and arrows in the PCSM need to be characterized or re-characterized for the new altered baseline conditions.

   Statements like are *"The data analysis and the DQOs presented in the DQO report were a definitive first step in the scoping process for the RI/FS, but due*

to the extended time frame and variable scope and quality of the previous data collection programs, this effort could not develop more specific data gaps." Only further demonstrates ARCO's misunderstanding or misuse of the DQO process in identifying data gaps

5. Judging from the local and regional geology, the list of COCs should include a screen for U^{238} (and its daughters) in liquids and Ra ^{226} (and its daughters) in soils/sediments.

6. The water balance presented, is very cursory, includes many errors and omissions, and is not an important component of this document. Recommend reserving interpretation on the water balance for a separate document(s).

7. Table 51 outlines an ambitious characterization program, that is applicable to nearly any new Superfund mine-site . However, had the DQO process described in General Comment No. 3 been conducted, it likely would have revealed that many of the Task ID's are not required to answer the pertinent questions (such questions also have not been determined at this time). Again, this document appears to be a scoping-level "work plan" for development of future work plans—something not contemplated by the SOW attached to the UAO (note that the term "project work plan" does not exist in the UAO and the attached SOW).

Specific Comments:

1. Page 5; Section 1.3; Paragraph 1; Sentence No. 1

> *" Consistent with the RI/FS guidance (U.S. EPA, 1988) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), the scope of the RI/FS is based on the data needs identified in the DQO Report. As stated above, the DQOs were developed following U.S. EPA's systematic process for identifying data needs to characterize the site, completing the conceptual site models (CSMs), better defining Applicable and/or Relevant and Appropriate Requirements (ARARs), and narrowing the range of the preliminary remedial alternatives."*

This is a gross overstatement of how data gaps were identified. See General comment No. 2

2. Page 8; Section 1.4; Paragraph 1; Sentence No. 1

> ***"****The FRI work plans will establish the rationale and methodologies for investigations to address data gaps.* ***"***

What document identifies data gaps? The DQOs document does not. This PMP does not. How can FRIs/GRAs identify data gaps? See General comment No. 3

3. Page 13; Section 2.1.2; Paragraph 1; Sentence No. 1

> *"The present-day Washoe Indian reservation lands are located outside of the Bryant Creek Watershed"*

This statement is incorrect. The Pine Nut Allotments are within the Bryant/Leviathan Creek Watershed. The Tribe has never relinquished its right hunting and fishing in these watersheds.

4. Page 13; Section 2.1.2; Paragraph 1; Sentence No. 3

> *"Details of the Washoe tribe's land use are discussed in Section 2.1.5."*

Details of the Washoe tribe's current or future land use are not discussed in Section 2.1.5.

5. Page 48; Section 2.5.3.3; Entire Paragraph 4;

> *"To estimate runoff, spring flows measured at Station 1 and Station 15 were compared to the total drainage areas above the gauges. For Station 1, average annual spring streamflows represent approximately 1.4 inches of runoff from the entire watershed above the gauge. For Station 15, average annual spring flows represent approximately 1.2 inches of runoff. An average of these values, 1.3 inches, was used to assess potential runoff produced flows from ungauged areas of the site."*

This approach is only applicable if the hydrogeology (Kv, thicknesses of deposits), slope, ET, etc are homogeneous in each area and are similar between areas. Since none of these assumptions are met, this approach is not technically supportable and does not follow standard practices used by professional hydrogeologist. Also see General Comment No. 5.

6. Page 49; Section 2.5.3.3; Paragraph 1; Sentence No. 1:

> *"Assuming that flows measured at the seep are comprised of infiltration through the disturbed area above the seep, the average annual measured flows represent approximately 2.4 inches of infiltration."*

Same concerns. See Specific Comment No. 5

7. Page 52; Section 3.1.1; Entire Section

See General Comment No. 4

8. Page 69; Section 3.3; Paragraph 1; Sentence No. 1

> *"Consistent with the SOW, a DQO report was prepared in 2008 (Atlantic Richfield, 2008). The DQOs were developed consistent with the RI/FS scoping process defined in the NCP, 40 CFR Section 300.430(b)."*

This statement is incorrect. See General Comments No.s 2 and 3.

9. Page 69; Section 3.3; Paragraph 2; Sentence No. 1

"The scoping process involves the following steps:
- *evaluate existing data,*
- *develop a CSM,*

• develop an SMS,
• develop remedial action objectives (RAOs) and initial remedial options,
• develop ARARs, and
• develop DQOs."

This list is not in a logical sequence and exemplifies what is wrong with the procedure used to identify data gaps. See General Comment No. 3 including Attachment No. 2

10. Page 69; Section 3.3; Last Paragraph:

> *"The data analysis and the DQOs presented in the DQO report were a definitive first step in the scoping process for the RI/FS, but due to the extended time frame and variable scope and quality of the previous data collection programs, this effort could not develop more specific data gaps."*

See General Comment No. 4

11. Page 75; Section 3.3.5; Entire section

See General Comment Nos. 2-4

12. Page 77; Section 3.4.2; Entire section

Judging from the local and regional geology, the list of COCs should include a screen for U^{238} (and its daughters) in liquids and Ra^{226} (and its daughters) in soils/sediments.. See General Comment No. 5

13. Page 81; Section 3.4.4.1; Last Paragraph; Sentence No. 2

> **"***The hypothetical RME scenario assumes that a tribal member lives a subsistence lifestyle with family in a house in a sparsely populated, riparian corridor near the site (Walker, 2003) throughout the year."*

Walker, 2003 is not the correct reference.

14. Page 81; Section 3.4.4.1; Last Paragraph; Sentence No. 4:

*"Subject to legal restrictions on access, potential exposure would be driven by media-specific concentrations in this area for some exposure media **(e.g., drinking water, plants)**," (Emphasis added)*

The list of exposure media should include: **"ground water, surface water, sediments, soils, flora, fauna."**

15. Page 90; Section 4.3; Paragraph 1; Sentence No. 1

"2. The data gaps for both the Human Health and Ecological CSMs are summarized the risk assessment work plans and in the RI Approach in Section 5."

Again, data gaps cannot be defined at this time. See General Comment 2-4. The statement ***"Data gaps for … CSMs"*** only strengthens previous arguments.

