



Department of Energy
Savannah River Operations Office
P.O. Box A
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JUN 13 2019

Ms. Susan Fulmer, P. G., Manager
Federal Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Mr. Jon Richards
Acting Savannah River Site Remedial Project Manager
Superfund Division
U. S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30303

Dear Ms. Fulmer and Mr. Richards:

SUBJECT: Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins (U) (ERD-EN-2018-0007, Revision 1 Redline, May 2019) and Savannah River Site's Responses to the Regulatory Comments on the Revision 0 Document, SEMS Number: 63

In accordance with the terms of the Federal Facility Agreement, the U. S. Department of Energy (DOE) is submitting the subject information for your review. The South Carolina Department of Health and Environmental Control (SCDHEC) and U. S. Environmental Protection Agency (EPA) provided comments on the Revision 0 document on November 29, 2018 and March 4, 2019, respectively. As a result of a comment resolution meeting held on May 9, 2019, the comment responses and the document have been revised to reflect the changes agreed upon at the meeting. Please review the enclosures and provide your approval within thirty (30) days of receipt. The effort and time that the SCDHEC and the EPA have provided on this operable unit are greatly appreciated.

Questions from you or your staff may be directed to me at (803) 952-8365, or the DOE Federal Project Director, Ms. Karen Adams, at (803) 952-7871.

Sincerely,

A handwritten signature in blue ink, appearing to read "BTH", written over a horizontal line.

Brian T. Hennessey
SRS Remedial Project Manager
Infrastructure and Area Completion Division

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Ms. Susan Fulmer
Mr. Jon Richards

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Enclosures:

1. Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins (U) (ERD-EN-2018-0007, Revision 1 Redline, May 2019) SEMS Number: 63
2. SRS Responses to South Carolina Department of Health & Environmental Control Comments on: Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins (U) SEMS Number: 63 (ERD-EN-2018-0007, Revision 0, October 2018)
3. SRS Responses to United States Environmental Protection Agency Comments on: Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins (U), SEMS Number: 63 (ERD-EN-2018-0007, Revision 0, October 2018)

cc w/o encl:

D. Scaturro, SCDHEC-Columbia
S. French, SCDHEC-Columbia
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B. Cameron, SCDHEC-Aiken Environmental Affairs Office
R. H. Pope, EPA

cc w/encl:

D. Lloyd, EPA-Atlanta
M. McRae, TechLaw, Inc.

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EPA COMMENTS

1. Section 1.0, Introduction of the Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins (U), SEMS Number: 63; ERD-EN-2018-0007, Revision 0, dated October 2018 (the Report), indicates that confirmation sampling was conducted in accordance with the *Confirmation Sampling and Analysis Plan (SAP) for Coal and/or Ash Removal at the Savannah River Site (SRS) (U) (SRNS 2014a)*, the *Field Sampling Plan (FSP) for the 488-1D Ash Basin (U) (SRNS 2015)*, and the *Field Sampling Plan for the D-Area 488-1D Inlet Basins (U) (SRNS 2014b)*. Given that the Report is an independent document, please include the SAP and the FSP as attachments to the Report.

Response: Disagree. The approved SAP and FSP documents are available in the Administrative Record File (ARF). Therefore, these documents do not need to be resubmitted (and duplicated in the ARF) as attachments. The purpose of these documents was to obtain upfront agreement/approval on how the data would be collected and processed for the technical evaluation prior to report generation. The SAP provides general requirements for confirmation of coal and/or ash removal and includes the data quality objectives, sampling design and rationale, and analytical plan. The FSP documents include the unit-specific information that is unique to the waste unit, such as number of samples and approximate locations. The *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D and Inlet Basins* was prepared consistent with the SAP and FSP documents. Please note that the same methodology was used to prepare the *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-2D Ash Basin (ERD-EN-2015-0053, October 2016)* approved by the EPA on 1/22/2017 and the *Human Health and Ecological Evaluation for Confirmation Sampling at the 489-D Coal Pile Runoff Basin (ERD-EN-2017-0027, October 2017)* approved by the EPA on 12/19/2017. No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

2. Section 2.1, the human health (HH) analytical approach section of the Report, indicates that the HH risk-based threshold levels (TLs) are the EPA residential regional screening levels (RSLs) as established in the Confirmation Sampling and Analysis Plan (SAP) for Coal and/or Ash Removal at SRS (SRNS 2014a). Since the SAP was not appended to the Report, an independent review was conducted of the TLs presented in Table 1, Human Health Threshold Levels, against the most current (i.e., November 2018) EPA residential RSLs. Based on this review, minor variations were noted in the TLs. For example, the residential RSL/PRG [Preliminary Remediation Goal] presented in Table 1 for arsenic is 0.61 milligrams per kilogram (mg/kg); however, the November 2018 residential RSL is 0.68 mg/kg. Similar
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variations in the RSLs were also noted for cadmium and mercury. Please use the most recent data for comparison.

