DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
8945 LATTY AVENUE
BERKELEY, MISSOURI 63134

July 30, 2012

REPLY TO
ATTENTION OF

Formerly Utilized Sites Remedial Action Program (FUSRAP)

SUBJECT: Draft Final Remedial Investigation and Baseline Risk Assessment Report for the Inaccessible Soil Operable Unit at the St. Louis Downtown Site (SLDS), dated July 26, 2012

Mr. Matthew Jefferson
U.S. Environmental Protection Agency
Region VII, Superfund Branch
901 North Fifth Street
Mail Stop: SUPR/MOKS
Kansas City, Kansas 66101-2907

Dear Mr. Jefferson:

Enclosed are 2 hard copies and 1 electronic copy of the subject document along with final responses to comments on the previous revision. Per the terms of the Federal Facilities Agreement, Section X.B.1, the subject document will become final on August 30, 2012 if dispute resolution is not invoked or as modified by decision of the dispute process.

Copies of this document are also being provided to Ms. Tiffany Burgess (Missouri Dept. of Natural Resources), Mr. Branden Doster (Missouri Dept. of Natural Resources), Ms. Karen Burke (Mallinckrodt), and Ms. Robin Rodriguez.

If you have any questions or require additional information, please contact Mr. Brenton Barkley at 314-260-3922 or Brenton.C.Barkley@usace.army.mil.

Sincerely,

Sharon R. Cotner
FUSRAP Program Manager

Final Responses, Submitted July 30, 2012 to EPA Comments on the SLDS Remedial Investigation and Baseline Risk Assessment, Revision B, dated November 10, 2011

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1.	General	The Army Corps of Engineers and its contractors are to be commended for taking a mountain of data and processing it into a useful form. However, it is clear from the numerous factual, mathematical and stylistic errors populating the appendices that one more cogent editing of the RI is necessary before it can stand as an acceptable basis for making a decision. Appendix I stands as a model of completeness of mathematical processes and of clarity of presentation. By contrast, appendices B, E, F and M contain multiple examples of factual and mathematical errors and presentational slovenliness. The author of Appendix I should be tasked with revising these appendices and bringing them up to an acceptable standard.		Appendices B, E, F, and M have been re-edited per this comment and comment numbers 55 through 76.
2.	General	In multiple places in this RI report, the reader is referred to the RI Work Plan for further details, methods, and/or procedures. This is not acceptable. The ISOU RI Report should be comprehensive to include all methods and procedures such that referring to separate documents is not necessary. Many of these specific inadequacies are noted in the technical comments below. Please ensure that this RI report is comprehensive to provide all necessary information.		Additional detail from the RI WP has been brought forward to the RI, as appropriate, to make the RI report comprehensive.
3.	General	The document does not follow the 1998 EPA Ecological Risk Assessment guidance entitled "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments". A Screening Level Ecological Risk Assessment needs to be performed according to the 1998 EPA guidance or an explanation in the text of why the screening level was not performed.		An Environmental Assessment for Biota was performed as part of the 1993 BRA, which evaluated potential receptor exposures to soil (mostly accessible), sediment, and surface water. The environmental assessment concluded that due to the urban environment, limited wildlife habitat, and biotic diversity, the significance of the SLDS in regard to ecological resources is minimal. Therefore, all subsequent investigative and remediation activities conducted under the 1998 SLDS ROD, have focused on protection from human health effects. However, as indicated in the *Second Five-Year Review Report for FUSRAP St. Louis Sites (September 22, 2010)*,

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				"Statement of Protectiveness," the remedial actions being undertaken at the SLDS accessible OU, are expected to be protective of both human health and the environment upon completion. In comparison to the accessible media evaluated in the 1993 environmental assessment, the potential for impacts to ecological receptors from ISOU media is significantly less for the following reasons. First, the potential for direct contact exposures to ISOU media is greater for human receptors than for terrestrial or aquatic species. Second, the presence of buildings/structures and consolidated cover (e.g. asphalt and concrete pavement) acts a physical barrier to direct contact exposures to inaccessible soils underlying those areas by terrestrial receptors. Third, the potential for subsurface migration to sensitive terrestrial or aquatic habitats (although none have been found to exist, per the Ecological Checklist in Appendix R), from inaccessible soil sources beneath structures and consolidated cover, is not significant. Finally, remedial actions that have been conducted at the SLDS, under the 1998 ROD, have reduced the likelihood that ISOU media will be impacted by accessible soil contamination. It is for the aforementioned reasons that the ISOU BRA does not include a comprehensive ecological risk assessment. Text (similar to what is stated above) and additional pathway information has also been added to the text, based on the revised CSM, to support this position.
4.	General	4. The document does not follow the EPA guidance in several key areas: a. The Remedial Investigation report does not evaluate potential risks to human health from radiological contaminants using EPA risk assessment guidance. Rather, the report uses the U.S. Department of Energy's RESidual RADioactivity (RESRAD) computer code to evaluate potential risk from		a. The RESRAD model is approved by NRC, DOE, and USEPA, and as USEPA indicates, RESRAD has been used for years at the SLDS. Continued use of this model for the ISOU BRA has been implemented to maintain a consistency