16. Page 69; Section 5.1.2; Entire Subheading *Task BIO-1—Plant Sampling*

Recommend collocated root and sediment/soil samples for plants consumed by the Tribe.

17. Page 107; Section 5.1.7; Paragraph 3; First Bullet:

- ***Analog creek site(s) for surface water, sediment, and biota—****The potential site(s) that would best be located near the site would represent similar rock types and alteration and preferably would not have been disturbed by mining. Areas along Mountaineer Creek and Monitor Creek have been reviewed as potential analog sites for surface water."*

Recommend onsite and offsite (down gradient) sediment and riparian soil cores obtained in likely depositional areas. This approach negates the need to reconstruct pre-release baseline conditions (pre-mining background).

18. Page 122; Section 6.1.4; Paragraph 2; Last Sentence:

"The HHRA assumes longer-term use of off-property areas in the future by Washoe tribe members and potentially less restricted access to certain on-property areas for recreational use following a final remedy, revegetation, etc."

Need to include periodic Washoe trespasser scenario that includes normal Washoe RME burden from non-trespass usage, but residing in the Pine Nuts area.

19. Page 122; Section 6.1.4.2; Paragraph 1; Last Sentence No. 1:

> *"A central tendency (CT) evaluation will be performed if the estimated cancer risks exceed the acceptable risk range of …"*

The Central tendency evaluation must be conducted using Washoe Exposure Factors (EFs) and values of CT for the exposure point concentrations (EPCs)—not using EFs for the General Public.

ATTACHMENT No. 1

November 6, 2008 Memo from Dr. F. E. Kirschner, Senior Scientist to Lynelle K. Hartway, General Counsel Washoe Tribe of Nevada & California: ***"Draft Data Quality Objectives Report: Remedial Investigation and Feasibility Study, Leviathan Mine Alpine County, California, AMEC Geomatrix, Inc., October 2008.***

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MEMORANDUM

TO: Lynelle K. Hartway, General Counsel
Washoe Tribe of Nevada & California

FROM: Dr. F. E. Kirschner, Senior Scientist

DATE: November 6, 2008

SUBJECT: Review of ***"Draft Data Quality Objectives Report: Remedial Investigation and Feasibility Study, Leviathan Mine Alpine County, California, AMEC Geomatrix, Inc., October 2008"***

CC: Joy Peterson, Hydrogeologist, WTN&C
Dr. Harper
File

This memo constitutes a review of the aforementioned document. In preparing these comments, the Tribe has attempted to focus on issues that could make a difference in the RI/FS and ultimately selection of the remedy in the Proposed Plan.

The drafting of this review ceased on November 5, 2008 at section 8.2, after discussion with EPA where they verbally assured us that DQO's, as defined by EPA guidance, would be deferred to the SAP/FSP portions of the project, diminishing the need for this document.

General Comments

1. Further site characterization studies may not be warranted for several reasons. First, the Draft concludes that decision rules (which are suppose to specified within this draft) will be based on professional judgment. This means that a statistically sound experimental design, as required by the NCP and the EPA supporting guidance documents for site characterization and data usability for risk assessment will not be employed. Decision rules are the most important step in the DQO statements.

Second, the proposed approach to the water balance will yield useless information, since the most important information will never be gathered due to anticipated poor weather conditions. Our experience with similar mines and experience with physico-chemical transport process in general tells us several things:

A. Overland flow is currently uncontrolled. A rule of thumb is 90-100% of sediment transport (solid-phase mass-flux) occurs via the overland-flow component during high-energy events such as run-off and especially during rain-on-snow events. Such events will not be monitored due to inclement weather conditions.

B. The majority of the problem associated with surface water quality is that the ground water to surface water pathway is uncontrolled. This pathway is responsible for contaminating downstream sediments via sorption as well as numerous biotic media during low flow. This pathway also is responsible for large mass releases of hazardous substances that have built-up in the unsaturated and saturated zones as salts. This release occurs annually in response to the freshet. Again, an event that will not be monitored due to inclement weather conditions.

C. A secondary problem, but easily solvable, is associated with uncontrolled releases from the contaminated water holding ponds during high runoff events. Again, an event that will not be monitored due to inclement weather conditions.

We have elected only to discuss these three challenged areas at this time since these areas are of greatest concern to downstream interests, including the Tribe.

Our experience with human health risk assessments on Superfund sites in which tribal members are receptors, tells us that the abiotic and biotic media of the exposure area must be relatively clean and free of contamination in comparison to sites in which only the General Public is exposed. <u>This means that for alternatives, other than the</u>

no action alternative, items A, B, and C, above, must be controlled in order to protect human health for our foreseeable future land use[1].

In order to protect against recontamination of downstream surface water, sediments, riparian soils, groundwater, roots, fish, as well as a long list of biologic receptors, Items defined in A, B, and C, above must be controlled year-round.

Our thinking on these necessary components of proposed Alternatives under the NCP are not new. We have expressed these needs to EPA in several venues very early-on when we realized that year-round pump and treatment coupled with promotion of runoff via capping, recontouring, and lining portions of the drainages would be necessary. However, as with the proposed decision rules, ARCO has incorrectly concluded that the weather would preclude year-round operation or year-round sampling.

The lack of year-round treatment is a fatal flaw of the entire document. Comments associated with this issue could be applied to all sections; however, the Tribe has elected not to do this for the sake of brevity. In other words, we could have ceased the review with this comment; however, the following has been produced in the interest of educating ARCO on many of the additional errors and omissions present in the Draft.

2. **Currently, the doc is not in logical order nor is it based on the scientific process or the NCP.** Following the scientific process, every study, being historic or future, being large or small, has or had DQOs driving the study design.

This document describes a site-specific DQO *process*, not DQOs themselves. Process is already defined in the EPA DQO guidance. This document is supposed to deliver the necessary information for screening historical data as well as developing new data. Currently this draft is a regurgitation of a mixture of EPA planning-level guidance tailored for the site. The reader is not given the opportunity to determine whether the current understanding of the system based on historical studies and data are adequate (because first of all "adequacy" is not defined via DQO statements) and whether proposed future studies are necessary and are capable of answering the important questions (because these questions are omitted as well). As such, the title could be changed to *Draft Data Quality Objectives* ***Process*** *Report; however, the SOW does not require a reinvention of the DQO process.*

At least four different end-users from four different disciplines will rely on data generated for each medium:

[1] The reservation or colonies and allotments were set aside by congress as the permanent homeland for the Tribe, providing all the necessary sustenance for survival. The Pinenuts Area downstream from the mine was allotted by Congress. By definition, allotments are set-aside for residential and farming use.