Response: Clarification. See response to comment #1. One purpose of the SAP was to obtain agreement on the HH TLs to be used in future evaluations. The minor variations in the RSL concentrations based on recent updates are insignificant and would not change the conclusion of the report. A new paragraph will be added to Section 2.1 Human Health, as follows:

“A review of the current set of RSL values (November 2018) and the HH TLs shown in Table 1, (which are based on the approved Confirmation SAP), shows that the more recent RSL values for arsenic, cadmium, hexavalent chromium and mercury are slightly higher (i.e., less conservative) than the values that were used in this evaluation. The minor differences in concentrations based on the most recent RSL updates are insignificant and do not change the conclusions of this document.”

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

3. Section 2.2, the ecological analytical approach section of the Report, indicates that the ecological based TLs (ECO TLs) are the Los Alamos National Laboratory (LANL) ECORISK Database low-effects screening level for soil media (LANL, 2015). While it is understood that the ECO TLs are those presented in the SAP, it is unclear why the more recent version of the ECO TLs as presented in LANL ECORISK Database (Release 4.1) were not used?

Response: Clarification. The SAP only considers human health risk-based thresholds levels. It acknowledges that ecological screening levels may require further site-specific consideration/ adjustment prior to establishing them as potential cleanup levels. Therefore, the development of site-specific ecological screening levels in the generic SAP was not deemed appropriate, and human health risk-based thresholds were used as cleanup levels as agreed to by the Core Team at the time of SAP approval.

The LANL ECORISK Database (Release 3.3) was used for this document because these were the values agreed to by the regulatory agencies for use in the two most recently approved SRS baseline risk assessments for the Lower Three Runs Operable Unit and the G-Area Oil Seepage Basin. SRS was not aware of an update to the LANL values at the time of data collection and preparation of this document. A review of the LANL ECORISK Database (Release 4.1) values confirms that the updated values would not change the conclusion of this report.

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- a. Additionally, it is unclear if the lowest available LANL soil-based Lowest-Observed Adverse Effect Level (LOAEL) was selected or if specific receptors were selected?

Response: Clarification. The lowest available LOAEL-based concentration was used as the ECO TL. These values are identified as “Minimum” in the database.

- b. This does not appear to be the case with arsenic, as the LANL 2015 database contains more sensitive LOAELs than those used.

Response: Agree with clarification. The LANL database Excel spreadsheet mis-identifies the arsenic value in this instance. More specifically, it shows the Low Effect ESL minimum value to be 68 mg/kg (earthworm), which is the value used in this evaluation. However, a more thorough review of the database shows that for arsenic, the range of values is from 24 mg/kg (shrew) to 8500 mg/kg (kestrel). The maximum detected concentration is 20.4 mg/kg in the 488-1D Ash Basin and 2.94 mg/kg in the Inlet Basins. Therefore, use of the 24 mg/kg as the ECO TL in place of the 68 mg/kg value would not change the ecological evaluation for arsenic since the maximum detected concentrations are below this value. A new paragraph will be added to Section 2.2 Ecological, as follows:

“The LANL database identifies 68 mg/kg as the Low Effect Ecological Screening Level to be used in the data screening for arsenic. A more thorough review of the database identifies a value of 24 mg/kg that may be the more appropriate value to be used because it is a lower, more conservative threshold. However, the use of the 24 mg/kg as the ECO TL in place of the 68 mg/kg value (Table 2) would not change the ecological evaluation for arsenic since the maximum detected concentrations of arsenic in the 488-1D Ash Basin dataset and the Inlet Basins dataset are below this more conservative value.”