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		radiological contaminants. Unfortunately, this issue is not unique to the St Louis Downtown Sites (SLDS). Rather, it is an issue that has been frequently raised at former Department of Energy sites around the country.		in the dose and risk assessment methodology being used at SLDS.
		b. EPA risk assessment guidance recommends screening contaminants for inclusion in the risk assessment using a1E-06 potential excess cancer risk. This document uses a 1E-05 potential excess cancer risk.		b. COPCs were identified by data comparisons with USEPA soil PRGs and derived building/structural surface PRGs protective of a target cancer risk of 1E-06.
		c. The document also screens contaminants using a dose limit of 25 mrem/year. The EPA has taken the position that a dose of 25 mrem/year is not sufficiently protective (per the 1997 EPA guidance "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination. OSWER Directive No. 9200.4-18"), and has recommended that a maximum dose of 15 mrem/year be used instead.		c. The HHRA has been revised to screen contaminants (i.e., to determine COPCs) based only on risk. In the revised HHRA, the dose limit of 25 mrem/year is only used as a target value for dose characterization purposes. Regarding the protectiveness of 25 mrem/year, USEPA has stated the following position (noted in the corresponding comment) taken in OSWER 9200.4-18, which is based mainly on equating dose limits to risk levels: "EPA has carefully reviewed the basis for the NRC dose levels" (25 mrem/yr) "and does not believe they are *generally* protective within the framework of CERCLA and the NCP." However, this position is based on a residential exposure scenario and is not site-specific. Residential land use is not a current land use nor is it expected to be a future land use for the ISOU and is therefore not included as a receptor scenario in this document. In discussing USEPA's document relating risk to dose (OSWER Directive No. 9200.4-18), ISCORS Technical Report No. 1 "Estimating Radiation Risk from Total Effective Dose Equivalent (TEDE)" states "a constant linear relationship between risk and dose" cannot be

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				expected and "it is not possible to convert a dose assessment made using FGR 11 dose coefficients into a risk assessment that will be consistent with FGR 13/HEAST."
5.	Section 2.1, paragraphs two through four, and Table 2-1	This section is not clear. The text describing PCOCs does not match with the constituents listed in Table 2-1, at least not directly. Or perhaps, paragraph four is prematurely placed in this discussion. If the final list of PCOCs is presented in paragraph five, please rearrange this text so Table 2-1 (and paragraph four) follows that information. Also, Table 2-1 would be more easily understood if there were separate columns for PCOCs in soil and in sediment. It appears that contradictory information is presented in paragraph three and four. For example, the last two sentences of paragraph three indicate that metals for soil were refined to As, Cd, and U-metal. However, the last sentence of paragraph four indicates those three metals plus Co, Cu, Pb, Mn, Mo, Ni, Se, V, and Zn. U-metal is not included in that last list. Please revise this section for clarity.		Section 2.1 has been revised for clarity. The discussion of inaccessible soil PCOCs has been separated from the sewers PCOCs discussion. The two separate discussions of soil and sewer PCOCs are now presented in new subsections 2.1.1 and 2.1.2. Table 2-1 has been split into two tables, one for inaccessible soil PCOCs (Table 2-1) and the other for sewer sediment and soil adjacent to sewers PCOCs (Table 2-2).
6.	Section 2.2.1, paragraph two and Figure 2-1	Looking at Figure 2-1, there is a note discussing a downward sloping of the inaccessible soil away from the structure foundation. This implies that inaccessible soil may extend beyond the five foot distance, even though the text specifically describes inaccessible soil as five feet on the horizontal. Please clarify in the text this sloping away from the structure and whether the five foot distance may be exceeded or not.		The text has been revised as follows to clarify: *"The horizontal boundaries for an inaccessible soil area associated with a structure are defined by the footprint of the structure. The footprint typically includes the area directly beneath the structure as well as an area surrounding the structure extending a minimum of 5 ft outward from the foundation (USACE 1999b) (Figure 2-1). Inaccessible areas associated with structures also include additional supporting soil extending outward beyond this 5 ft buffer zone at a slope that is determined based on soil properties and on site-specific engineering and safety concerns. The areas beyond the 5 ft buffer zone were investigated under the 1998 ROD. Therefore, for the*