- Physical Scientists/Contaminant Transport and Fate Specialists
- Ecological Risk Assessors
- Human Health Risk Assessors
- Remedial Design Specialists

Each end user will have different DQO's for each study. It is clear that each end user has not been involved in development of this document. Generally, DQOs required by each discipline are drafted in separate documents with site characterization performed by the physical scientists as being the first step.

The Tribe suggests the following outline:

I. Intro/background
   A. Purpose
   B. Objectives

II. Preliminary Conceptual Site Models (PCSMs). In summary, as the Tribe discussed at the last conference call, the PCSMs are a visual accounting tool used to develop lists of necessary studies. Both wire-frame(flow-sheet style) and physical CSMs (e.g. hydrogeologic cross-sections depicting transport) <u>for each Operable Unit (OU) or exposure area (EA)</u>must be developed. These should be initially constructed <u>in the absence of previous information</u> for a generic open-pit/underground mine site which has been developed in rugged terrain in the headwaters of a small riverine system. This section or chapter should include:

   A. PCSMs for Contaminant Transport and fate;
   B. PCSMs for HHRA; and
   C. PCSMs for ERA
   D. PCSMs for alternative designs

III. Potential Sources

   A. comprehensive discussions of metallurgical processes and expected historical discharges. **(NO further studies are recommended until the comprehensive list of COIs has been determined from this step; otherwise studies will have to be redone in the very near future. Once a comprehensive list of COIs has been developed then the necessary risk-based or technology-limited detection limits have been determined. This must be done using preliminary runs of the HHRA and BERA).**

B. Physical locations of releases (spatial characterization)

C. COIs released (temporal characterization)

IV. Develop Alternative Hypotheses (developed from the CSMs in absence of previous work and/or data)

V. Process to Determine Data Needs and DQOs.

A. As discussed in "II" , above. PCSMs are used as visual accounting tools to determine what studies would be necessary in the absence of all historic data. (Sometimes this dataset is referred to as study needs or data needs; however, we refer to them as study needs herein)

B. DQO's are then derived as per EPA guidance for all of the studies that were identified from the PCSM in the absence of existing or historic data. DQOs, including experimental design parameters, must be developed and specified **prior** to reviewing the existing data, otherwise there is a tendency to attempt to make DQOs "fit" the data. The DQOs are akin to inflexible building codes/blueprints specified by the architect. One must design to meet code, not vice versa. This break in the logical order underlying the scientific process is demonstrated in throughout the draft where data evaluations are being performed prior to developing DQOs.

C. Historic studies and their DQO's are compared to the list of studies and their DQOs determined in "V. B", above.

D. Holidays or study-gaps are identified directly on the PCSM. For example, the surface water to ground water pathway for an OU or an EA does not meet the numerical specifications of being "adequately characterized" over the temporal and spatial scopes specified in the DQOs that were developed for the HHRA.

E. DQOs described in VB may then be altered as per EPA guidance to design the new studies that fill the study gaps. Decisional flow charts (DFCs) are typically employed in this process depicting decisions necessary to each end-user (an example DFC for characterization of sediment for a human health risk assessor is included)

F. Revise PCSM. If there is agreement among technical experts, this is the point where COIs, pathways, and endpoints may be reduced and the PCSMs collapsed.

Perhaps the DQOs are being reserved for the SAP/FSP, but these need to be determined prior to evaluating the data for "usability". Otherwise there is a tendency to attempt to fit the DQO's to meet the existing data.

In summary, DQOs including objectives and decision rules are the "rules to the RI/FS and must be stated and agreed upon by the participating governments prior to attempting to propose work. As such the current draft makes unfounded, premature, judgments on the quality and usability of the data. If reserved for SAP/FSP, then these judgments regarding data quality should be reserved for those documents. However, the Tribe was told, during our last conference call, that this document would contain all of the requisite the DQOs.

The Work Plan for the HHRA and the BERA should be drafted by risk assessors following RAGS and should develop the specifications required to provide a reasonably reliable baseline HHRA (e.g. $UCL95_{(COI,x,y,z,t)}$ for each exposure area). Qualified personnel in other disciplines should use these specifications to determine if existing data can be used to meet these specifications. If existing data do not meet the specifications, experts within each discipline will develop the necessary studies to fill the data gaps—not risk assessors.

Specific Comments

1. Section 1.0, Page 1, Paragraph 1; last sentence:

> *"The Report follows the requirements for scoping a RI/FS as defined in the Guidance for Conducting Remedial Investigations and Feasibility Studies under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (OSWER 9335.3-01)."*

This statement is false. Also the definition of DQOs is a study design-level process and not scoping.

2. Section 1.0, Page 2, Paragraph 1; last sentence:

> *The DQO Report was originally due to U.S. EPA by September 22, 2008, 90 days from the June 23, 2008, effective date of the UAO. U.S. EPA then agreed to extend the DQO Report submittal date to October 22, 2008, to allow **stakeholder** input prior to Report preparation. [emphasis added]*

The public is not involved in this process. Recommend changing "stakeholder" to "participating governments".

3. Section 1.2, Page 2, Paragraph 1; first sentence:

> *"The **process described** in this DQO Report will meet the following objectives:"*

This report should not be intended to describe process. Process is already defined in the EPA DQO guidance. This document is supposed to deliver the necessary information for screening historical data as well as developing new data. This document does not achive any of the listed objectives. See General Comments No. 2

4. Section 1.2, Page 2, Paragraph 1; Bullet 2:

> • *assist in developing a RI/FS strategy to deal with project constraints (time, budget, weather, health and safety, etc.);*

This document does not fulfill this objective.

5. Section 1.2, Page 2, Paragraph 1; Bullet 5:

• assist in developing a strategy for determining the confidence level in the data collected;

Again, this document is suppose to do this, not tell us how this will be done. The confidence level goals required by each end-user must be stated prior to study design. This should occur here and now, not in some later document. Again, this document does not achieve this objective.

6. Section 1.2, Page 2, Paragraph 1; Bullet 6:

"• assist the team in identifying "data gaps.; and"

A process for vetting existing data and determining what that data tells us is required, before we can identify gaps.