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

4. Section 3.0, Acceptance Criteria, describes using ProUCL to calculate representative site concentrations for comparison to the selected human health-based and ECO Threshold Levels (TLs). The mean contaminant levels were used for this purpose. This approach is not consistent with USEPA’s standard approach to risk assessment and may not be sufficiently protective to support final risk management decision making. Please revise this section to provide a reference supporting the current approach and justify selection of the arithmetic mean, rather than the 95% Upper Confidence Limit (UCL) of the mean, as the basis for exposure point concentrations, consistent with a Reasonable Maximum Exposure (RME) condition or revise the current assessment to predicate TL comparisons on site-specific 95UCLs for all contaminants of concern.
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Response: Clarification. See response to comment #1. Conforming to the USEPA standard approach to risk assessments is not appropriate for this document because the purpose of the evaluation is to verify attainment of cleanup levels following a removal action, not for preparation of a baseline risk assessment. The baseline risk assessment is typically performed earlier in the process based on conservative assumptions to determine whether a remedial action is necessary and is not intended to be used to verify attainment of agreed-to cleanup levels. Excerpts from the approved SAP that justify this position are provided below:

“Section 3.1.5, Develop the Analytical Approach

...According to USEPA’s *Data Quality Assessment: A Reviewer’s Guide* (USEPA 2006b), statistical hypothesis testing approaches may be used to verify the attainment of cleanup standards at contaminated sites after conducting remediation in the area of concern (AOC). Hypothesis testing is especially useful for confirmation analysis because the evaluation relies on the more representative mean value of all samples and does not artificially elevate the number of non-detected values that would be expected following removal activities.

The ProUCL (USEPA 2013b) software package contains statistical methods that can be used to evaluate and address various environmental issues. The single sample hypothesis tests are useful when the environmental parameters such as the clean standard, threshold level, or compliance limits are known, and the objective is to compare site concentrations with these known threshold values. Specifically, a t-Test (parametric) or a Wilcoxon Signed Rank (WSR) Test (nonparametric) may be used to verify the attainment of cleanup levels within the AOC after a remediation activity.

3.1.6, Specify Performance or Acceptance Criteria

...The decision rule for this confirmation sampling is expressed as a statistical hypothesis test. To test the hypothesis that TLs are achieved following removal activities, the null hypothesis (H_0) of interest is established as follows: Site mean concentration is less than or equal to the TL. The alternative hypothesis (H_A) would then be that the site mean concentration is greater than the TL. These are considered typical statements when the cleanup level has been pre-established. A t-Test will be used to verify the attainment of cleanup levels within the AOC after the excavation activity. Specifically, the statistical test for ash and/or coal removal confirmation soil sampling is as follows:

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Null hypothesis (H₀): COC site mean concentration \leq threshold limit

Alternative hypothesis (H_A): COC site mean concentration $>$ threshold limit

For H_A: COC site mean concentration $>$ threshold limit, if

$t > t_{\alpha(1),v}$, then reject H₀

where

$\alpha = 0.05$ is the level of significance (i.e., 95% confidence level)

1 = one-tail t test

$v = \text{degrees of freedom} = n - 1$, where $n = \text{number of sample results}$ ”

No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

5. The Data Usability Reports for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins were not attached to the Report. As such, data validation of the confirmation sampling results for the 488-1D Ash Basin and Inlet Basins could not be verified. Please submit the requested reports.

Response: Clarification. In accordance with the FSP and consistent with prior Core Team agreements, the Data Usability Reports (DURs) were provided in the Removal Action Report (RAR) for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin. The RAR (SRNS-RP-2018-01091, Revision 0, March 2019) was submitted to the regulatory agencies on March 6, 2019. The DURs are provided in Appendix S of the RAR. Text in Section 1.0 Introduction will be revised to provide the formal reference to the RAR as follows:

“... This evaluation will be used to support the *Removal Action Report for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin (SRNS 2019)*. A Data Usability Report for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins will also be was generated upon completion of sampling activities and submitted with in Appendix S of the Removal Action Report.”

In addition, Section 6.0 References will be revised as follows:

“SRNS, 2019. *Removal Action Report for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin*, Revision 0, SRNS-RP-2018-010991, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken SC”

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

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6. Based on review of Sections 4.1 and 5.1, addressing data associated with the 488-1D Ash Basin and Inlet Basins, respectively, it appears that samples from different basins (e.g., northern and southern basins) and features (e.g., cap, berm, and basins) within the basins were combined.
- a. It is noted that this approach may result in biased statistics. EPA requests that the Report be revised to include separate analysis of each independent dataset or clarify the rationale for pooling of datasets from different areas/features.

