

Atlantic Richfield Company

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April 23, 2010

Mr. Tom Dunkelman
On-Scene Coordinator
U.S. Environmental Protection Agency - Region 9
75 Hawthorne Street, SFD-8-2
San Francisco, California 94105

Subject: Response to EPA Comments dated March 22, 2010 on the Draft Transite Pipe Removal Action Plan dated January 8, 2010 and Submittal of a Supplemental Scale Sampling and Analysis Plan; Yerington Mine Site, Lyon County, Nevada: Administrative Order on Consent, EPA Docket No. 09-2009-0010

Dear Mr. Dunkelman:

Atlantic Richfield Company (ARC) has prepared the attached responses to comments provided by the U.S. Environmental Protection Agency - Region 9 (EPA) on March 22, 2010 for the draft Transite Pipe Removal Action Plan (draft RAP) for the Yerington Mine Site (Site) dated January 8, 2010. The transite pipe removal action is required by the Administrative Order on Consent and Settlement Agreement for Removal Action and Past Response Costs and associated Scope of Work (AOC/SOW; EPA Docket No. 09-2009-0010). The attached responses reflect two technical meetings held on April 8 and 13, 2010 (the latter was conducted on the Site) between ARC, EPA and representatives from the Nevada Division of Environmental Protection and the Nevada Department of Health and Human Services (NDHHS). The attached responses to EPA comments address issues presented by EPA with respect to the collection of data to support the removal action and operation of the on-Site landfill, and issues associated with the format of the RAP.

Also attached is a draft Supplemental Scale Sampling and Analysis Plan (SAP), discussed during the on-Site meeting held on April 13, 2010. The draft SAP contains a planned submittal for a revision to the draft RAP of July 9, 2010. The revised RAP will include the results of the additional scale sampling, which ARC will immediately implement upon written approval of the SAP by EPA, and an updated decision tree with a gamma survey action level. Per recent discussions with EPA, the 15 pCi/g of radium 226 previously established as the Site-specific ARAR will be replaced by a value of 5 pCi/g of radium 226 (this change is discussed in a number of the attached responses to comments).

Also, in keeping with the fact that copper ores were "beneficiated" at the Site, and not "processed" on-Site and pursuant to 40 CFR 261.4(b)(7), the following responses to comments and text of the attached SAP will use the term "ore beneficiation solutions" to avoid further confusion. ARC plans to use this term in future work plans and data summary reports that include a discussion of solutions associated with dump, heap and vat leaching, solvent extraction and electrowinning, and milling associated with the beneficiation of sulfide ores, and the wastes derived from these solutions.

ARC appreciates the opportunity to discuss EPA's comments, the development of the draft SAP and the issues to be addressed in a revised RAP over the last two weeks. As recently discussed with EPA, both parties desire to improve the work flow process for work plans, reports and other documents required under the AOC and the Administrative Order for the Remedial Investigation and Feasibility Study (RI/FS; EPA Docket No. 9-2007-0005). ARC believes the approach taken for the RAP since receiving EPA's March 22nd comments is a good example of improving work flow efficiency.

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Mr. Tom Dunkelman
April 23, 2010
Page 2 of 2

If you have any questions regarding the attached responses to comments and/or draft SAP, please feel free to contact me at (714) 228-6774 or via e-mail at jack.oman@bp.com.

Sincerely,



Jack Oman
Project Manager

cc: Nadia Hollan Burke, EPA
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Matt Arno, Foxfire Scientific
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Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

EPA General Comment #1: The discussion in Section 1.1 Waste Materials and Management is insufficient. There is no discussion of whether any of the pipe or scale constitutes a RCRA hazardous waste. This issue needs to be resolved with an adequate amount of representative sampling to demonstrate that neither the pipe nor scale constitute a RCRA Characteristic waste. EPA recommends that ARC collect a representative number of pipe and scale samples from each identified Homogeneous Area (HA) and make a determination of whether the pipe or scale constitute a RCRA waste.

ARC Response: Prior to the submittal of the draft RAP, ARC's review of applicable, relevant and appropriate requirements (ARARs) established that the transite pipe and scale (where scale is present) are not hazardous wastes, and a hazardous waste determination is not required for the removal action (i.e., the transite pipe is not corrosive, ignitable, reactive, etc.). As stated in the draft RAP, accumulations of loose scale in the pipe will be treated as mixed asbestos-TENORM waste. Federal regulations classify asbestos-containing materials (ACM) as a solid waste, but not a hazardous waste. In Nevada, friable asbestos waste is subject to regulations concerning handling, transportation, record-keeping, notification and disposal per the Nevada Administrative Code (NAC) 444.965 through 444.976. Scale or absorbed materials, if any, in the transite pipe are not hazardous wastes because such materials are explicitly excluded per 40 CFR 261.4(b)(7):

"(7) Solid waste from the extraction, beneficiation, and processing of ores and minerals (including coal, phosphate rock, and overburden from the mining of uranium ore), except as provided by §266.112 of this chapter for facilities that burn or process hazardous waste:

- (i) For purposes of §261.4(b)(7) beneficiation of ores and minerals is restricted to the following activities; crushing; grinding; washing; dissolution; crystallization; filtration; sorting; sizing; drying; sintering; pelletizing; briquetting; calcining to remove water and/or carbon dioxide; roasting, autoclaving, and/or chlorination in preparation for leaching (except where the roasting (and/or autoclaving and/or chlorination)/leaching sequence produces a final or intermediate product that does not undergo further beneficiation or processing); gravity concentration; magnetic separation; electrostatic separation; flotation; ion exchange; solvent extraction; electrowinning; precipitation; amalgamation; and heap, dump, vat, tank, and in situ leaching."

ARC discussed the applicability of the Bevill Amendment to the transite pipe with EPA and NDEP/NDHHS representatives (Evan Chambers of NDEP on April 8, 2010 and Eric Matus of NDHHS on April 13, 2010) who unequivocally supported ARC's position that the transite pipe and associated asbestos-containing materials are subject to the Bevill Amendment and are not RCRA hazardous wastes. In addition, pursuant to EPA's request in an e-mail dated April 20, 2010 to address step-by-step questions presented on the following EPA Bevill Amendment training website (<http://www.epa.gov/oecaerth/assistance/sectors/minerals/processing/bevillquestions.html>), ARC provides answers to the questions at the end of these responses.

In keeping with the fact that copper ores were "beneficiated" at the Site, and not "processed" on-Site and pursuant to 40 CFR 261.4(b)(7), the following responses to comments and text of the attached Supplemental Scale Sampling and Analysis Plan will use the term "ore beneficiation solutions" to avoid further confusion. This term will also be used in future work plans and data summary reports that include a discussion of solutions associated with dump, heap and vat leaching, solvent extraction and electrowinning, and milling steps associated with the beneficiation of sulfide ores, and the wastes derived from these solutions.

EPA General Comment #2. The discussion in Section 1.1 Waste Materials and Management is insufficient. The following statement is made on p. 2. "Because the State of Nevada does not have regulations applicable to TENORM, the 15 pCi/g bulk concentration criterion from the adjacent State of Utah was selected ..." This statement is not correct. Please see NAC 459.180 through 459.314, Licensing of Radioactive Material. There are two sections here which are particularly relevant.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

NAC 459.182 Exemptions for source materials. ([NRS 459.201](#))

1. Any person is exempt from [NAC 459.180](#) to [459.314](#), inclusive, to the extent that he receives, possesses, uses, owns or transfers source material in any chemical mixture, compound, solution or alloy in which the source material is by weight less than 0.05 percent of the mixture, compound, solution or alloy.