7. Section 1.3, Page 2, Entire section:

Why is scoping discussed here?

8. Section 1.3, Page 2, Paragraph 1, Sentence 2:

"The first step begins with the collection and evaluation of existing Site data and the development of the Conceptual Site Models (CSMs) (Figure 2)."

Data must be vetted with the participating governments first.

9. Section 1.3, Page 2, Paragraph 1, Last Sentence:

".. the optimal sequence of Site actions and activities, and the procedures that may be used to streamline the RI/FS process."

If all of this can be done in the scoping-phase, why is the RI/FS needed? See General Comment No. 1.

10. Section 1.4, Page 2, Paragraph 1:

"The U.S. EPA defines the DQO process as "a systematic, iterative, and flexible planning process based on the scientific method." U.S. EPA policy states that:

> *"before information or data are collected on Agency-funded or regulated environmental programs and projects, a systematic planning process must occur during which performance or acceptance criteria are developed for the collection, evaluation, or use of these data."*

Perhaps, however, this document does not accomplish or meet these requirements. Again, reinventing process should not be the intent of this document.

11. Section 1.5, Page 4, Paragraph 1:

> *"Section 2 summarizes background information including the Site history, the primary data sources used to develop the DQOs and the work completed as part of the RI/FS scoping data evaluation in 2007."*

These data and information have not been vetted by the end users or participating governments; therefore, the utility of the data may be limited.

12. Section 2.0, Page 5, Paragraph 1:

> "*This section provides a Site history, presents the primary data sources considered in the DQO development process, and describes the scope and* ***results of the data evaluation conducted as part of the scoping work that was used to prepare the CSMs presented in Section 3."*** [emphasis added]

Data are not required to develop the PCSM. Please explain in detail how the data were used to produce these PCSMs.

13. Section 2.4, Page 7, Entire section:

> *"Consistent with the RI/FS scoping process defined in the National Contingency Plan (NCP), 40 CFR Section 300.430(b),* ***an evaluation of existing data was conducted in 2007*** *to form a basis*
>
> *.*
>
> *.*
>
> *.*
>
> ***Additional detail on the analysis of existing data will be presented in the RI/FS Work Plan."***

The data evaluation/assessment cannot precede development of DQOs. DQOs are the criteria in which one measures the quality and adequacy of the data. See General comment No. 2.

14. Section 2.4.1, Page 8, Paragraph 1, Sentence 2:

> *"An inventory of data from various environmental media was prepared and an assessment of the data for usability in the RI/FS process was conducted."*

The data evaluation/assessment cannot precede development of DQOs. DQOs are the criteria in which one measures the quality and adequacy of the data. See General comment No. 2.

15. Section 2.4.2, Entire water balance including all subordinate headings:

A considerable amount of time and effort is expended on the water balance. The waterbalance or portions thereof are performed in this document prior to development of DQOs. Further it relies on data that have not been evaluated nor vetted. ARCO is building on its house of cards, prior to development of DQOs. DQOs are the criteria in which one measures the quality and adequacy of the data. The data are the information used in the water balance. Again, the logic is lacking. See General comment No. 2.

One necessary outcome of a water balance is to determine the outflow from the ground water to surface water pathway. In the absence of geochemical tracers this is done by deduction. However, the error in precipitation data alone for this site, will overwhelm any attempt to get a reasonable estimate of discharge to surface water (See General Comment no 1).

16. Section 2.4.2.1, Entire Section including Figure 5:

This section would benefit from a conceptual hydrogeologic x-section depicting flow and transport. The text is confusing. For example it is not clear why the distinction is made between on-site and off site. Figure 5 is not useful. The "Inflows" portion of the balance contains discharges (outflows). Ground water outflows are identified as points, when in reality entire reaches are likely gaining in mountainous locations.

17. Section 2.4.2.2, Page 11; Paragraph 2:

> *"A review of the map of mean annual precipitation for California developed by Rantz (1969), based on precipitation measured between 1900 and*

1960, shows the Leviathan Mine Site is falling between the 22.5 and 27.0 inches per year contours, suggesting a much higher mean annual precipitation than that estimated by Brown and Caldwell."

Although not part of a true DQO process, the analysis provided herein is an admission to the faulty reclamation design implemented by Brown and Caldwell.

18. Section 2.4.2.3, Page 14; Paragraph 2; Last Sentence

"As before, measurement error and biases make interpreting the short period of Site data difficult, and use of the 24-hour precipitation estimates from the NOAA Atlas is considered conservative."

The estimates may only be considered conservative in comparison to the site data. There is no basis to know if indeed the NOAA results are conservative.

Many of the other conclusions in this section are unsupported and unfounded

19. Section 2.4.2.4, Page 15; Paragraph 3;

While general average conditions may be estimated from the limited stream flow data set from continuous monitoring at the Site, the period of record ***is not extensive enough*** *to accurately estimate extreme conditions* **[emphasis added.]**

The criteria for all of these "data evaluations" are reserved for the DQO process. Criterion needs to be determined a priori by the hydrologists in a DQO document. See General Comment No. 2.

20. Section 2.4.2.5, Page 16; Paragraph 1; Sentence 1:

"Groundwater discharges to the surface at the Site occur from the Aspen and Delta Seep the mine adit, and the pit and channel underdrains."

Seepage into and out of the stream bottom has been omitted.

21. Section 2.4.2.6, Page 16; Entire section:

The entire section omits preliminary calculations. Again these are not necessary in this document. See General comment No. 2.

22. Section 2.4.3, Page 17; Entire Section:

This entire section is very poor scoping-level verbiage, which omits citations necessary to support conclusions, contains altruisms (e.g. "Depending on the composition of these units at a particular location, they may transmit water."), and is otherwise not useful for specifying DQOs. See General Comment no. 2.

The reminder of section 2.4 is loaded with much more of the same. In order to save time we have not enumerated these concerns, but are willing to discuss them with ARCO/EPA.

23. Section 3.0, Page 34; Entire Section

The detail portrayed in the wire-frame preliminary conceptual site models (PCSMs; Figures 26 and 27) are probably adequate for human and ecological risk assessment planning as long as a single exposure area (EA) is contemplated. However, ARCO has already alluded to on-site and off-site distinctions.