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				purposes of this investigation, the initial boundaries for inaccessible soil areas associated with a structure were limited to the areas directly beneath the structure and the 5 ft buffer zone extending outward from the foundation."
7.	Section 2.2.1, paragraph two and Figure 2-2	Similar general comment as 2, but for the roadbed.		The text has been revised as follows to clarify: *"The typical horizontal boundary for inaccessible soil beneath or adjacent to a roadway is defined as the roadway and its associated ROW extending 5 ft from the edge of the pavement (USACE 1999b) (Figure 2-2). Any additional inaccessible soil extending outward beyond the 5 ft buffer zone was not included in the investigation because it was characterized under the 1998 ROD. Therefore, for the purposes of this investigation, the initial boundaries for inaccessible soil areas associated with roadways were limited to the areas directly beneath the roadway and the 5 ft buffer zone."*
8.	Section 2.2.1, paragraph two and Figure 2-3	Similar general comment as 2, but for the rail bed and a ten foot distance.		The text has been revised as follows to clarify: *The typical horizontal boundary for inaccessible soil beneath or adjacent to a RR track is defined as the area that includes the track and the associated RR ROW extending a distance of 10 ft from the outermost rail of the track (USACE 1999b) (Figure 2-3). Any additional inaccessible soil extending outward beyond the 10 ft buffer zone was not included in the investigation because it was characterized under the 1998 ROD. Therefore, for the purposes of this investigation, the initial boundaries for inaccessible soil areas associated with the RRs were limited to the areas directly beneath the RR tracks and the 10 ft buffer zone."*
9.	Table 2-2, footnote b	It would appear that the reference to the RI WP here is unnecessary. Recommend deleting "As described in the RI WP". Either refer to another section of the ISOU RI or, if more information is required as to the		Footnote b was revised to state, *"The specific media (inaccessible soil, sewers, or buildings) at the property were previously determined to be non-impacted as documented in the RI WP; therefore, no*

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		non-impacted areas, please provide it in the text, rather than referring to a separate document.		*RI sampling was conducted.*" It does not seem beneficial to include the rationale for not sampling specific media in the RI report that was not included in the RI scope. The scope of the RI was previously agreed upon by the stakeholders as documented in the approved RI WP. The reference to the RI WP was included as a courtesy to the reader in case they were interested in how the scope of the RI was determined. Additional details concerning non-impacted inaccessible soil have been added to the text in Section 4.2.
10.	Section 2.2.3, paragraph three, first sentence	Please do not refer the reader to the RI WP for methods and procedures for field activities. All methods and procedures should be presented in this ISOU RI Report. Please revise the report as necessary.		Additional information regarding the methods and procedures used during sewer sampling has been added to Section 2.2.3. The reference to the RI WP will remain in the section to demonstrate that USACE followed the sewer sampling procedures as planned.
11.	Section 2.2.3, Manhole Sediment Sampling, last sentence	Please revise "soil boring logs" to either "sewer sediment manhole logs" or "sewer soil boring logs".		The last statements under "Manhole Sediment Sampling" and "Soil Boring Sampling Adjacent to Sewers" have been revised to refer to *"sewer sediment manhole logs"* and *"soil adjacent to sewers boring logs"*, respectively.
12.	Section 2.2.3, Soil Boring Sampling Adjacent to Sewers, paragraph three, first sentence	Stating that "Some modifications were made to the soil sampling approach outlined in the RI WP" implies that the soil sampling approach is not provided in this ISOU RI Report. Please ensure that the soil sampling approach is presented in this ISOU RI Report.		The general sampling approach for soil adjacent to sewers is described in the first two paragraphs of this subsection, with the exception of the depth information that is included in the 3rd paragraph. Information concerning the sampling methods used for this approach has been added as noted in response to Comment 10.
13.	Section 2.2.4, paragraph one, first sentence	Stating that "…QA/QC samples were obtained and analyzed in accordance with the RI WP" implies that QA/QC sampling and analytical requirements are not presented in this ISOU RI Report. Please ensure that all QA/QC requirements are presented in this ISOU RI Report and that there is no need to refer to a separate document.		The first paragraph of Section 2.2.4 was replaced with the following text: *"During RI characterization, QA/QC sampling and laboratory analysis activities were conducted in accordance with the performance criteria and QA objectives that were established in the RI WP (USACE 2009a), and that are presented in the*

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				bulleted items below. The QA/QC sample results are documented in the Quality Control Summary Report contained in Appendix B. • *Duplicate and split samples were each collected at a rate of approximately 5% for field and laboratory QC purposes.* • *Precision is the degree to which the analytical result for a sample can be reproduced during separate measurements. Precision was determined by the collection of a parent sample along with a split sample and a duplicate sample. The acceptable relative percent difference (RPD) between a parent and duplicate samples or parent and split samples was 30% or less. The objective applied for the RPD when reported results are greater than 5 times their minimum detectable concentrations was 50%. If radiological sample results are less than 5 times their respective minimum detectable concentrations, then the normalized absolute difference (NAD) was used with the objective being a NAD less than 1.96.* • *Accuracy provides a gauge or measure of the agreement between an observed result and the true value for an analysis. For this report, accuracy is measured through the use of the field split soil samples through a comparison of the prime laboratory results versus the results of an independent laboratory.* • *Representativeness and comparability were used to ensure that the samples represent a characteristic of the location sampled and are assured through the selection and proper implementation of systematic sampling and measurement techniques, as well as compliance with analytical methods and sample hold times.* • *Completeness refers to the portion of the data that*