NAC 459.184 Exemption for certain concentrations and quantities of radioactive material other than source material. ([NRS 459.030](#), [459.201](#))

1. Except as otherwise provided in subsection 2, any person is exempt from [NAC 459.180](#) to [459.314](#), inclusive, to the extent that he receives, possesses, uses, transfers, owns or acquires products or materials containing:

- (a) Radioactive material in concentrations not in excess of those listed in [NAC 459.186](#); or
- (b) Naturally occurring radioactive material that contains less than 5 picocuries of radium 226 per gram of material.

Please discuss how these NAC sections impact the conclusions of the RAP, both in terms of onsite and offsite disposal of the transite pipe. EPA will provide a copy of a spreadsheet (provided by NV State Radiological Health) that can be used to determine source material concentration. It is EPA's belief that transite pipe or scale exceeding either of the above requirements (source material is by weight more than 0.05 percent of the mixture, compound, solution or alloy; or radium 226 in excess of 5 picocuries per gram) must be disposed of at an appropriate offsite facility.

ARC Response: Per discussions with Eric Matus of the Nevada Department of Health and Human Services (NDHHS) on March 16, 2010, NDHHS's concern from a licensing perspective is not a point exceedance of 5 pCi/g of radium-226, but the average concentrations over transite pipe sections "used for the same purpose". ARC interpreted this to be the average concentration within each homogeneous area (HA) and that, based on the collected data, the average concentrations in all HAs will be below the EPA-proposed ARAR of 5 pCi/g of radium-226. ARC also recognizes that individual pipe sections within HA-4 and HA-1 may have a bulk concentration that exceeds 5 pCi/g of radium-226 (e.g., sampling of the transite pipe conducted per the EPA-approved work plan determined that the bulk concentrations of radium-226 in all but two samples were less than 5 pCi/g), and has addressed this in the draft RAP with the planned implementation of the field screening decision tree. The decision tree was developed on the basis of the radiochemical analytical and radiometric survey results, and will allow individual transite pipe sections to be characterized and conservatively managed in accordance with the EPA-proposed ARAR of 5 pCi/g of radium-226. During the Site visit/meeting held on April 13, 2010, ARC agreed with EPA and NDHHS that: 1) a revised decision tree should be included in the revised RAP; 2) radiometric readings will be used to determine the dispositioning of the transite pipe and associated asbestos solid waste materials (i.e., gamma surveys will determine if the pipe is below or above the Site-specific ARAR); 3) average concentrations would be based on long pipe runs used for the same purpose; and 4) transite pipe that exceeds the Site-specific ARAR will be disposed at an appropriate off-Site facility in accordance with the EPA-approved RAP unless EPA agrees to allow temporary on-Site storage of such pipe pending its consolidation with other TENORM wastes destined for off-Site disposal.

EPA General Comment #3. The RAP has not sufficiently identified appropriate offsite disposal facilities which can accept transite pipe or scale which exceeds the above identified regulatory criteria, including applicable RCRA waste criteria. The RAP should identify what levels these facilities can accept, their analytical requirements for acceptance, transport and packaging requirements, transportation and disposal costs, etc. The RAP should also identify any licensing requirements that may be necessary to dispose of material at these facilities, and whether any CERCLA exemptions exist with regard to licensing.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

ARC Response: As described in the draft RAP and previously discussed with EPA, ARC's intention has been to: 1) defer this evaluation until other radiological materials on the Site have been characterized (e.g., the Process Areas radiological characterization removal action activities); and 2) mixed asbestos-TENORM wastes identified for off-Site disposal will be segregated and stored pending completion of any radiological removal action(s) in the Process Areas. However, as a result of clarification provided by NDHHS, only a limited storage period can be accommodated without licensing the Site for storing TENORM. ARC will discuss this further with EPA and NDHHS, but will identify appropriate off-Site repositories in the revised RAP.

EPA General Comment #4. The RAP has not sufficiently characterized the radiochemistry of the scale. While numerous samples of pipe and scale were collected, only three samples of scale only were collected, and two of these samples exceed the regulatory criteria cited above (see EPA General Comment #2). EPA believes that the scale samples (as opposed to samples of both scale and pipe combined) will determine the appropriate disposal requirements. In addition, the analytical methodology for the radiochemical analyses is flawed as the samples were not adequately prepared (ground and homogenized) prior to analysis. As described in subsequent comments, a representative number of scale samples should be collected and analyzed using appropriate sample preparation procedures.

ARC Response: The EPA-approved Transite Pipe Removal Action Work Plan - Revision 1 (Work Plan) dated August 19, 2009 did not specify that separate scale samples would be characterized, which was intentional and appropriate because waste disposal is not based on the characteristics of a (very) small portion of a waste stream. For example, any waste sent off-Site (e.g., Energy Solutions, Deer Park, Clean Harbors or other location), the disposal facility would require waste characterization in terms of the overall waste stream (i.e., the total mass, total radioactivity and bulk concentration of radiochemicals). However, as a result of the April 13, 2010 Site visit and meeting, ARC will collect additional scale samples per the attached draft SAP.

As discussed in Section 4.2 of the RAP, sample aliquots for gamma spectroscopy were selected by breaking up the submitted sample into smaller pieces and visually selecting those pieces that represented the bulk sample for counting. This method used approximately 40% of the submitted sample (200 grams of an approximately 500 gram submitted sample), and was determined by the analytical laboratory to constitute a representative portion of the submitted sample. Three scale samples were collected by ARC on its own initiative to serve as an upper bound of concentrations of Ra-226 that may be observed. These three scale samples also provided an initial estimate of the concentrations of asbestos-TENORM waste that will result from any limited decontamination activities that occur. As described in the draft RAP, two of the three scale samples (both from HA-4) contained friable ACM that could not be physically separated from the scale, and the one relatively pure scale sample was obtained from HA-1. These locations were selected as those exhibiting the highest radiochemical concentrations and survey results. These samples also provide an initial estimate of the concentrations of asbestos-TENORM waste that will result from any limited decontamination activities that may occur during the removal action. Other locations are anticipated to contain radiochemical concentrations in any removable scale that is less than these locations. No laboratory issues for the analyses of the scale samples were identified.

Also presented in Section 4.2 of the draft RAP was the fact that the thorium and uranium concentration data based upon the more reliable analytical method (i.e., gamma spectroscopy data were more reliable than mass spectrometry) were used for the evaluation and conclusions presented in the RAP. Regardless, the issue of sample preparation does not impact the evaluation of radium-226 since the sample preparation issues concerned the ICP-MS-based data and not the gamma-spectroscopy-based data. Since the pipe disposal decision tree is based solely on the radium-226 concentrations, it is not impacted by this issue.

As described in the attached draft SAP, the additional scale samples to be collected will be analyzed by a laboratory (Eberline) that was mutually agreed upon during the April 13, 2010 Site visit and meeting with EPA and NDHHS. This lab has the capacity to grind and homogenize scale samples that may contain asbestos. Also, as noted in the draft SAP, this lab has not been pre-qualified by ARC and may not be entirely consistent with the Site-Wide Quality Assurance Project Plan (QAPP - Revision 5) requirements.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

EPA General Comment #5. Neither the *Draft Transite Pipe Removal Action Plan* nor the *Transite Pipe Removal Action Work Plan* sufficiently describes an adequate correlation study to determine an appropriate action level in microrentgen per hour (microR/hr) or counts per minute (cpm) that represents an exceedance of regulatory requirements. In general, EPA believes that ARC's reliance upon an attempt to establish a correlation between radiochemistry data and field survey data is flawed and will not ultimately result in a workable procedure to properly assess and dispose of the transite pipe. Instead, EPA believes that ARC needs to focus on a process based on radiochemistry data rather than correlated field survey data. For each Homogeneous Area (HA), ARC should identify (and clearly describe) a representative number of composite samples that would be necessary to characterize the scale in the pipe. After proper radiochemical analyses, the result should then be compared to the appropriate NAC requirements to determine whether the scale and pipe can be disposed of onsite or offsite. In the event that the results are below the NAC requirements, the pipe and any scale could be disposed of at an onsite landfill that is appropriately sited, designed and permitted. In the event that the results are above the NAC requirements, then ARC would need to identify subsequent options. These options could include additional sampling and analyses to identify the contaminated pipe sections, removal of scale and resampling, or simply deciding on offsite disposal of all pipe segments from that HA.