We are only reviewing Figure 26, the HHRA PCSM; however, since the Tribe relies heavily on the ecology as a source of sustenance, it would make more sense to combine these two PSCMs as has been done elsewhere where Tribes are involved. Numerous problems with Fig 26 have been identified. A sampling is provided below:

A. According to the Scenario, all on-site and off-site Washoe future member pathways should be a complete. Again ARCO is making pre-judgment calls on the adequacy of characterization of these pathways prior to development of DQOs (See General Comment No. 2).

B. The potential and pathways need to be segregated into: (1) ingestion, (2) dermal, and (3) inhalation for each for each media.

C. The surface water to sediment pathway (sorption of COIs described in General Comment No. 1 is likely the main contributor to sediment contamination during low-energy times) has been omitted.

D. Sediment to cattle has been omitted.

24. Section 4.0 Entire Section

This entire section is a regurgitation of scoping-level work and should be deleted from the DQO's document. See General Comment No. 2.

25. Section 5.0 Entire Section

This entire section is a regurgitation of scoping-level work and should be deleted from the DQO's document. See General Comment No. 2.

26. Section 6.0 Entire Section

This entire section is a regurgitation of scoping-level work and should be deleted from the DQO's document. See General Comment No. 2.

27. Section 6.0 ; Paragraph 1; Last Sentence:

> *"The identification of the initial remedial actions at this stage will help ensure that data needed to conduct the technical evaluation can be collected as early as possible in the RI/FS process."*

As stated before in previous comment, this approach is inconsistent with the NCP.

28. Section 6.1 ; Paragraph 1; First Bullet:

- *prevent, mitigate, or reduce potential human health and environmental exposure;*

These are not site-specific, quantitative RAOs/PRGs. As discussed above, preliminary runs of the HHRA model will be necessary to determine cleanup goals that are protective (e.g. cumulative HI<1.0 and cumulative R $<10^{-6}$ probability of premature death from cancer) of the Tribe for the different situations as well as method detection limits.

29. Section 7.0 Entire Section

This entire section is a regurgitation of scoping-level work and should be deleted from the DQO's document. See General Comment No. 2.

30. Section 8.1.1, Page 68; Paragraph 1; Sentence 1:

> *Conceptual Model Statement: There are two known discharges that occur in the ACSA; the Upper Overburden Seep and the Overburden Seep (also know as the Aspen Seep).*

The operable work is "known". The ground-water to surface water pathway via stream bed conductance has been omitted (See CSM).

Although not designated as separate OUs, they are being treated as such. Therefore, each OU should have a separate PCSM that can be used as a visual accounting tool (See General Comment No. 2). The Tribe recommends using annotated/highlighted portions of the location-specific PCSM to demonstrate what is being addressed herein. Also, the decisional flowcharts need to be constructed before writing DQOs statements (See General Comment No. 2).

31. Section 8.1.1, Page 68; Paragraph 3; Sentence 2:

> *The overburden piles are known to contain some areas with an* ***increased percentage of pyrite*** *where if water comes in contact with these areas it would likely become impacted.* [emphasis added]

Please specify the criterion used to characterize such overburden as containing "increased percentage of pyrite"...

> *"Where these areas exist at the* ***ground surface*** *they will need to be assessed from a human and ecological health exposure standpoint. Otherwise data collected from the overburden piles and Aspen Creek sampling suggest that the piles as a whole* ***do not represent a current or future exposure concern****."* [emphasis added]

Although pyrite is responsible for generation of acid rock drainage (ARD), pyrite is not a hazardous substance.

32. Section 8.1.1, Page 68; Paragraph 4; Sentence 1:

> *Since the ASB has been operating the quality of surface water in the creek has improved greatly. The current CSM identifies the on-site trespasser as the primary human receptor and potentially aquatic organisms as ecological receptors if the treatment system fails.*

Please specify what is criteria defining improvement. Has this been demonstrated for all times. Again, there is no evidence supporting any of these far reaching statements.

Downstream interests suffer each time the performance of the ASB is diminished. Logic and CSM applied here are flawed.

32. Section 8.1.1, Page 69; Paragraph 1:

> *"Problem Statement: In the past, ARD from the ACSA discharged to Aspen Creek. The discharge is currently captured by the ASB. Since capture began, water quality in the creek has improved. evaluate the long-term effectiveness of the ASB compared to other remedial and mitigation alternatives should be collected."*

Many problem statements have been omitted. An incomplete sampling is provided below:

1. Source of the ground water;
2. Source of runoff/overland flow (pile hydrogeologic characterization);
3. C(x,y,z,t) at seeps and stream beds for all t
4. Hydrogeologic characterization of bedrock and unconsolidated units characterization
5. Prediction on future releases if changes made to system.

Please provide evidence supporting statements claiming improvement of surface water quality for all times (including winter months).

33. Section 8.1.1, Page 69; Paragraph 2:

> *"The necessary resources are available to collect the data needed. Access to the Site is limited due to weather conditions and the majority of the data collection generally needs to occur between June 1 and September 30 of each year. Source and contaminant pathway characterization data are planned to be collected in the ACSA during the first two years of the RI/FS."*

See General Comment No. 1.

34. Section 8.1.2, Page 69; Paragraph 1; Sentence 2:

> *"Each PSQ and the associated AAs are then combined into decision statements (DSs) that express a choice among AAs."*

Recommend using decisional flow charts that enable logic tracking. These tables are not very useful.

35. Table 8-1

> ***"PSQ #1** – Are sufficient data available to construct a water balance for the study area and estimate the primary migration/transport pathways for precipitation falling on the overburden and discharging at Aspen Seep?"*

Why is this question important? Need to relate each question to the PCSM. Again an area-specific PCSM would be handy.

This document needs to define "sufficient" in terms of statistical tolerances.

The temporal component has been omitted. See General Comment No. 1.

> ***"DS #1 –** Evaluate whether sufficient data are available to construct a water balance, or if additional data are needed."*

Statistical evaluation criteria must be specified within this draft. Again this document is guidance-level and of little use at this time. See General Comment No. 2

> ***PSQ #2 –** Does impacted soil, sediment, surface water, or groundwater in the ACSA represent an unacceptable current or future risk to human health or biota and need to be evaluated through further study?*

Standard HHRA benchmarks are not protective of the Washoe Tribe and therefore, this exercise is useless.