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				meets acceptance criteria and is, therefore, usable for statistical testing and risk assessment. The objective applied for this RI was 90%."
14.	Section 2.2.5, paragraph one, first sentence	Please ensure that all equipment decontamination procedures are included in this ISOU RI Report, and that the reader does not need to refer to a separate document. Revise the report as necessary.		Additional information has been added to Section 2.2.5 of the RI report to better describe the equipment decontamination procedures that were used during the RI field activities.
15.	Section 2.2.5, paragraph one, third sentence	What is "chemical sampling"? Are chemicals being sampled; or instead, is environmental media (soil, sediment, etc.) sampled for chemical analysis? Please revise the report for clarity.		The following statement has been added to paragraph 1: *"For the purposes of this report, chemical sampling refers to the sampling of soil or sediment for chemical analysis (i.e., laboratory analysis for the metal PCOCs identified for inaccessible soil, soil adjacent to sewers, and sewer sediment)."*
16.	Section 2.2.5, paragraph two, first sentence	Please see technical comment 15, except this is in reference to "radiological sampling". Please revise the report for clarity.		The following statement has been added to paragraph 1. *"Radiological sampling refers to the sampling of soil or sediment for radiological analysis (i.e., laboratory analysis for the radiological PCOCs identified for inaccessible soil, soil adjacent to sewers, and sewer sediment)."*
17.	Section 2.2.5, paragraph three, fourth sentence	Instead of referring the reader to the SAG to know what the "unrestricted use" contamination levels are for deconned equipment, please revise the report to present those levels in the ISOU RI Report.		The unrestricted use criteria were added to the text.
18.	Section 2.2.6, third sentence	Please ensure that methods and procedure related to the management of IDW are included in this ISOU RI Report, and that the reader does not need to refer to the SAG.		Additional information has been added to Section 2.2.6 of the RI report to better describe the management of IDW that was completed during the RI field activities. The reference to the SAG will remain in the section to demonstrate that USACE followed their planned IDW management procedures.
19.	Section 4.1, paragraph two, first	"Screening levels are health-based for radiological and metal PCOCs. Radiological screening levels are dose-based and metal screening levels are risk based."		All radiological and screening levels from 40 CFR 192 that were previously used in the RI/BRA have been replaced with USEPA's risk-based generic

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<tr><th>Comment #</th><th>Page/ Section/ Paragraph</th><th>Comment</th><th>Reviewer</th><th>Response</th></tr>
<tr><td></td><td>sentence</td><td>What does this mean? For clarity, please elaborate.</td><td></td><td>preliminary remediation goals (PRGs) for outdoor worker exposures to soil (dated August 2010), targeting a cancer risk of 1E-06. The radiological PRGs were obtained on-line from the following website:
http://epa-prgs.ornl.gov/radionuclides/

All of the metals screening levels for soil are now USEPA's industrial regional screening levels (dated November 2011) that target either a cancer risk of 1E-06 or a hazard index of 1.0. As a result of these changes, all of Section 4, including Section 4.1 has been rewritten. Also, for consistency with CERCLA language, all USEPA radiological PRGs and regional screening levels are now referred to as PRGs in the RI/BRA.</td></tr>
<tr><td>20.</td><td>Section 4.1, Table 4-1</td><td>This table provides the screening level concentrations used to identify chemicals of potential concern. For several compounds, the screening level concentration exceeds the recommended screening levels derived using EPA's radiological PRG calculator, which can be found at http://epa-prgs.ornl.gov/radionuclides/, as well as EPA's regional screening table for metals, which can be found at http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm. Because several of the screening levels are higher than what the EPA recommends, it is possible for some areas with relatively low levels of contamination to be excluded from the risk assessment. The following table identifies those contaminants with elevated screening values, as shown in Table 4-1 of the report. Note that the EPA screening values are based on an excess potential cancer risk of 1E-06:

<table>
<tr><td>Ra-226</td><td>5 pCi/g</td><td>2.48E-02 pCi/g</td><td>2.78 pCi/g</td></tr>
<tr><td>Ra-228</td><td>5 pCi/g</td><td>5.38E-02 pCi/g</td><td>0.95 pCi/g</td></tr>
</table></td><td></td><td>Please see the response to comment 19. Section 4.1 and Table 4-1 have been revised accordingly.</td></tr>
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		U-238 | 50 pCi/g | 1.65 pCi/g | 1.44 pCi/g Arsenic | 60 mg/kg | 1.6 mg/kg | 21.76 mg/kg		
21.	Section 4.1, paragraph two, first sentence	"Screening levels are health-based for radiological and metal PCOCs. Radiological screening levels are dose-based and metal screening levels are risk based." What does this mean? For clarity, please elaborate.		This paragraph has been deleted and Section 4 has been rewritten to incorporate discussion of the revised PRGs. Please see the response to comment 19 above.
22.	Section 4.1.1, last paragraph	Rather than refer the reader to the RI WP, please provide the DCGL calculation process for structure surfaces in the ISOU RI Report. An appendix will suffice, is applicable.		The DCGL calculation process, similar to Appendix B in the RI WP, has been added as Appendix S to this RI report.
23.	Section 4.1.1, paragraph one, last sentence	"….demonstrated protectiveness of the 50 pCi/g standard." A literature citation must be provided for this assertion.		This sentence is no longer included in Section 4. Section 4 has been rewritten to include discussion of the revised PRGs which do not include the 50 pCi/g for U-238. Please see the response to comment 19 above.
24.	Section 4.1.1, paragraph three	This subsection mentions DCGLs derived from gross alpha measurements of radioactive material on building surfaces. That is confusing since DCGLs are radioisotope specific and gross alpha measurements are not radioisotope specific in principle. Furthermore, DCGLs are for internal dose calculation. How does this report get from building surface contamination measurements to DCGLs? This is particularly difficult since section 4.2.1 states that radium-containing pitchblend ores were processed from 1942-1945. These West-African ores were geologically old and contained many daughter isotopes in secular equilibrium. Therefore, the measured alpha particles could have come from any of a dozen or more isotopes in the uranium and thorium decay chains. So how do these gross alpha measurements translate into isotope specific alpha values? The authors must assume some radiosotope speciation; but, what and where is that information derived from? Footnote i in Table 4.1 states that the		See response to comment 22 above.

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		methods of deriving DCGLs is found in Appendix B of the RI WP. This methodology should be set forth somewhere in the RI, probably in an appendix, so it can be reviewed. The reader should not have to chase down other documents in order to find the relevant technical methodologies for critically important calculations. Furthermore, since there is no external dose from alpha particles how do the authors get from contamination on the building surfaces to internal dose? They must assume that some fraction of the surface contamination is inhaled and/or ingested. But what are the assumed inhalation and ingestion fractions? Finally, where are the example calculations to demonstrate the methodology for these dose contentions? This RI needs a full set of start-to-finish example calculations from one real and significant measurement. The example calculation should set forth the relevant methodologies, with literature citations, to demonstrate that the complicated processes of going from gross alpha surface measurements to DCGLs to internal dose are founded on legitimate methodologies and correct mathematical manipulation.		
25.	Section 4.1.2, paragraph one, second sentence	Until this point in the RI, the uranium PCOC in soil was referred to as "uranium metal". Here the term used is "elemental uranium". Please revise the report to use the same term throughout the report for consistency.		With the exception of those instances where the statements or table headers clearly note that the COPCs discussed are metals, the document has been revised globally to state "uranium metal" when referring to the non-isotopic form.
26.	Section 4.1.2, paragraph one, last sentence	Please add the reference for the 1988 FS for industrial workers by inserting "(USACE 1998b)" at the end of the sentence.		Section 4.1.2 was re-written due to a change in screening levels. Please see the response to comment 19 above.
27.	Section 4.1.2, paragraph two, last sentence	Please define "RG" if it is used here for the first time.		RG was first defined in the 7th paragraph of Section 1.1.1.

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28.	Section 4.2, last paragraph, second sentence	Table 4-2 is referred to here, saying that it presents radiological "COC" data. However, the table heading indicates "PCOCs". Please revise either the text or table as appropriate.		The Table 4-2 heading is correct. The text has been corrected to state *"A summary of the radiological concentrations in inaccessible soil at the SLDS is shown in Table 4-2 on a property-by-property basis."*.
29.	Section 4.2.1.1, paragraph three, fourth sentence	Rather than refer the reader to the RI WP, please summarize the details associated with non-impacted inaccessible soil in this section of the ISOU RI Report.		These paragraphs are no longer included in Section 4.2.1.1. Section 4.2 was re-written due to the change in PRGs. Please see the response to comment 19 above. Additional details concerning non-impacted inaccessible soil have been added to the text.
30.	Table 4-2	Table 4-2 lists the minimum and maximum values and the arithmetic average of all the measurements. In order to form a complete understanding of the measurements two other values should be presented: the median and the modal values. For example, in the first row of Table 4-2 the Plant 1 soil radium values are listed as 0.39 minimum, 623 maximum, and 6.58 average. This is such a large range of values that the average by itself does not tell the reader what is going on. The cited measurements suggest that there is a radium hotspot in Plant 1. But is there one hotspot, two hotspots or more? There is no way to know from the data as presented. The median and the mode would present a much more complete understanding what the measurements really mean.		The mode and median values were calculated and added to the property-by-property values in the Appendix E tables. A footnote was added to Table 4-2 to indicate this.
31.	Table 4-2	Please provide a footnote with meaning of the grey shaded cells.		Footnote changed to *"Bold values and gray shading indicate samples collected at the property that exceeded the PRG."*
32.	Table 4-2	Please verify the accuracy of BSNF RR (DT-12) summarized results. Total samples on Table 4-2 indicate 480, while Appendix E Table E-22 shows 484.		Table 4-2 was updated to match the results presented in Table E-22 (now Table E-1-25).
33.	Section 4.2.7.2, Page 52	The text reports that areas of radiological contamination are present beneath the two salt domes, but there do not appear to be any plans to address those areas of contamination.		Section 4.2.7.2 was re-written due to the change in PRGs. Please see response to comment 19 above.