ARC Response: As discussed in Section 4.4 of the draft RAP, a quantitative correlation of alpha/beta or gamma survey results to radiochemical concentrations is limited because the great majority of analytical data indicates low levels of radiochemical concentrations and a lack of results spanning the range of interest (i.e., Ra-226 concentrations from 5 to 25 pCi/g). This statement would be true for an action level of 5 or 15 pCi/g of radium-226. Per the April 13, 2010 ^{Site} visit and meeting with EPA and NDHHS, gamma survey readings and the revised decision tree presented in the attached SAP, will be used to determine if pipe sections or loose/broken materials will be suitable for on- or off-Site disposal (i.e., below or above the revised Site-specific ARAR of 5 pCi/g of Ra-226, respectively).

EPA General Comment #6: Neither the *Draft Transite Pipe Removal Action Plan* nor the *Transite Pipe Removal Action Work Plan* sufficiently describes the procedure/technique (detector orientation, static or scanning, count time, minimum detectable concentration (MDC), etc.) used to collect microR/hr and cpm measurements from the transite pipe; see EPA General Comment # 5 above.

ARC Response: ARC appreciates this comment and, in both documents, considered the details for taking radiation measurements to be an industry-standard approach that would be recognized by EPA. Thus, this detail was not provided in the Work Plan. Also, EPA did not request this level of detail prior to approving the Work Plan, and ARC assumed that the EPA reviewer(s) considered it to be unnecessary. However, ARC will add this level of detail in the revised RAP and draft SAP.

EPA General Comment #7: The RAP repeatedly refers to average values for radionuclides yet the sampling was very limited in extent. With such severe limits on sampling; only on easily assessable ends and very diluted with other materials, analysis of the scale was at best qualitative. Subsequently, interpretation requiring quantitative values is inappropriate. An appropriate conclusion for this data could include: *Significant levels of radionuclides are associated with the pipe at multiple locations*. Without more concise sampling to quantify this issue, analysis is not possible from easily accessible open ends of what may be long runs of pipe and discussion of quantity, including average quantity, is not possible with the methods developed for and provided in this report. Additionally, Section 4 is inherently flawed by the quality of the data collected. Unfortunately, this results in all subsequent sections of the work plan now not being supported by the generated data. The study performed to support this RAP is useful in that the presence of significant levels of radionuclides were found at multiple locations for the transite pipe, but plans for disposal are generally based on insufficient data.

ARC Response: ARC strongly disagrees with EPA's assertion that the sample collection and subsequent analysis was inherently flawed and that significant levels of radionuclides were found at multiple locations, and believes this comment was addressed during the April 13, 2010 Site visit. EPA was able to see visually observe, and take radiometric readings at, a number of locations within HA 1, -2 and -4 that demonstrated the limited and isolated occurrences of scale with radiochemical concentrations that have the potential to exceed the revised Site-specific ARAR of 5 pCi/gm.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

The EPA-approved sampling approach was conducted in the manner and in the locations described in the Work Plan, which is consistent with industry standards for transite pipe inspections, per 40 CFR Section 763.86. Sampling was conducted in locations that could be accessed without using invasive means, with the objective of limiting the potential to generate and/or release friable asbestos, and the collected samples were not diluted with other materials.

As indicated in the response to general comment #4, waste disposal is not based on the characteristics of a small portion of a waste stream. For any waste sent to an off-Site location (Energy Solutions, Deer Park, Clean Harbors or other), the disposal facility would require the characterization of the waste in terms of the overall waste stream (i.e., the total mass, total radioactivity, and bulk concentration of radiochemicals). The Work Plan was designed to collect this type of information. An evaluation of only the scale, separate from the overwhelming majority of the waste stream, would not serve this purpose. As described in the draft RAP, weathering of the transite pipe extensive enough to result in significant formation of scale that could be removed from the pipe interior was not observed and is not believed to have significantly impacted the bulk concentration of any radiochemicals. Regardless, any weathering would not impact the correlation of the radiochemical sampling results with the radiation surveys since the surveys measured radiation levels from the weathered sections and still correlate with the actual radiochemical concentration.

Additional gamma survey readings were taken along the length of pipe sections, and no increases of radiation levels with increasing distance from an opening in the pipe sections were noted, indicating that weathering or scale formation within the interior of the pipe sections had not occurred. Visual examination of the sampling locations during sampling activities did not observe any instances where sufficient windblown dust was present to significantly impact the radiochemical concentrations. The presence of windblown dust, if visible at all, was limited to a thin layer of dust not even sufficient to obscure the pipe surface beneath the dust. Each sample collected was analyzed quantitatively in accordance with the EPA-approved Work Plan to determine the bulk concentration of radiochemicals. These quantitative data, coupled with the radiometric survey results, supports the following conclusion: *"Elevated levels of radiochemicals were associated with the pipe at only two locations within the seven HAs inspected and sampled (HA-1 and HA-4)"*.

As indicated above, and specified in the EPA-approved Work Plan, no attempt was made to quantify by radiochemical analysis what may be in long runs of transite pipe. Quantification of the radiological character within the long runs of pipe will be accomplished during the removal action in accordance with the decision tree, which was specifically developed to resolve the issues raised in this comment. ARC strongly believes that the radiochemical and radiological data collected in accordance with the EPA-approved Work Plan is defensible, and supports the decision tree developed to further characterize manage all transite pipe sections and associated loose materials during the removal action. ARC anticipates that this belief will be further supported by the results of the attached draft SAP.

EPA General Comment #8: While survey (gamma, alpha/beta) and radiochemical (Th-232, U-238) results are tabulated and extensively discussed, only brief discussions and summary tables are presented for Ra-226 and Ra-228. Please explain this apparent inconsistent treatment between these isotopes. Furthermore, there should be more analysis of data presented in Appendix E, within the body of the report.

ARC Response: Thorium and uranium results were discussed in greater detail due to the issues that were discovered with laboratory sample preparation techniques. The radium-226/228 sample analysis did not have the same issues and thus were not discussed as extensively. The Ra-226 concentration is the key criterion for dispositioning the transite pipe. The radium-226 concentrations are presented in Tables 4-7 through 4-11, and are the subject of the discussion in the text after Table 4-11.

EPA General Comment #9: Upon review, it is not stated whether ARC believes their initial sampling approach was sufficient to adequately characterize asbestos or radiochemical concentrations within each HA. Please review characterization data, including data variability, and your characterization results against acceptable industry standards, statistical criteria and/or other Federal or state requirements to conclude that ARC has/has not completely characterized these wastes prior to placement into an onsite landfill. This should included detailed discussion of the "uniquely associated" determinations rendered by ARC for the RCRA waste regulation/exemption of the transite pipe intended for disposal. EPA requests that this discussion be clearly presented in Section 1.0 of the RAP.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

ARC Response: Per our meeting and Site visit on April 13, 2010 and the anticipated results expected from implementing the draft SAP, the revised RAP will adequately address this comment. See ARC's response to general comment #1 regarding RCRA exemption for this waste.

EPA Specific Comment #1, Section 1.0, Page 1: Per Section 3.0 (Removal Action Plan) of the August 19, 2009 Removal Action Work Plan, the results of the ACM inspection program and characterization data would result in the preparation of a supplemental RAP, presumably to serve as a supplement to that section of the work plan. It is recommended that the January 8, 2010 RAP be revised to comply with this portion of the work plan.