> ***PSQ #3 –** Are sufficient data available to estimate COPC distribution in the shallow groundwater and estimate COPC fate and transport (e.g., groundwater elevations, gradients, hydraulic properties)?*

Again, this document needs to define "sufficient" in terms of statistical tolerances dictated by each end user group. Use of DFC would demonstrate that a waterbalance would have to be conducted prior to this endeavor.

> ***DS #3 –** Evaluate whether current data set is sufficient to allow estimation of the COPC plume in shallow groundwater and predict future fate and transport of COPCs in the unconfined aquifer, or if additional data are needed.*

Again, this document needs to define "sufficient" in terms of statistical tolerances dictated by each end user group.

> ***PSQ #4 –** Are sufficient data available to evaluate if remedial actions are necessary and support a feasibility study of relevant remedial action*

alternatives (e.g., range of COPC concentrations, depth and distribution of contaminants, chemical form, aquifer properties)?

Again, this document needs to define "sufficient" in terms of statistical tolerances dictated by each end user group.

36. Section 8.1.3.2, Page 72;

"Analytical performance requirements will be established as appropriate to support decisions regarding site-specific action levels."

See General comment No. 2. Once a comprehensive list of COIs has been developed, the necessary risk-based or technology-limited detection limits can been determined. Again, this must be done using preliminary runs of the HHRA and BERA.

37. Table 8-2

According to the table, ARCO does not believe that any of the of the decisions can be made due to insufficient data. However, "sufficient" has not been defined anywhere within this document.

38. Table 8-3

Again this is an overly generic discussion of the parameters that are necessary to perform a study. The table also omits several pathways and media. See General Comment No. 2

39. Section 8.1.4.2, Page 75;

The spatial boundaries for the ACSA over which these populations will be evaluated is a three dimensional area that is defined in the X – Y plane as a wedge shaped study area, bounded on the northeast and east by Aspen Creek, on the south by the pit wall and the west and northwest along the landslide scarp (Figure 29).

The basis for the geographical scope is not clear. Are these based on drainage basins? If so, how will the fact that ground water basins do not necessarily correspond to surface water drainage basins be resolved?

Need rationale for spatial boundaries. Recommend involving the pre-mining topography and hydrogeology in this discussion. Also the definition of the Geographic Boundary itself is a DQO.

40. Section 8.1.4.3, Page 76

> *Source and contaminant pathway characterization data are planned to be collected in the ACSA during the first two years of the RI/FS. Where possible data collected will provide information on seasonal variability. However, access to the Site is limited due to weather conditions and the majority of the data collection needs to occur between June 1 and September 30 of the year.*

Treatment of ground water will be required year-round. Therefore, it will be necessary to characterize the system over all times of the year. If weather and costs of working in weather precludes us from getting the answer to the question, we must make conservative estimates. Since, the winter months and the freshet hold the data necessary for remedial design and since we will be estimating this, there is no need for doing any new studies. We need to engineer for year-round pump and treat and stop the science fair now. (See General Comment No. 1).

41. Section 8.1.4.5, Page 76; Sentence 2

> *"The "scale of decision making" refers to the smallest unit of area or volume over which data will be collected, analyzed, and interpreted to make a decision (Byrnes, 2008)."*

Need to first define EAs for the target receptors, including humans.

42. Section 8.1.4.5, Page 76; Sentence 2

> ***"For this DQO Report,*** *the scale of decision making has been maintained in general terms" [emphasis added]*

The Tribe asked ARCO during a conference call that preceded release of this draft DQP document, "if this DQO document would contain all of the DQOs or do you envision DQOs developed for each QAPP/SAP/FSP". The Tribe pointed-out that each discipline has different DQOs as described in General Comment No. 2; hence, DQOs are more traditionally developed in the FSP/SAP portions of the project. However, ARCO stated that this DQO document would fulfill all of the necessary requirements and that this document would contain all of the DQO's for the entire project. Now it appears that the DQO's are being pushed back to a later time, perhaps to the individual workplans,

QAPP/FSP/SAP. However, this approach is inconsistent with the UAO and really is not necessary. See General Comment No. 2.

43. Table 8-3:

This table is non-specific and therefore meaningless. See General Comment No. 2.

44. Section 8.1.5; Entire Section:

This section is non-specific and therefore meaningless. See General Comment No. 2.

The drafting of this review ceased on November 5, 2008 at section 8.2, after discussion with EPA where they verbally assured us that DQO's, as defined by EPA guidance, would be deferred to the SAP/FSP portions of the project, diminishing the need for this document.

ATTACHMENT No. 2

AESE DQO worksheet.

Appendix A: DQO Worksheet

Table of Contents

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1.0 Introduction to Data Quality Objectives (DQO) Process

EPA (2000) provides guidance on development of Data Quality Objectives (DQO) for a single study. However, the document does not adequately describe how DQOs for each study are developed using the Preliminary Conceptual Site Models (PCMs). An example is given below in which DQOs for a single study (identified as a box or arrow on the PCSM) is developed in the absence of all existing data. Ultimately these DQO's are compared to existing data to determine if the existing data meet the required DQOs. Shortfalls in the existing data are data gaps in which further study/field work may be necessary.

This Attachment describes the Process for Data Gaps Analysis from a top-down perspective. This attachment contains four sections: Section 1.0 is a brief introduction to the DQO and Data Gap Analyses Processes. Section 2.0 describes how the Data Gaps are identified for and entire project which is comprised of numerous studies that are described by the Conceptual site Model. Section 3.0 describes the data quality objectives (DQO) process, Section 4.0 presents the DQOs for a single medium study (e.g. soil sampling), and Section 5.0 presents the references used to develop this attachment.

2.0 DQOs and the Procedure for Data Gap Analysis

Following the scientific process, every study, being historic or future, being large or small has DQOs driving the study design.

1. PCSM used as visual accounting tool to determine what studies would be necessary in the absence of all historic data (Sometimes called data needs). An example PCSM is depicted in Figure 1. Each box and arrow on the PCSM identifies a medium or flux that requires initial investigation.

2. DQO's are then derived for each and all of these studies. The result of this work are published in a stand alone DQO document. It is worthy to note that several disciplines including, but not limited to Physical scientists responsible for characterizing media for contaminant transport and fate and determining the nature and extent of contamination; human health risk assessors, and ecological risk assessors all likely have different data needs and therefore different DQOs for each medium.