Response: Clarification. See response to comment #1. The data was collected and evaluated as described in the approved FSPs. The 488-1D Ash Basin was evaluated separately from the combined North and South Inlet Basins as identified in the approved FSPs and agreed to by the Core Team and as presented in Sections 4.0 and 5.0 of the report. This approach allows for more targeted decision making by considering each area independently.

Consistent with the Core Team agreement, the datasets for the North and South Inlet Basins were combined and evaluated together because the basins are adjacent to each other and had the same configuration/function/history of use and received the same effluent from the 484-D Powerhouse, resulting in identical conceptual site models. No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

7. Based on review of Section 5, Inlet Basins Data Evaluations, the Inlet Basin dataset only contains eight observations and yet statistical tests were still performed. It should be noted that the USEPA Statistical Software ProUCL 5.1 for Environmental Applications for Data Sets With and Without Nondetect Observations (USEPA 2015), indicates that in order for statistical tests to be performed, sample sizes should be equal to or greater than 10 observations. Revise the Report to reference and follow USEPA's ProUCL guidance on conducting statistical tests on small datasets. Alternatively, revise the Report to include an uncertainty analysis section that specifically identifies issues and biases related to the use of small data sets and other similar considerations that may affect the results of the analyses performed.

Response: Clarification. See response to comment #1. The FSP for the Inlet Basins was reviewed and approved by USEPA and SCDHEC in July 2014. As stated in the comment, it is acknowledged that the ProUCL Technical Guide, Chapter 1, Guidance on the Use of Statistical Methods in ProUCL Software, states that the hypothesis testing approach is used when at least 10 site observations are available. However, Chapter 6, Single and Two Sample Hypotheses Testing Approaches, provides more detailed information on the

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use of hypotheses testing, but identifies a minimum of 8 (not 10) samples to allow for single sample hypothesis testing as indicated in the following excerpts:

“Chapter 6, Single and Two-sample Hypothesis Testing Approaches, Section 6.1 When to Use Single Sample Hypotheses Approaches

Page 182: ...When the number of available site observations is less than 4-6, one might perform point-by-point site observation comparisons with a BTV; and when enough onsite observations (> 8 to 10, more are preferable) are available, it is suggested to use single-sample hypothesis testing approaches. Some recent EPA guidance documents (EPA 2009) also recommend the availability of at least 8-10 observations to perform statistical inference.

Page 183: ...It is beneficial to use DQO-based sampling plans to collect an appropriate amount of data. In any case, in order to obtain reasonably reliable estimates and compute reliable test statistics, an adequate amount of representative site data (*at least 8 to 10 observations*) should be made available to perform the single-sample hypotheses tests listed above. As mentioned before, if only a small number of site observations are available, instead of using hypotheses testing approaches, point-by-point site concentrations may be compared with the specified action level, *A0*. Individual point-by-point observations are not to be compared with the average cleanup or threshold level, *Cs*. The estimated sample mean, such as a UCL95, is compared with a threshold representing an average cleanup standard.”

Therefore, the approved FSP for the Inlet Basins was developed with the understanding that a minimum of 8 samples are needed to use single sample hypothesis testing as described in Chapter 6 of the ProUCL Technical Guide (*ProUCL Version 5.1 Technical Guide, Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations, EPA/600/R-07/041, October 2015 www.epa.gov*). No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

8. The verification of attainment of constituent of concern (COC) cleanup levels was achieved by comparing the COC mean concentrations to their respective human health-based and ECO TLs, and not a more conservative 95% Upper Confidence Limit (UCL) of the mean. Usually, the 95% UCL of the arithmetic mean is used because of the uncertainty associated with estimating the true average concentration at a site. The use of an upper-bound estimate
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provides reasonable confidence that the true average will not be underestimated. Please provide a rationale for using the other than the 95% UCL, as outlined above.

Response: Clarification. See response to comments #1 and #4. Also note that the response to the previous comment (#7) includes the following excerpt from the ProUCL Technical Guide:

“Page 183: ...As mentioned before, if only a small number of site observations are available, instead of using hypotheses testing approaches, point-by-point site concentrations may be compared with the specified action level, *A0*. Individual point-by-point observations are not to be compared with the average cleanup or threshold level, *Cs*. The estimated sample mean, such as a UCL95, is compared with a threshold representing an average cleanup standard.”