ARC Response: The draft RAP subject to this comment was presented as a stand-alone document, as described in the Work Plan.

EPA Specific Comment #2, Section 1.0, Page 1: The plan states that "The removal action will be performed for transite pipe and associated materials located on the accessible portions of the Site" and then later states "Transite pipe occurs within five of the eight Operable Units". This should clarify that additional transite pipe may occur in less assessable areas or be found as part of a utility system component survey. A reviewer could be misdirected to believe that this plan will result in the removal of all transite materials.

ARC Response: The revised RAP will clarify this.

EPA Specific Comment #3, Section 1.2, Page 2: This section should also discuss the follow-on work that was completed by ARC during November 24, 2009 and that this work occurred without EPA oversight.

ARC Response: The revised RAP will describe that the three scale samples were collected outside the scope of the approved work plan. As discussed in the attached draft SAP, additional scale sampling will take place following EPA approval. ARC will inform EPA of the timing of the additional scale sampling and, if EPA wishes to provide oversight, ARC will arrange for such oversight.

EPA Specific Comment #4, Section 1.2, Page 3: The last paragraph states "Section 5.0 presents the updated plan for the removal action, in part based on the field..." It is recommended that this discussion be expanded to include other criteria used to develop the updated plan for removal action.

ARC Response: The intent of Section 1.2 was to give the reader an understanding of the basic layout of the document, and the basis for the removal action was presented in Section 5.0. ARC will eliminate the level of detail that was provided in Section 1.2 in the revised RAP.

EPA Specific Comment #5, Section 2.0, Page 4: The bulleted summary differs from the work plan, with the HA-4 discussion referencing scattered transite pipe materials (not referenced in the work plan) and the work plan identifying a "few friable" pipe sections within the RCA. For HA-5, the work plan description for this area defines its boundary as also extending between the Process Area and southern Sulfide Tailings Area. Please ensure that the descriptions are consistent between the plans and if differences exist; clearly explain these differences, why they occur and when they were discovered.

ARC Response: The HA descriptions in the Work Plan and draft RAP were not intended to provide complete descriptions of the contents of each HA, but were intended to provide brief descriptions of these areas (the use of the word "includes" in the bullet lists). The CAS inspection report (Appendix D of the draft RAP) provides details of inspected and sampled transite pipe and associated materials in each HA, lengths and diameters of the inspected pipe, and the estimated volumes of broken pipe and ACM debris to support the basis for the on-Site landfill cell design.

EPA Specific Comment #6, Section 2.1, Pages 5-6: This section is specific to ACM sampling and should be identified accordingly. The statement "Sample locations, type of characterization performed and pipe descriptions is not accurate. Inspection and sampling criteria (Work Plan, Section 2.0) is generally discussed, but should be reiterated in tabular form to display the total linear (or square) footage for each HA that was sampled and the corresponding number of samples planned and obtained for each. In this manner, compliance with work plan requirements would be more clearly illustrated.

ARC Response: The revised RAP will clearly demonstrate that the Work Plan objectives and requirements were achieved, pursuant to this comment and the additional scale sampling described in the attached draft SAP.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

EPA Specific Comment #7, Table 2-1: Table 2-1 is incorrectly labeled as it also contains a summary of coated metal and concrete pipe samples. It is recommended that the title be revised to reflect all sampled materials, or that the sampled coated metal and concrete pipe materials be included in a separate table. Table 2-1 also lacks considerable information relevant to the characterization, including; NR – not defined, approximate volume of ACM characterized/sample (per AEHRA requirements and to corroborate Section 2.3 statements), incomplete or missing comment discussions. Given that ARC is proposing to land dispose at least a portion of these materials in an onsite landfill, EPA expects a complete and detailed discussion of all sample locations.

ARC Response: The revised draft RAP will address the various elements presented in this comment.

EPA Specific Comment #8, Section 2.4, Page 12: ARC states that the radiometric survey would "...fulfill the function described in Section 2.2.4 of the MARSAME Manual; EPA, 2009". It is recommended that ARC determine whether or not the survey fulfilled these requirements and specifically state that the work did or did not fulfill the function described in Section 2.2.4 of the MARSAME Manual.

ARC Response: The intent of this discussion was to point out that the use of surrogate measurement data, or non-radionuclide-specific measurement methods, is recognized as an acceptable approach for characterization. This is the approach agreed to during the April 13, 2010 Site visit and meeting between EPA, ARC and NDHHS. The revised RAP will address this comment and support the referenced statement.

EPA Specific Comment #9, Section 2.4, Page 12: It is stated that "The majority of the measurements were taken at intervals...and holes or breaks in intact pipe" and "Where pipe segments had terminated...interior of the pipe, a gamma..." Please expand this discussion to indicate whether or not debris/scale was observed at the sampled locations and define what "the majority" relates to, or if this information is described elsewhere in the RAP, provide a reference to that location in this portion of the RAP.

ARC Response: The field notes contained in Appendix B document where scaling was observed. Section 4 of the draft RAP will be revised to provide a table indicating where the scaling was observed. Survey measurements were made at 101 locations. Samples were collected at 23 of these locations. Thus, "the majority," the other 78 measurements, were collected at the locations as described in this section. The field notes contained in Appendix B document where the survey measurements were made. The revised draft RAP will: 1) address the elements of this comment with expanded details and references to other portions of the RAP (i.e., the appendices that provide the requested information); and 2) include the analytical results of scale samples collected pursuant to the attached draft SAP.

EPA Specific Comment #10, Section 2.4, Page 12: Interior radiation measurements will be influenced by the shielding affects of the transite pipe wall, thus the determination of background values from uncontaminated pipes should be determined for each instrument.

ARC Response: Background subtraction is not proposed for the field evaluation of the interior radiological measurements of the pipe sections during the removal action. Therefore, the determination of the background from an uncontaminated pipe is not relevant.

EPA Specific Comment #11, Section 2.4, Page 13: ARC states "...ACM samples and were collected in a manner suitable for determining radiochemical concentrations..." EPA requests that ARC describe the "manner" suitable for determining radiochemical concentrations because this discussion is unclear. Further, please also discuss where pipe interiors were scoped with the pancake monitor. Also, this sentence concludes with "...scale and deposits, where applicable, on the inner pipe wall)" Would it be more appropriate to state "...scale and deposits, if present, on the inner pipe wall)"? Please also indicate where these scale deposits were located.

ARC Response: The intention of the sample collection effort was to determine bulk radiochemical concentrations. A typical length of transite pipe that is 13 feet long, 12-inches interior diameter and 1-inch thick weighs approximately 500 pounds. Based on observed occurrences of scale on the interior walls of the pipe, the scale would only weigh a small fraction (i.e., less than 1 percent) of bulk mass of the pipe section. Therefore, and in conjunction with ARC's responses to the relevant general comments presented above, measurements of the concentration exclusively in the scale are not relevant to waste disposal. For waste disposal, the relevant concentration is the total activity divided by the total mass of the waste stream (i.e., the bulk concentration). The sample collection method described in the Work Plan, and approved by EPA on September 11, 2009, states that the "samples will be collected in a manner suitable for determining the bulk material concentration of radiochemical, factoring in the mass and wall thickness of the pipe." As EPA recognized during the Site visit on April 13, 2010, the collected samples were representative of the total mass and total activity (see the response to EPA General Comment 4).

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

As discussed in the response to general comment #6, ARC considered that the details associated with obtaining radiological measurements as industry-standard/skill of the craft, and that it did not seem necessary to provide detailed description of these techniques. As stated previously, if the EPA desires this level of detail to be added to the revised RAP, ARC will add these details. The phrase "Where applicable" will be replaced by "where present" in the revised RAP, with no change in the meaning and intent of the text.