3. Historic studies (and their DQO's, if known) are compared to the freshly derived DQO's in Step 2 to develop necessary studies (sometimes referred to study-gaps) and identify

datagaps. The list of deficiencies are termed Studygaps or datagaps.

5. The DQOs are then used to design the new studies that fill the studygaps and datagaps identified by the different disciplines

6. Studies are conducted

7. The performance of studies are determined by comparing the results to DQOs

3.0 Study-Specific Data Quality Objectives Process

An example for development of a single DQO, for a single study, by the human health risk assessment team, for a single medium (soils in this case) is given below. The example employs a decisional flow-chart to frame the DQO question or problem at hand (Figure 2).

The U.S. Environmental Protection Agency (EPA) DQO process was used to identify the specific needs for the project and to establish decision rules for the collection of soil sampling data. The DQO process is a seven-step iterative planning approach used to prepare plans for environmental data collection activities and is intended to help site managers plan to collect data of the right type, quality, and quantity to support defensible site decisions. The seven steps are as follows:

1.. State the Problem - Summarize the contamination problem that will require environmental data, and identify the resources available to resolve the problem; develop the conceptual site model (See Figures 1 and 2)

2.. Identify the Decision -. Identify the decision that requires environmental data to address the contamination problem (Figure 2).

3.. Identify Inputs to the Decision - Identify the information needed to support the decision and specify which inputs require new environmental measurements (Figure 2).

4.. Define the Study Boundaries - Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision (Figure 2)

5.. Develop a Decision Rule - Develop a logical “if.. . then.. .“ statement that defines the conditions that would cause the decision-maker to choose among alterative actions (Figure 2).

6.. Specify Limits on Decision Errors — Specify the decision-maker’s acceptable limits

on decision errors, which are used to establish performance goals for limiting uncertainty in the data (Figure 2)

7.. Optimize the Design for Obtaining Data - Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQO (This step is not portrayed herein)

4.0 Medium Sampling Plan Data Quality Objectives

This section details the DQOs as they relate to a sampling plan for a given medium at a given site. The section uses the format presented in Data *Quality Objectives Process for Hazardous Waste Site Investigations* (EPA, 2000).

Step 1. State the Problem

1. Identify members of the planning team
2. Identify the primary decision-maker
3. Develop a concise description of the problem
4. Specify available resources and relevant deadlines for the study

Step 2. Identify the Decision

1. Identify the principal study questions.
2. Define alternative actions that could result from resolution of the principal study questions.
3. Combine the principal study questions and the alternative actions into a decision statement
4. Organize multiple decisions

Step 3. Identify Inputs to the Decision

1. Identify information that will be required to resolve the decision statement
2. Determine the sources for <u>each</u> <u>item</u> <u>of</u> <u>information</u> required
3. Identify the information that is needed to establish the action level

4. Confirm the appropriate measurement methods exist to provide the necessary data

Step 4. Define the Boundaries for the Study —

1. Specify the characteristics that define the population of interest

2. Define the spatial boundary of the decision statement

3. Define the temporal boundary of the decision statement

4. Define the scale of decision-making

5. Identify practical constraints on data collection

Step 5. Develop a Decision Rule

1.. Specify the statistical parameter that characterizes the population of interest.

2. Specify the action level for the study

3. Develop a decision rule (an "if. . . .then...." statement)

Step 6. Specify Tolerable Limits on Decision Errors

1. Determine the range of the parameters of interest

2. Identify the decision errors and choose a null hypothesis

3. Specify a range of possible values of the parameter of interest where the consequences of decision error are relatively minor

4. Assign probability values to points above or below the action level that reflect the tolerable probability for the occurrence of decision errors.

Step 7. Optimize the Design — Soil Sampling Program

1. Review the DQO outputs and existing data

2. Develop general data collection design alternatives

3. Formulate the mathematical expressions necessary for each design alternative

4. For each data collection design alternative, select the optimal size that satisfies the DQOs

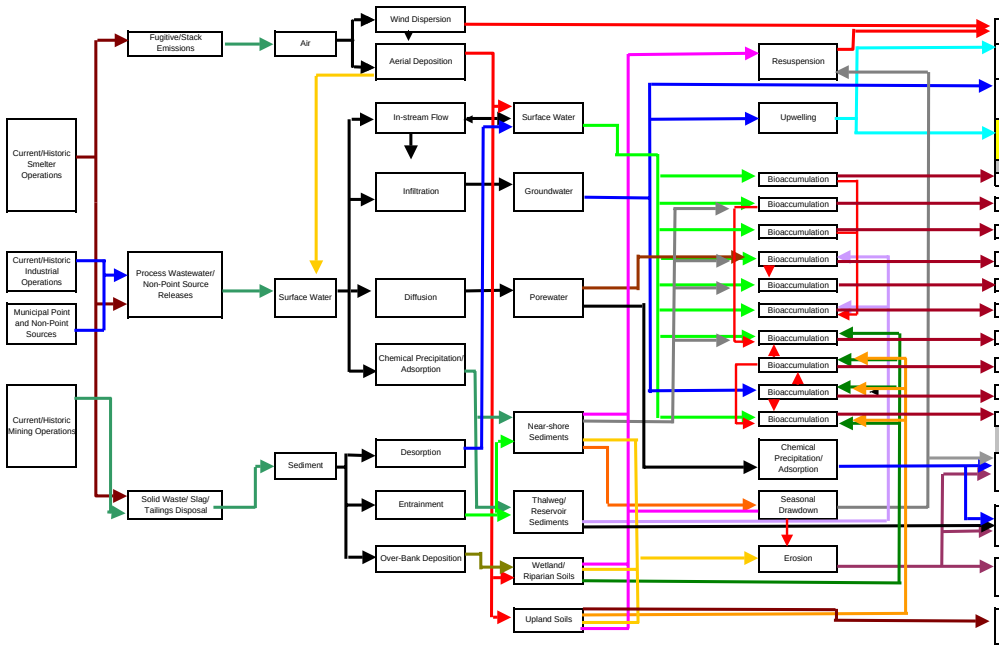
5. Select the most resource-effective data collection design that satisfies the DQOs

6. Document the operational details and theoretical assumptions of the selected design in the sampling and analysis plan

5.0 References Cited

U.S. EPA, 2000, Data Quality Objectives Process for Hazardous Waste Site Investigations EPA QA/G-4HW Final, EPA/600/R-00/007 January 2000.