Therefore, the UCL95 is used when a small number of samples are available (4-6), whereas the hypothesis testing approach uses the average to compare to cleanup level. Section 6.3, Statistical Terminology for Hypotheses Testing Approaches uses the mean (or median) to form the hypothesis test for attainment of cleanup levels. There is not an option to use the UCL95 in the ProUCL software, and the mean concentration is the default value since this is considered the appropriate method for evaluation of attainment of cleanup levels.

This document uses the default inputs from the ProUCL software package for the statistical hypothesis testing that was performed. No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

9. Section 5.4, Inlet Basins Conclusions, indicates that since residual concentrations of the analytes detected at the Inlet Basins met the pre-established HH cleanup criteria, the Inlet Basins will be graded and contoured to support unrestrictive land use. Noting that this decision was based on a comparison of the mean COC concentrations to HH TLs and that the Report does not present a quantification of residual site risk and hazard, it is unclear if the unrestricted land use designation is supported. In order to support pragmatic risk management decisions, an assessment (predicated on use of the 95UCL as the basis for exposure point concentrations) should be conducted for all constituents with a maximum detected concentration in excess of health-based TLs (i.e., regardless of whether the secondary mean-based assessment concentration meets the cleanup criteria). Please provide the requested information.

Response: Disagree. See responses to comments #1, #4, #7, and #8. No change to the document is proposed.

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Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

10. Section 2.2 Ecological, Page 2 of 34, This section indicates that the ECO TLs represent the Lowest-Observed Adverse Effects Level (LOAEL)-based thresholds. An alternative to such an approach would be to use a Maximum-Acceptable Toxicant Concentration (MATC), calculated as the geometric mean of a No-Observed Adverse Effects Level (NOAEL) and a LOAEL. Such an approach represents a more defensible cleanup goal because it falls between the no-effect and low-effect TLs. Revise this section to justify the use of an effect-based ECO TL instead of a MATC ECO TL, and explain how this decision was reached.

Response: Clarification. Typically, LOAEL-based thresholds are identified as the remedial goal concentration (i.e., cleanup level) in the ecological risk assessment program at SRS. (These values may further be refined based on the receptor and consideration of an area use factor for population level effects).

SRS is unaware of any MATC concentrations that have been published/approved by USEPA. The use of the MATC as a cleanup goal is a programmatic topic for future Risk Assessment Design Team consideration. No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

11. Table 2, Ecological Threshold Levels, Page 21 of 34: Based on review of Table 2, it is unclear why the SRS 95th percentile background concentration was not used for the ECO TL when a Los Alamos National Laboratory (LANL) screening value was unavailable. This occurred for three analytes, with K-40 being the most important, since this analyte's maximum detected concentration is comparable to background. Revise the Report to clarify why the SRS 95th percentile background concentration was not used for analytes without a LANL ECO TL.

Response: Clarification. Constituents that do not have an ecological screening value (i.e., aluminum, iron, magnesium and potassium-40) were not carried through the ecological evaluation process. All are naturally occurring constituents that are ubiquitous in the environment. Since there is not a documented ECO TL value, the potential risk to ecological receptors was considered minimal/insignificant. This approach is consistent with the approved technical evaluations for the 488-2D Ash Basin and 489-D Coal Pile Runoff Basin.

Note that HH TLs are available for aluminum, iron and potassium-40 and were evaluated accordingly. Magnesium does not have a HH TL because it is considered an essential nutrient.

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No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

12. Table 4, 488-1D Ash Basin: Maximum Detected Concentration Compared to Threshold Levels, Page 23 of 54: This table contains entries for Pb-214, Ac-228, and Pb-212, but does not summarize the maximum detections or TLs for these analytes. It should be noted that Appendix A provides a table of all confirmation sampling results and TLs for the three referenced analytes; as such, it is unclear why these constituents were not included on Table 4. Revise Table 4 of the Report to include the maximum detected concentrations and TLs for these analytes.