EPA Specific Comment #12, Section 2.4, Page 13: A Ludlum Model 44-9 will detect gamma radiation in addition to alpha and beta radiation, thus the report should acknowledge this fact. Measurement of only alpha and beta radiation should be conducted with a Ludlum Model 43-93 not a Model 44-9. The plan states that a Ludlum model 44-9 probe will be used to perform alpha and beta surveys. The 44-9 detector is a pancake G-M tube typically used to make beta-gamma contamination measurements. Although the detector will respond to high energy alpha particles, the efficiencies obtained are not good. The mica window of the detector shields out most alpha particles. Suggest dropping the reference to alpha measurements.

ARC Response: The revised RAP will indicate that a Ludlum Model 44-9 is capable of detecting gamma radiation, and discussions of alpha/beta measurements will be changed to "mixed field" measurements. However, the efficiency for gamma detection is quite low, less than 1%. The CSDA range of a ~ 4.5 MeV alpha particle from radium-226 is ~ 4.4 mg/cm² in mica (See Physics for Radiation Protection by James E. Martin, pages 228-230, based on mica composed primarily of quartz, SiO₂). The window thickness of a Ludlum Model 44-9 is only 1.7 mg/cm² (http://www.ludlums.com/index.php?page=shop.product_details&flypage=flypage_ludlum.tpl&product_id=185&category_id=62&activetab=specs&option=com_virtuemart&Itemid=15; Ludlum Measurements, Inc. product information for a Model 44-9 detector), which indicates that the mica window of the detector does not shield out most of the alpha particles. While the alpha particle's energy is reduced, there is more than enough energy to trigger sufficient ionizations in the active volume of the detector to register a count. This is consistent with Ludlum Measurements' statement that a Model 44-9 has a 15% efficiency for detecting alpha particles from plutonium-239. This is a much higher efficiency than is quoted for gamma rays. ARC will revise the text to indicate that the Model 44-9 responds to alpha, beta, and gamma radiation. The radiation surveys agreed to in the April 13, 2010 meeting and detailed in the SAP will not be made with a Ludlum Model 44-9 but rather with a Ludlum Model 44-2 which is only capable of detecting gamma radiation.

EPA Specific Comment #13 Section 2.4, Page 13: The procedure for sample preparation for gamma spectroscopy analysis is unclear. The analytical method of analyzing pieces of pipe instead of grinding and homogenizing an adequate sample mass will result in unknown data quality. Laboratories have the capability to grind and homogenize a wide variety of hazardous samples, thus a transite pipe sample should not prevent proper analytical preparation.

ARC Response: The sample aliquot was selected to be representative of the submitted sample, including the pipe exterior wall, the full pipe wall thickness, and the interior wall with any attached or incorporated scale matrix. As discussed in Section 4.2 of the draft RAP, sample aliquots for gamma spectroscopy were selected by breaking up the submitted sample into smaller pieces and visually selecting representative pieces for counting. This method used approximately 40 percent of the sample (200 grams of an approximate 500-gram submitted sample), and is considered by the analytical laboratory and ARC to represent the samples collected in the field. Scale samples to be collected pursuant to the attached draft SAP will be homogenized by Eberline labs.

EPA Specific Comment #14, Section 2.4, Page 13: Radiochemical samples were not exclusive to scale but included the entire thickness of the pipe. This sample was essentially diluted with asbestos. The pipe scale is not permanently attached to the pipe and the pipe was observed in many cases to be degraded. The pipe scale should be sampled by analyzing multiple samples of visible scale to determine average concentrations. This will also reduce risk to laboratory personnel from asbestos.

ARC Response: The Work Plan stated how samples would be collected and that they would include the entire thickness of pipe, as presented in the responses to EPA general comments 4 and 7 and specific comment #11. This approach was approved by EPA and, as stated previously, is the appropriate sampling methodology to determine the bulk concentration of radiochemicals. Although ARC disagrees with EPA's opinion that the pipe scale is not permanently attached to the pipe (it has been observed as such in the field), ARC recognizes that in some locations there may be loose scale that can easily be removed.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

These observations were validated as a result of the April 13, 2010 Site visit with EPA. In most locations, removal of the scale would require aggressive actions to detach the scale. Such aggressive action would generate friable asbestos in locations where the asbestos is not presently friable. Even in locations where the pipe is degraded, the scale is mixed with the degraded portion of the pipe such that it would not be possible to separate the scale from the degraded pipe matrix. ARC encountered this condition during the collection of the three scale samples described in the draft RAP. Under these conditions, it is unlikely that asbestos-free scale samples can be collected. To the extent practicable, scale samples to be collected pursuant to the attached draft SAP will be collected to limit the inclusion of non-impacted pipe wall. However, as observed during the April 13, 2010 Site visit, interior pipe walls at a number of locations have been impregnated with radiochemicals carried by ore beneficiation solutions and these locations will not allow for asbestos to be separated from pure scale.

EPA Specific Comment #15, Section 2.4, Page 13: The data packages from Test America were not validated. In addition, the laboratory did not include a discussion of the affects on data quality due to the unconventional sample preparation and analysis geometry for gamma spectroscopy, but should have. Please correct this deficiency.

ARC Response: The TestAmerica data packages were validated by ARC's third-party laboratory quality assurance reviewer, Environmental Standards, Inc., but the validation reports were not received until after the draft RAP was submitted to EPA for review. Twenty percent of the radiological lab results were validated on a Level 4 data package and the remaining eighty percent were verified on the Level 2 data package prepared by the laboratory. The validation and verification reports will be added to the appendices of the revised RAP, and a discussion of the data validation will be included in the text.

EPA Specific Comment #16, Section 2.4, Page 13: A detailed description of how the meters were calibrated to Ra-226 should be provided.

ARC Response: The meters were calibrated by the manufacturer, Ludlum Measurements, Inc. with a Ra-226 source per the manufacturer's specifications. If available from Ludlum, ARC will provide the calibration details.

EPA Specific Comment #17, Section 2.4, Page 14: Please clarify what is meant by "These two samples likely contained some remnant asbestos." The previous sentence, which is referencing "scale" samples from HA-4-01 and HA-4-02 consisting of "flaky friable transite pipe material (i.e., RACM)", suggests that these samples do contain asbestos. Please clarify this discussion.

ARC Response: The scale samples from locations HA-4-01 and HA-4-02 were not distinct, and could not be separated, from the transite pipe material, which was weathered and friable, and appeared to have been impregnated with ore beneficiation solutions. These samples differed from the asbestos samples taken at the same location because they included only the interior portion of the pipe that appeared to be impregnated, rather than the entire pipe thickness. However, as noted in the draft RAP, they appeared to contain asbestos material.

EPA Specific Comment #18, Section 2.5, Page 14: For the bulleted discussion, it is requested that the estimated length and square footage of inaccessible pipe for each HA be included.

ARC Response: The revised RAP will include this information.

EPA Specific Comment #19, Section 2.5, Page 14: The plan should address how an assessment of inaccessible pipe will be conducted. Because it appears that sampling was limited to easily accessible areas, this limits how representative the results are; conditions of scale can vary away from the joints between the pipes or weak spots where breaks occurred. In addition, pipe ends are subject to weathering. The sample limitation may be defensible, but its effect on the data should be discussed.

ARC Response: Inaccessible pipe from a sampling standpoint will likely also be inaccessible during the removal action. However, if road improvements or other construction-related activities allow safe access to transite pipe sections during the removal action, these pipe sections will be subject to the same radiometric surveys to be performed for other pipe sections. As stated above, and as observed during the April 13, 2010 Site visit, ARC believes that all results presented in the draft RAP are representative of conditions to be addressed during the removal action. A discussion of the potential effect of weather (see response to EPA General Comment # 7 will be added to the revised RAP). Also, see the responses to general comments 4, 7 and 9.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

EPA Specific Comment #20, Section 3.1, Page 15: Please specify how Data Verification was completed.