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34.	Section 4.3.1.2	Where did the Ra-226 and Th-230 values come from?		The values were reported in Table E-14 (now Table E-1-17).
35.	Section 4.4.3.2, last paragraph, and Table 4-3	Please verify the accuracy of BSNF RR (DT-12) summarized metals results on Table 4-3. There is no data indicated for uranium; instead, there is a superscript noting that summary data do not include soil associated with sewers. However, reading the text, it indicates that the "results for cadmium and uranium metals analysis…were below screening levels". Results for uranium are not presented on Table E-23 either. Please revise text and/or tables for accuracy.		Samples were collected for uranium metal at two excavation sidewall locations for a total of 12 samples. Table 4-3 was updated with these results.
36.	Section 4.6, paragraph three, last sentence	The text sets forth a gross alpha screening level of 3900 dpm/100 cm2. How was this value derived? It is not acceptable to simply assert a limiting value without explaining how it was derived. A brief cogent explanation should be inserted into the text.		Please see response to comment 22 above.
37.	Section 4.6 and Table 4-4	In multiples places on this table, instead of data, dashes (--) are indicated. According to the matching footnote for this symbol, "Sampling was not proposed in the RI WP". Reading the text of the accompanying subsections of Section 4.6, there is no information to support not conducting a survey on that portion of the particular buildings. For every survey area indicated as "--" on Table 4-4, please provide information in the accompanying text as to why that area was not proposed for surveying. The reader should be able to understand why certain areas were not surveyed without having to obtain the RI WP.		Buildings that do not fit the definition of impacted were not surveyed. Additional information concerning the basis for designating a building as impacted and requiring sampling has been added to the beginning of Section 4.3.
38.	Section 4.6.10	There are no figures referred to for the properties discussed in this section. At a minimum, reference to Figure 1-2 would be helpful to the reader to put these property locations into context with SLDS. In addition, there are discrepancies between the		A figure citation was added to reference the property locations. The following statement has been added: *"The buildings surveyed are shown on figures provided in Appendices C and E."* This section has been revised and no longer includes

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		buildings stated as being surveyed (in the text) and data tables presenting the survey results in Appendix F. For example, buildings DT-20 and DT-26 were reported as surveyed; however, there are no data tables for these buildings in Appendix F. For one building, DT-21, there are two data tables presented in Appendix F: F-63 and F-64. Please review this section and revise as appropriate.		text concerning the buildings at DT-20 and DT-26. - There are two tables for DT-21 property since there were two buildings surveyed. The file names were updated to identify the building names.
39.	Section 4.7, paragraph two, second sentence	For consistency with earlier sections of the report, please revise "10-6" to "1E-06".		Section 4.7 was re-written due to change in screening levels. Please see response to comment 19 above. However, scientific notation will be used consistently throughout the document.
40.	Table 4-5	Please provide the definition of "FOD" as a footnote.		Table 4-5 removed from main text. Table is now Appendix I. The following footnote was used: *"(2) Frequency of Detection (FOD) is expressed as a percentage of detections out of the total number of samples analyzed."*
41.	Section 4.7.2.2	Is this subsection heading missing a title? Please revise as appropriate.		This subsection number is in the wrong place and has been deleted; however, Section 4.7 was re-written due to the change in screening levels (PRGs). Please see response to comment 19 above.
42.	Section 4.7	Throughout this section, there are subsections titled "Sediment Sampling Results" and "Soil Sampling Results". For consistency with the text and Tables 4-6 and 4-7, it is recommended that these titles be revised to "Sewer Sediment Sampling Results" and "Sewer Soil Sampling Results".		Section 4 has been revised due to the changes in screening levels. These subsections are no longer required for the revised text addressing sewers. (Section 4.4). Please see response to comment 19 above.
43.	Section 4.7	While analytical data are summarized in this section for sewer soil samples, summary data tables for sewer sediments are not. There are no summary tables for either radiological or metal analytes for sewer sediments. This is not consistent with the manner in which data have been summarized in earlier portions		Summary data tables for the radiological and metal PCOCs in sewer sediment have been added.