Response: Clarification. The FSP for the 488-1D Ash Basin provides an explanation on the use of daughter products to estimate the activity of the parent as follows:

“Note that short-lived, high energy emission daughter products may be more easily detected in the laboratory than the long-lived, low-energy emission parent. Under most environmental conditions, the parent and daughter products are in secular equilibrium; therefore, the measured activity of the progeny can be used to estimate the activity of the parent. For this plan, the daughter products of radium-226 (one of the daughter products is lead-214), radium-228 (daughter product is actinium-228), and thorium-228 (one of the daughter products is lead-212) will be analyzed in the laboratory and used to estimate the activity of the parent. The parent +D preliminary remediation goal is then used in the data evaluation.”

The maximum detected concentrations of the parents (Ra-226, Ra-228 and Th-228) in Table 4 are based on the concentrations of the daughters (Pb-214, Ac-228, Pb-212).

No change to the document is proposed.

Responsible Party: Doug Martinson, (803) 852-6043, douglas.martinson@srs.gov

SRS Responses to
SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
Comments on:

Human Health and Ecological Evaluation for Confirmation Sampling at the
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GENERAL COMMENTS

SPECIFIC COMMENTS

1. Section 2.2 Ecological, page 2, and Table 2. The screening value for the Ecological Thresholds (ECO TLs) used in this document is taken from the Los Alamos National Laboratory (LANL) ECO Risk Database low-effects screening level for soil media (LANL, 2015). The values from this LANL document are quite different with the ECO TLs used for the previous ecological evaluation for the 488-2D Ash Basin or the 489-D CPRB. For ecological evaluation for confirmation sampling at the 488-2D Ash Basin, the lowest observed adverse effects level (LOAEL)-based ECO TLs for sediment and soil were used as the screening values for aquatic and terrestrial receptors, respectively, which are more stringent than the LANL screening values, especially for Aluminum, Arsenic, Chromium, and Hexavalent Chromium. Therefore, if the LOAEL-based TLs were applied to the 488-1D Ash Basin evaluation, the maximum detected concentrations for these constituents would exceed the ECO TL (Note that Aluminum even exceeds the maximum SRS background concentration at several sampling locations). Please address why the source for the ECO TLs has been changed in this document and confirm that the LANL ECO TLs are the most appropriate values for use in the ecological evaluation and to support risk management decision making.

Response: Clarification. The differences between the three evaluations can be attributed to the implementation of an evolving set of ecological threshold levels for each media type (soil or sediment) that were available/appropriate at the time of document preparation. Further explanation for each subunit, presented in order of document submittal, is provided below.

The threshold levels used in the evaluation of the 488-2D Ash Basin confirmation sampling results are LOAEL-based values that were derived using the SRS documents that were published/approved in 2004. An additional evaluation was conducted for the 488-2D Ash Basin conservatively using the EPA Region 4 Interim Draft Guidance Document (2015) NOAEL-based values for soil media. Programmatically, NOAEL-based values are to be used in the initial data screening step of an ecological risk assessment and should not be used as cleanup concentrations. However, the EPA Region 4 does not provide more appropriate LOAEL-based values for soil media that can be used either in the refinement step of an ecological risk assessment or as the basis for establishment of waste site cleanup levels. During formal scoping of the Lower Three Runs (LTR) Integrator Operable Unit (IOU) Baseline Risk Assessment in the 2016 / 2017 timeframe, the Core Team discussed the need for revised threshold levels using updated toxicity information. Based on the agreements to use the LANL (2015) database

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thresholds for the LTR IOU, the 2004 SRS-derived values used in the 488-2D Ash Basin evaluation are now considered obsolete.

The 489-D Coal Pile Runoff Basin (CPRB) sample results were evaluated for both aquatic (sediment) and terrestrial (soil) receptors. The EPA Region 4 Interim Draft Guidance Document (2015) was used as the primary source of thresholds for both scenarios. For sediment media, the refinement screening values (RSVs), which are similar to LOAEL-based values for soil media, were used. For the evaluation as soil media, the conservative NOAEL-based values were used because the LOAEL-based LANL values had not been approved (i.e., in the LTR IOU BRA) at the time of document preparation.

Based on the approval of the LTR IOU BRA in December 2017, the threshold levels used in the evaluation of the 488-1D Ash Basin and Inlet Basins confirmation sampling results are LOAEL-based values for soil media from the LANL database. In the absence of waste site-specific ecological study/information, the LANL LOAEL-based threshold levels are currently the most appropriate values for use in an ecological evaluation of soil media to support risk management decision making and for establishment of cleanup levels. If outdated or overly conservative values were used in the ecological evaluation of the 488-1D Ash Basin and Inlet Basins, the final conclusion for risk management decision making would be the same because the weight-of-evidence (uncertainty) discussion would now incorporate the more appropriate LANL values.