ARC Response: The revised RAP will include this information.

EPA Specific Comment #21, Section 3.2, Page 18: It is recommended that the discussion pertaining to the asphaltic-coated metal pipe CAT II non-friable ACM designation be clarified as related to the metal pipe or the asphaltic coating.

ARC Response: The revised RAP will incorporate this recommendation.

EPA Specific Comment #22, Section 3.2, Page 19: It is recommended that the bulleted discussion be revised to state that these items “will” versus “should” be completed, given, sprayed or retained.

ARC Response: The revised RAP will include this recommendation.

EPA Specific Comment #23, Section 4.0, Page 20: Please specify the length and square-footage for each area characterized.

ARC Response: The revised RAP will include this information.

EPA Specific Comment #24, Section 4.1: A table summarizing individual microR/hr, cpm, and pCi/g results for each measured location should be included.

ARC Response: This data was contained in Appendix E of the draft RAP, and a summary table, will be added to the text of the revised RAP.

EPA Specific Comment #25, Section 4.1, Page 20: Background data collected on-site is not an appropriate location due to the many potential influences on background; i.e., presence of nearby radioactive materials, presence of various construction materials, etc. Background values should be obtained from a site designated background area (ARC has previously identified a representative background area) and statistically based background values should be reported and used for comparison to on-site measurements.

ARC Response: The purpose of collecting “background” measurements was to determine the potential impact of locally-elevated radiation levels in the general area on the measurements obtained for the pipe itself. To avoid future confusion, such measurements will be termed “local comparison values” as discussed in the April 13, 2010 and meeting and detailed in the SAP. It is precisely the “presence of nearby radioactive materials” whose effect upon the measurements of the pipe is being evaluated, and the collection of on-Site background data “local comparison values” in the immediate vicinity of the measurement locations is completely appropriate. See the response to EPA specific comment # 35.

EPA Specific Comment #26, Section 4.1, Page 21: Please describe the exception noted due to pipe scale or sediment. This cannot be the only location that exhibited pipe scale or sediment, but appears to be the only location where interior/exterior radiological readings were “inconsistent”. What location-specific factors contributed to this inconsistency based on field observations and characterization data?

ARC Response: The scale at this location was noticeably thicker than scale observed at other locations, and will be discussed revised RAP.

EPA Specific Comment #27, Table 4-6, Page 25: Please explain the significant difference between sample HA-4-02 and its field duplicate. Also, please explain what conditions contributed to the elevated readings at location HA-1-07?

ARC Response: The field duplicate is not a true duplicate due to the practical difficulties of sampling asbestos-containing materials. It would be more accurately described as a co-located sample. The reason for the difference between the two co-located samples is not known, but may be attributable to the relative amount of scale with variable TENORM characteristics in each sample. The reason for the elevated readings at location HA-1-07 is also unknown - this pipe is stacked up and the original location and use of the pipe is not known.

EPA Specific Comment #28, Table 4-10, Page 27: Scale sample results for both HA-1-07 and HA-4-02 exceed the previous ARAR of 15 pCi/g for Ra-226, with HA-1-07 scale sample results almost twice the level that were observed in the pipe sample. EPA requests that ARC explain (1) the factors that would contribute to this significant variability between the pipe and scale sample results at location HA-1-07, and (2) discuss these contributing factors relative to observations made at other sample locations.

ARC Response: Radiochemical concentrations from a sample collected to maximize the portion of the sample composed of scale will always exceed the concentration in a bulk concentration sample because radiochemicals are concentrated in the scale. Scale samples were collected at three locations with higher bulk radiochemical concentrations to provide a maximum concentration of Ra-226. All three scale samples exhibited elevated Ra-226 concentrations relative to the bulk concentration samples collected from the same location.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

EPA Specific Comment #29, Section 4.2, Page 27: ARC states "...scale samples from HA-1-07 and HA-4-02 (FD) exceed the previous Site-specific ARAR of 15 pCi/g for Ra-226." Table 4-10 suggests that sample HA-4-02 (not HA-4-02 [FD]) exceeds the ARAR. Please confirm and correct this statement, or revise Tables 4-10 and 4-11 to be consistent with the text discussion.

ARC Response: The table is correct - no field duplicate scale sample was collected at HA-4-02. The revised RAP will be modified accordingly.

EPA Specific Comment #30, Section 4.4, Page 30: The Plan discusses a 30 μ R/hr action level or a net dose rate of 6 μ R/hr above background. Is this a contact measurement?

ARC Response: The probe will be essentially in contact with the pipe surface (i.e., less than one inch away) without actually making contact with the pipe to limit damage and/or contaminate the instrument. See the response to EPA general comment #6.

EPA Specific Comment #31, Section 4.4, Page 32: The Plan discusses using 3,000 counts per minute as a screening value for interior pipe wall surfaces. The Plan states that "This approach is validated by the fact that sample location HA-4-02, with a count rate of 6,500 cpm, has a Ra-226 concentration of 6.4 pCi/g (measured in the field duplicate sample)". However, sample HA-1-07 has a count rate of 7,000 cpm and a corresponding Ra-226 concentration of 95.4 pCi/g on the transite pipe sample and 155 pCi/g on the scale sample. There is little correlation between dose rate measurements and surface scan measurements. There is insufficient data to validate the 3,000 cpm screening level.

ARC Response: As discussed in Section 4.4 of the draft RAP, the ability to correlate alpha/beta or gamma survey results to radiochemical concentrations is limited because the majority of the analytical data indicate: 1) radiochemical concentrations at relatively low levels; and 2) that, in particular, there was a lack of results spanning the range of interest (i.e., Ra-226 concentrations from 5 to 25 pCi/g). A value of 3,000 cpm was determined to be the upper bound of the count rates associated with Ra-226 levels interpreted to be consistent with background concentrations. Therefore, ARC believes it is appropriate and conservative to assume that any pipe sections exhibiting count rates greater than this value would exceed the revised Site-specific ARAR of 5 pCi/g of radium-226. See the response to EPA general comment #5. During the April 13, 2010 Site visit, ARC agreed with EPA and NDHHS that the action level will be based on 30-second count measurements taken with a Ludlum 44-2 (1x1 NaI probe) with an action level to be determined by the results of implementing the draft SAP.

EPA Specific Comment #32, Section 4.4, Page 32: The statement "given that the majority of the alpha/beta survey results were less than half of the site specific ARARs, the proposed 3000 cpm actual represents a conservative action level to designate transite pipe sections as suitable for disposable in the on-site landfill cell or not", is misleading as to the quality of the data generated and a misinterpretation of the data. In addition to being poor grammar, this is making an assumption of scale at the end of the pipe exposed to weather and dilution by a well known windblown dust issue. All of the samples were also diluted by asbestos as indicated in Comment 4. Subsequently, this and following statements in the work plan regarding the quality of the data should be disregarded. The data collected for the study simply does not support this depth of interpretation.