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		of the report for soil and building surveys. It is recommended that sewer sediment summary tables also be presented, as appropriate, in this section.		
44.	Section 4.7.2.4 and Table 4-6	Table 4-6 shows Th-230 to be greater than the screening levels in Plant 1 sewer soil. Section 4.7.2.4 states that there is no radiological impact from the Plant 1 sewer soils. These seem to be conflicting statements. It seems that one statement refers to the sewer soils and the other to the adjacent soils. Perhaps this could be re-worded to be clearer.		Section 4.7.2.4 has been revised due to the changes in screening levels (PRGs). Please see response to comment 19 above. The distinction intended here is between sewer sediment and soil adjacent to sewer lines. The statement in the first paragraph refers to "sewer sediment" (i.e., sediment within manholes/drains).
45.	Table 4-8	It would be helpful to revise this table title, or column headers, to somehow indicate that COPCs are presented in this table.		Table 4-8 has been deleted as part of the revisions made to Section 4 to incorporate the new screening values. A new table (Table 4-14) titled "Contaminants of Potential Concern for the Inaccessible Soil Operable Unit" has been added.
46.	Section 5.0, Page 115	The text states that "The CSM does not consider future scenarios in which the inaccessible soil areas become accessible due to removal of buildings, ground cover, etc., because this would result in conditions that would have to be addressed in accordance with the 1998 ROD, which considers only accessible soils". The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requires that future use scenarios, absent any institutional controls, be considered in the risk assessment.		The CSM, as presented in Section 5.0 and Figure 5-1, was developed to describe sources and transport pathways for the non-BRA sections of the RI Report, which addresses conditions under current configurations. However, this resulted in an information gap between the RI Report, which addresses current configurations, and the BRA, which evaluates possible future conditions in which inaccessible soil becomes accessible. Therefore, the CSM figure has been revised to reflect both sets of exposure configurations as current and future exposure scenarios in the BRA. Because receptors and pathways have been introduced, Figure 5-1 has become Figure 6-3 in the BRA Section and Figure K-3 in the BRA Appendix. Discussions in Section 5 now refer to Figure 6-3. Additionally, the Section 5 text now clarifies the difference between evaluation of current configurations versus loss of health-protective barriers under current and future scenarios, respectively.
47.	Section 5.4.1,	This sentence states that "In water, the partitioning of		A table of site-specific K_d values for the COPCs has

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	paragraph one, third sentence	an element between dissolved and adsorbed forms is influenced greatly by the geochemical characteristics of the site. It is necessary, therefore, to rely on estimates of the Kd….." Why were the Kd values estimated? There is a database of soil borings with detailed descriptions of soil morphology and geochemistry. For example, in the third paragraph of section 5.4.2, it states: "Metals are typically attenuated by clay soil, such as that found in the subsurface environments at the SLDS….". Further, in paragraph three of Section 5.4.2.2, it states: "Under the near-neutral pH conditions observed in shallow ground water at the SLDS…." Given what seems to be, from these and other statements in the body of the text, a significant body of geochemical data from the site, why were Kd values not generated from site-specific data?		been added (Table 5-3) and the following text has been added to Section 5.4.1 after the quoted statement: *"A detailed review of K_d values reported in the literature is presented in USEPA's three-volume guidance document "Understanding Variation in Partition Coefficient, K_d, Values" (USEPA 1999a, 1999b, 2004a). Based on the results of this review, USEPA developed formulas and look-up tables that can be used to estimate an appropriate range of K_d values for a contaminant at a particular site based on various site-specific parameters. Table 5-3 presents predicted K_d values for the ISOU radiological COPCs (radium, thorium, and uranium) based on measured values for site-specific parameters, including pH, soil type, and the dissolved concentration of the COPC in site groundwater."* The following statement has been added to Section 5.4.2 (metals): *"Table 5-3 presents predicted K_d values for the metal COPCs (arsenic, cadmium, and lead) based on results of groundwater sampling at the SLDS. These K_d values were estimated using site-specific values of pH and the equilibrium concentration of the COPC in SLDS groundwater."* Additional text has been added under the subsections dealing with each COPC to provide the basis of each K_d value in the table. Also, a statement has been added to Section 5.4.1.1 to provide the site-specific measured uranium K_d value (146 mL/g) that is reported in the 1994 RI for the SLS.
48.	Section 6.1, Page 135	Here and in other locations, the risk assessment reports that a dose value of 25 mrem/yr, and a potential excess cancer risk value of 1E-05, were used as screening levels. As noted in General Comment 4,		Please see the responses to comments 4b and 4c above.