As justified in the Field Sampling Plan for the 488-1D Ash Basin (SRNS-RP-2015-00096), an evaluation for aquatic receptors (sediment media) was not performed for the 488-1D Ash Basin since the final action for the western portion of the basin is designed to promote storm water drainage and eliminate the containment of water that could support aquatic communities.

In contrast to the preliminary remedial goals (PRGs) and regional screening levels (RSLs) used in the human health risk assessment, there is not a set of established, consistent threshold levels that are appropriate for use in all phases of an ecological evaluation. This is a topic for consideration in a future SRS Risk Assessment Design Team setting.

No change to the document is proposed.

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2. Section 4.3.2 Hexavalent Chromium, page 8. The last paragraph discusses the differences in results using EPA Method 7196A and Method 7199. Please consider the following revision for the last two sentences for clarity and correction: “A comparison of results for both methods by sample location are reported in Table 9. Table 10 is a data summary comparison of both methods that include minimum, maximum and mean concentrations. Mean values reported in Table 10 for Method 7196A use a surrogate of one-half the sample-specific detection limit for non-detects. Statistical input/output using EPA ProUCL software for Method 7196A are in Appendix B and the mean calculation is in Appendix D. Method 7199 did not yield non-detects and all results used as reported. Statistical input/output using EPA ProUCL software for Method 7199 are in Appendix D.”

Furthermore, please identify on the statistical test output page used for Cr+6 in Appendix B, page B-4, as results from Method 7196A for completeness.

Response: Agree. The text in Section 4.3.2 will be revised as follows:

“...The results of this alternate analysis are compared to the colorimetric method by sample location in Table 9. Table 10 is a data summary comparison of the two analytical methods, including minimum, maximum and mean concentrations. Mean values reported in this table use a surrogate of one-half the sample specific detection limit for nondetects (applies to General Engineering Laboratories [GEL] EPA Method 7196A sample results only, see Appendix D for calculation); mean values reported in Appendix B using ProUCL software are based on detected results only. A comparison of results for both methods by sample location are reported in Table 9. Table 10 is a data summary comparison of both methods that include minimum, maximum and mean concentrations. Mean values reported in Table 10 for Method 7196A use a surrogate of one-half the sample-specific detection limit for non-detects. Statistical input/output using EPA ProUCL software for Method 7196A are in Appendix B and the mean calculation is in Appendix D. Method 7199 did not yield non-detects and all results used as reported. Statistical input/output using EPA ProUCL software for Method 7199 are in Appendix D.”

In addition, the title of the statistical test output page for Cr+6 in Appendix B, page B-4 will be revised as follows:

“One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects - Hexavalent Chromium (Method 7196A)”

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3. Section 5.3.2 Hexavalent Chromium, page 13, third paragraph. Like the specific comment above, please consider the following revision beginning with the second sentence: "A comparison of results for both methods by sample location are reported in Table 16. Table 17 is a data summary comparison of both methods that include minimum, maximum and mean concentrations. Mean values reported in Table 17 for Method 7196A use a surrogate of one-half the sample-specific detection limit for non-detects. Statistical input/output using EPA ProUCL software for both methods and the mean calculation for Method 7196A is in Appendix H. Method 7199 did not yield non-detects and all results used as reported."

Response: Agree. The text in Section 5.3.2 will be revised as follows:

"...The results of this alternate analysis are compared to the colorimetric method by sample location in Table 16. Table 17 is a data summary comparison of the two analytical methods, including minimum, maximum and mean concentrations. Mean values reported in this table use a surrogate of one-half the detection limit for nondetects; mean values reported in Appendix H (Additional Hexavalent Chromium Evaluation) using ProUCL software are based on detected results only. A comparison of results for both methods by sample location are reported in Table 16. Table 17 is a data summary comparison of both methods that include minimum, maximum and mean concentrations. Mean values reported in Table 17 for Method 7196A use a surrogate of one-half the sample-specific detection limit for non-detects. Statistical input/output using EPA ProUCL software for both methods and the mean calculation for Method 7196A is in Appendix H. Method 7199 did not yield non-detects and all results used as reported."

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