ARC Response: ARC will improve the grammar of the text presented in the revised RAP. As discussed in the response to EPA general comment #5, only two samples exceeded the revised ARAR of 5 pCi/g of radium-226. ARC believes that the April 13, 2010 Site visit allowed EPA to recognize this condition. Chemical or climatic weathering extensive enough to result in significant material removal was not observed by ARC, and is not believed to have significantly impacted the bulk concentration of any of the radiochemicals that were reported from the transite pipe. If EPA can support their assertions regarding hypothetical dilution of loose scale associated with transite pipe, ARC would appreciate receiving such technical or anecdotal information. Regardless, it is ARC's opinion that weathering effects would not affect the correlation of radiochemical sampling results with the radiometric surveys because the survey measurements include measurements from weathered pipe sections, and would still correlate with the actual radiochemical concentration. Additional gamma survey readings were taken along the length of pipe sections. No increases of radiation levels with increasing distance from an opening in the pipe sections were noted, further indicating that weathering had no significant impact. As previously indicated in ARC's response to EPA general comment #7, visual examination of the sampling locations during sampling activities did not observe any instances where sufficient windblown dust was present to significantly impact the radiochemical concentrations. The presence of windblown dust, if visible at all, was limited to a thin layer of dust not even sufficient to obscure the pipe surface beneath the dust. As discussed in the response to EPA general comments 4 and 7, and specific comment #11, the samples were not "diluted" with asbestos. The collected represent the bulk concentration of the transite pipe, in accordance with the EPA-approved Work Plan.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

EPA Specific Comment #33, Section 4.4, Page 32: Given the previous comments, the correlation of microR/hr and cpm measurements to 15 pCi/g Ra-226 is unclear. Thus, 6 microR/hr or 3,000 cpm above background may or may not represent conservative values equivalent to less than 15 pCi/g Ra-226.

ARC Response: See previous responses to comments on the appropriateness of the exposure and count rates relative to the decision tree presented in the draft RAP. ARC anticipates that, based on the April 13, 2010 Site visit, ARC and EPA will agree on a gamma survey level that will be used during the removal action.

EPA Specific Comment #34, Section 4.4, Page 32: Radon-220 and radon 222 are gases and some quantity will continuously migrate from the scale matrix, thus preventing secular equilibrium with radium-228/thorium-232 and radium-226/uranium-238, respectively. Therefore, Figures 4-6a, 4-6b, 4-7a, and 4-7b misrepresent this fact. Calculation of an estimated equilibrium may be possible with correct statistical analysis of the data.

ARC Response: Radon-220 and radon-222 are decay products of radium-228 and radium-226 respectively. As such, they do not occur in the decay chain between uranium-238 and radium-226 or between thorium-232 and radium-228 (i.e., these portions of the respective decay chains are above the radium isotopes). Therefore, the magnitude of radon emanation from the scale would have absolutely zero impact on the equilibrium relationship between uranium-238 and radium-226, or the relationship between thorium-232 and radium-228. Figures 4-6a through 4-7b in the draft RAP depicted these equilibrium relationships.

EPA Specific Comment #35, Section 4.4, Page 32: HA-4-01 in Figure 4-1a indicates a microR/hr value above 100 similar to HA-4-02-FD. However, the cpm values for HA-4-01 indicated in Figure 4-3a is substantially lower than the value for HA-4-02-FD. Likewise the radiochemical results are substantially lower for HA-4-01 than the values for HA-4-02-FD. These discrepancies should be fully addressed.

ARC Response: The discrepancy is due to the elevated and highly variable background present within HA-4. Additional discussion of the impact of this elevated and variable background will be added to the revised RAP. This phenomenon is also the reason that the RAP specifies that pipe sections should be moved to areas with consistent background radiation levels for detailed field screening during the removal action. However, as discussed during the April 13, 2010 Site visit and pending further discussions with EPA and NDHHS, the need for consistent background conditions may not be needed during the removal action.

EPA Specific Comment #36, Section 4.4, Page 32: Also, related to the 3,000 cpm screening value, using the value of 2.22 disintegrations per minute per pCi and assuming a 15% efficiency for a Ludlum 44-9 G-M detector, 3000 cpm equates to 9000 pCi per 15.5 cm² (the approximate active probe surface area).

ARC Response: Response characteristics of a Ludlum Model 44-9 G-M detector to the radiation field inside a transite pipe section is influenced by many factors, including those summarized below (see Ludlum Measurements, Inc. product information for a Model 44-9 detector at http://www.ludlums.com/index.php?page=shop.product_details&flypage=flypage_ludlum.tpl&product_id=185&category_id=62&activetab=specs&option=com_virtuemart&Itemid=15):

- The efficiency of a Ludlum Model 44-9 G-M detector varies from 19% to 32% for moderate energy beta particles and is approximately 15% for alpha particles. The average efficiency for NORM radionuclides would thus be closer to 20% than 15% for detecting a mixed field of alpha/beta particles, resulting in effectively 6700 pCi per 15.5 cm².
- Almost half of the uranium and thorium decay chain radiochemicals also emit gamma rays. As pointed out in specific comment #12, a Ludlum Model 44-9 G-M detector can detect these gamma rays, leading to a single decay being counted multiple times in some instances.
- The “field of view” of the Ludlum Model 44-9 G-M detector for gamma rays is much larger than the probe surface area, especially in an annular geometry such as the inside of a pipe. This is because most of the gamma ray response is due to gamma ray interactions that occur in the wall of the detector, regardless of whether the gamma rays pass through the active surface (i.e., mica window) of the probe. Gamma rays passing through the side or back wall of the detector are also counted.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

- Given the wall thickness and density of transite pipe, and the fact that most of the radiochemicals are located on or in the interior pipe wall, a surface area of 15.5 cm² can easily view several thousand pCi of radiochemicals. With an average transite pipe wall thickness of one inch and a density of approximately 2.3 g/cc (density of standard concrete), a bulk radium-226 concentration of 5 pCi/g in equilibrium with the uranium-238 decay chain would amount to approximately 6,800 pCi of alpha/beta emissions under the active probe surface area. In addition, thorium-232 decay chain radiochemicals present will contribute to the instrument response in a similar manner. Thorium-232/radium-228 present at the radium-228 mean concentration of 1.45 pCi/g would contribute another 1,400 pCi of equivalent response.
- As discussed above, this does not account for simultaneous gamma radiation emissions that occur from this material or gamma emissions from the remainder of the pipe interior not under the active surface of the probe, which will also contribute to the instrument response.
- Radon emanation from scale can actually be quite small. Radon emanation from scale formed in oil and gas wells has an emanation coefficient of less than 10⁻³ (E. Fruchtnicht Master's Thesis, Rn-222 and Rn-220 Emanation Fractions from Three Separate Formations of Oil Field Scale, Texas A&M University, 2004). Even if the radon emanation coefficient is larger, reducing the number of decay products contributing to the instrument response, the instrument response is reasonable and consistent with these theoretical calculations.

During the April 13, 2010 Site visit, ARC agreed with EPA and NDHHS that the action level will be based on 30-second count measurements taken with a Ludlum 44-2 (1x1 NaI probe) with an action level to be determined by the results of implementing the draft SAP.

EPA Specific Comment #37, Section 5.1, Page 35: The plan states that "ARC plans to manage all loose scale and sediment derived from this limited decontamination activity as mixed asbestos-TENORM waste after completion of the removal action activities described below." The two questions that this statement creates are 1) the data appears to indicate the potential for all the material to be "mixed asbestos-TENORM waste" so why only this fraction to be at least named accordingly and 2) what is the plan for disposal of asbestos-TENORM waste?

ARC Response: ARC strongly disagrees with EPA's conclusion that all the [transite pipe] material is mixed asbestos-TENORM waste based on the revised Site-specific ARAR of 5 pCi/g (i.e., only a very small fraction of the pipe, or two samples, contains scale that exceeded the ARAR). EPA seemed to agree with ARC's position during the April 13, 2010 Site visit and, based on the Site visit, ARC understands that EPA would no longer ascribe to the view set forth in Comment #37. As required by NDHHS, mixed asbestos-TENORM waste above the revised Site-specific ARAR of 5 pCi/g of Ra-226 will be shipped to, and properly disposed of in, an off-Site repository.