Figure 1. Example Preliminary Conceptual Site Model for a Generic Lacustrine/Riverine Site in the Western U.S. The basic interaction between ecological and human receptors (Native Americans or others who rely heavily on site resources) are also depicted.



LEGEND

= Exposure Pathway Complete

= Possibly complete exposure pathway, but likely not significant or insufficient data for analysis

= Incomplete Exposure Pathway

N = Pathway Not Applicable

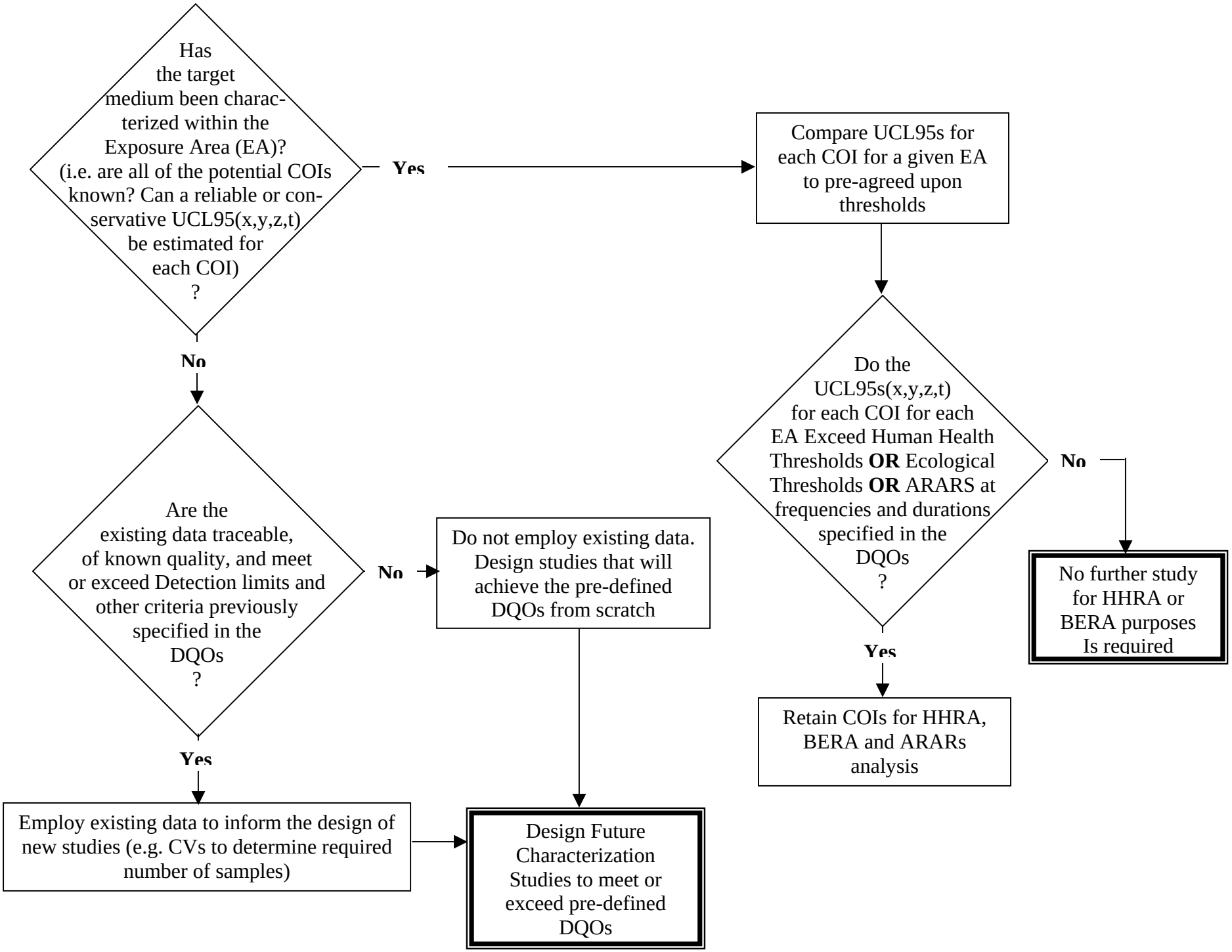
Red outlined columns are dominant HH media/pathways

1. By definition, porewater IS groundwater. (No need to add more confusion of terms.....Clean Porewater Act?)
2. Upon death, Receptor contributes, as solid-phase and liquid-phase detritus to the dietary, dermal, and incidental ingestion pathways....dietary is probably of importance
3. Chemisorption onto external organic material
4. Inhalation of COCs contained in media via Sweatlodge pathway

Pathways required for HHRA as well as FS remedial design (ultimate remedial design will hinge on ability to discriminate between the source of Dose to fish i.e. sediment or surface water)

Fish	Respiration (Gill)
	Diet
	Sediment Incidental Ingestion
	Dermal

Figure 2. Example Decisional Flow Chart (DFC) for characterization of a given medium (represented as a single "Box" in a wire-frame style preliminary conceptual site model (PCSM). The DFC, along with predefined DQOs, the PCSM, and Existing Studies/data (that have been evaluated to determine if they meet the predefined DQOs) are the basis for Data Gaps or Study gaps Analyses. In other words, The DFC, along with predefined DQOs, the PCSM defines what is needed (in the absence of any data): Existing Data are what we have. Datagaps are the shortfalls in the ability of Existing Data to meet the DQOs (or data needs).


Has the target medium been characterized within the Exposure Area (EA)? (i.e. are all of the potential COIs known? Can a reliable or conservative UCL95(x,y,z,t) be estimated for each COI) ?
Yes
Compare UCL95s for each COI for a given EA to pre-agreed upon thresholds
Do the UCL95s(x,y,z,t) for each COI for each EA Exceed Human Health Thresholds **OR** Ecological Thresholds **OR** ARARS at frequencies and durations specified in the DQOs ?
No
No further study for HHRA or BERA purposes Is required
Yes
Retain COIs for HHRA, BERA and ARARs analysis
No
Are the existing data traceable, of known quality, and meet or exceed Detection limits and other criteria previously specified in the DQOs ?
No
Do not employ existing data. Design studies that will achieve the pre-defined DQOs from scratch
Yes
Employ existing data to inform the design of new studies (e.g. CVs to determine required number of samples)
Design Future Characterization Studies to meet or exceed pre-defined DQOs