EPA Specific Comment #38, Section 5.1, Page 36: ARC needs to be more specific as to whether they are pursuing a Class III landfill or a Class III landfill waiver. Again, given the CERCLA exemption, only the substantive requirements must be met. Furthermore, the exceptions for the landfill, less than 100 feet to groundwater and vegetative cover, should be addressed in greater detail.

ARC Response: ARC proposes to discuss this comment with EPA and NDEP given that ARC does not understand what additional information EPA or NDEP may require relative to the groundwater and vegetative cover exemptions.

EPA Specific Comment #39, Section 5.1, Page 37: This section states "Pursuant to the EPA-approved Transite Pipe Removal Action Work Plan – Revision 1, the landfill cell will be..." ARC, EPA and NDEP were to meet once the transite characterization program had concluded to summarize the available asbestos and radiological characterization data required to support a decision regarding what type of waste can be placed in an unlined on-Site landfill cell and the appropriate disposal method for mixed wastes. This discussion has not occurred and conclusions about what may/may not be required are not approved by EPA. This statement is misleading and EPA requests that it be qualified or removed until these discussions have occurred and a path forward is agreed upon.

Also EPA would suggest minimizing or eliminating the amount of VLT that is used in the floor and ramps of the landfill. This could be done by utilizing track-mounted vehicles to the maximum extent possible, rather than rubber tired equipment. In the past removal actions, EPA did not have a problem running rubber tired haul trucks over the sulfide tailings. In the event that this was a problem, local sources of gravel are available, to improve traction.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

ARC Response: ARC appreciates EPA's past removal action experience at the Site. However, ARC believes that the use of VLT materials will: 1) allow the contractor (i.e., landfill operator) optimal flexibility without the potential for bottlenecks caused by slower tracked equipment; 2) mitigate the risk of rubber-tired equipment becoming stuck during precipitation events by creating a reliable and stable base; and 3) require less construction water and energy which would be required to compact the fine-grained sulfide tailings. ARC does not agree with EPA that the landfill cell can be efficiently constructed with tracked equipment (i.e., the use of such equipment would require a relatively longer schedule, more water on thinner material lifts with more compaction effort at more risk, as reflected in EPA's comment 'in the event there was a problem'). ARC has previously quantified the mechanical properties of the VLT materials in support of the evaporation pond removal action, and understands that EPA will direct ARC to use the VLT to create interim covers over the Thumb Pond and Sub-Area A (the latter located within the sulfide tailings nearby the proposed landfill cell locations. In addition, the landfill cell cap will require a minimal 6-inch veneer of VLT materials to prevent dust generation. For the reasons listed above, and the response to specific comment #41, ARC requests EPA's approval to use the VLT materials in the construction, operation and closure of the landfill.

EPA Specific Comment #40, Section 5.4, P. 43: Discuss how transite pipe that is left in place will be identified and recorded, so that future workers are aware of its presence.

ARC Response: Following the removal action, ARC will prepare a technical memorandum to be attached to the removal action report that identifies, describes and reiterates the institutional controls to be used, as presented in Section 5.4 of the draft RAP.

EPA Specific Comment #41, Section 5.5, P. 44: Describe what long-term maintenance may be necessary for the landfill. Given that the pipes are being buried uncrushed, there is potential for material to fill the void space over time, and thereby lead to settling.

ARC Response: Potential long-term settlement issues associated with the landfill cell design will be mitigated by the following design elements: 1) fill requirements during construction require relatively light ground pressure (LGP) tracked equipment to place the initial cover materials until a sufficient cover thickness (i.e., at least one foot) is placed over the pipe, which will disperse rubber-tired ground pressure below potential crushing limits of the pipe; and 2) the ends of the pipe are to be compacted with on-site fill in between pipe lengths then covered with double-sided textured HDPE to assist with cover support at the pipe ends;

Therefore, given the use of VLT materials with quantified and more reliable mechanical properties than sulfide tailings to prevent settlement and support the landfill cell cap design, ARC does not anticipate any significant long-term settlement issues to occur. However, in the event of surface settlement that may be detrimental to the function of the landfill, VLT tailings materials are readily available on the Site to mitigate any observed settlement.

EPA Specific Comment #42, Figure 4-8: Based on comments provided, the Pipe Disposal Decision Tree will need substantial revision.

ARC Response: Once the prior comments have been successfully resolved with the EPA, the Decision Tree will be updated as necessary in accordance with the resolution of those comments.

Pursuant to EPA's e-mail dated April 20, 2010, ARC has developed answers to step-by-step questions from EPA's online Bevill Amendment training materials web site (<http://www.epa.gov/oecaerth/assistance/sectors/minerals/processing/bevillquestions.html>):

“What are the Basic Steps in Making Bevill Determinations?”

1. **“Determine whether the material is considered a solid waste under RCRA.”** The transite (concrete-asbestos) pipe and any associated scale or residue are *solid wastes* per 40 CFR 261.2(a) because they are and will be *discarded materials* that will be *abandoned by being disposed of* and are presently accumulated before being disposed of per 40 CFR 261.2(b), and these discarded materials are not otherwise excluded or exempt from being classified as a solid waste.

Responses to Draft EPA Comments on the Draft Transite Pipe Removal Action Plan dated January 8, 2010

- 2. Determine whether the facility is using a primary ore or mineral to produce a final or intermediate product and also whether less than 50 percent of the feedstocks on an annual basis are from secondary sources.”** The Anaconda Company (Anaconda) mined *primary copper ores* from the open pit at the Yerington Site and utilized them to produce the product (average 83%) copper cement. Feedstocks were from primary rather than secondary sources, and were *less than 50 percent* from secondary sources.

- 3. “Establish whether the material and the operation that generates it are uniquely associated with mineral production.”** The Anaconda feedstock, product, operations, and facilities and residues such as the discarded transite pipe/residues were all *uniquely associated* with mineral production. Operations at the site included mining and the following ore *beneficiation* activities listed in 40 CFR 261.4(b) (7): crushing, grinding, sizing, washing, vat leaching, precipitation ((also called cementation), gravity concentration, flotation, and drying. Subsequent owners/operators at the site conducted heap leaching and electrowinning activities. These have all been described in detail in previous reports and work plans submitted to, and approved by, EPA.

The transite pipe was utilized by Anaconda to convey acidic ore beneficiation solutions used to *leach* copper from oxide ores mined at the Site, and to convey copper-rich (i.e., pregnant) solutions *to ore beneficiation facilities*.

- 4. “Determine where in the sequence of operations beneficiation ends and mineral processing begins.”** Mineral processing was not conducted by Anaconda at the Site. Processing occurred at an off-Site smelter.

- 5. “If the material is a mineral processing waste, determine whether it is one of the 20 special wastes from mineral processing.”** Anaconda did not generate mineral processing waste at the Site. *The transite pipe is not a mineral processing waste.*

“This analytical sequence will result in one of three outcomes:

- (i) the material is not a solid waste and therefore not subject to RCRA;**
- (ii) the material is a solid waste but is exempt from RCRA Subtitle C because of the Mining Waste Exclusion; or**
- (iii) the material is a solid waste that is not exempt from RCRA Subtitle C and is subject to regulation as a hazardous waste if it is a listed or characteristic hazardous waste.”**

The responses to the questions above establish that the transite pipe with any associated scale and/or residue is a solid waste associated with ore beneficiation, but is exempt from RCRA Subtitle C per 40 CFR 261.4(b)(7). In addition, as presented in the response to EPA general comment #1, ARC discussed the applicability of the Bevill Amendment to the transite pipe with EPA and NDEP/NDHHS representatives (Evan Chambers of NDEP on April 8, 2010 and Eric Matus of NDHHS on April 13, 2010). Both of these State of Nevada hazardous waste experts unequivocally indicated that the transite pipe and associated asbestos-containing materials are solid wastes subject to the Bevill Amendment, and are not RCRA hazardous wastes.