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		the EPA guidance does not consider a dose of 25 mrem/yr to be sufficiently protective under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Also, the EPA screening values are based on a potential excess cancer risk of 1E-06, not 1E-05.		
49.	Section 6.1.1, Page 135	The text identifies Ac-227 as one of the COPCs at the site. However, Table 4-1 does not include this compound. Please reconcile.		Table 4-1 has been revised to include Ac-227, as well as Pa-231.
50.	Section 6.1.1, paragraph two, first set of bullets for inaccessible soils	Is Plant 6, Radiological, missing from this bullet list? Referring to Table 4-8, that information is shown for Plant 6. Plant 6 showing risks exceeding acceptable criteria are also presented in Section 6.1.2.1, paragraph four, first group of bullets, and Plant 6 is also shown as a bullet in this similar section for Appendix K. Please evaluate and revise if necessary.		Section 6.1.1 was re-written due to the change in the HHRA Please see the responses to comments 4b and 4c above.
51.	Section 6.1.2.2	It's not clear what additional calculation is being performed here and why. Please be more specific to elaborate on this separate evaluation to enable the reader to understand the reasoning behind it and the general approach.		The HHRA has been revised to evaluate SLDS-wide and property-specific doses and risks; therefore, information relevant to the evaluations of elevated measurement areas has been removed from Section 6 and Appendix K. Section 6.1.2.2, as presented in the Revision B document, has been removed from the document. The dose and risk evaluations of elevated measurement areas will be a focus of the Feasibility Study.
52.	Section 6.1.2.2, Page 142	Why was the utility worker scenario the only one evaluated in the "elevated measurement areas"?		Please see the response to comment 51above.
53.	Section 6.1.2.3, paragraph two	EPCs for building and structural surfaces are calculated… and converted to the unit of picocuries per square meter. A sample calculation showing these conversions would be helpful.		A reference to the calculation shown in Section K2.3.1.2 in Appendix K has been added to the second paragraph of Section 6.1.2.2.
54.	Section 6.3, Page 145	Why was the construction worker scenario evaluated only at offsite properties, and excluded from evaluation onsite?		The portions of the railroads and roadways investigated during the ISOU RI, then evaluated in the BRA, are not considered offsite because they are within the ISOU study area. The construction worker

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				is a more likely receptor for contamination at these properties than the utility worker. The HHRA has been revised to include the evaluations of the construction worker at all properties where PRGs are exceeded.
55.	Appendix B, Section B 3.2	The definition of "U", "The material was analyzed for a parameter, but it was not detected above the level of the associated value." This statement is incoherent. What does the phrase "....the level of the associated value" mean? Please revise for clarity.		Per EPA QA/G-8, Nov 2002, USEPA National Functional Guidelines, Oct. 1999 and Jan. 2010 the definition of "U", was changed to *"The analyte was analyzed for, but was not detected above the reported sample quantitation limit."*
56.	Appendix B, Section B 4.0	The normalized absolute difference (NAD) is presented as an alternative statistical analysis when the relative percent difference (RPD) value is greater than 50%. The NAD is applied to a sample size of two, the initial value and the split sample value. The analysis then chooses the 95th percentile (1.96 sigma) as the decision point to determine if the values are statistically the same. The use of the NAD for this analysis needs to be either justified or replaced with a conservative decision rule. The following decision rule is recommended: if the RPD value is greater than 50%, use the higher analytical value. From a theoretical standpoint, it is questioned whether the NAD is applicable to this data set at all. No justification is presented for the use of the NAD and several considerations militate against its use. For one, the Gaussian Normal probability distribution function is a distribution for continuous variables. In the Appendix B tables, the NAD is calculated for each set of two measurements, the original analysis and the split or replicate sample analysis. These two analytical values are discrete, non-correlated discontinuous values rather than continuous ones. Other statistical distributions, such as the Poisson probability distribution function assume non-correlated discontinuity of values. Why weren't Poisson statistics used to analyze these paired values		The normalized absolute difference (NAD) that is referenced in the calculations is a valid statistical calculation used to evaluate duplicate and/or replicate results and associated uncertainty for radiological values. The sample and duplicate result data are evaluated as to whether the RPD is within 30% or 50% depending upon the matrix. When the RPD is >30% or 50% the NAD is calculated and evaluated to the 95^{th} percentile or 1.96 sigma. The data sets then are used to determine potential problems with the data set and any "missed" evaluation is counted as an individual miss and then compared to the total. The data sets are then used to evaluate two items of concern for sample analyses: Repeatability of results (inter-laboratory and intra-laboratory), and effectiveness of field sampling efforts in preparation of duplication by sub-sampling in the field. Then conclusions with respect to data quality may be evaluated from the data set with further analysis. RPD only compares sample and duplicate result values without consideration to the total propagated uncertainty of each sample. The NAD calculation is referenced in section D.4.2 of DOE's Quality Systems for Analytical Services

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		which are binomial by definition? The standard deviation of any measurement in a Poisson distribution is simply the square root of the measurement. So the standard deviations of each values of a pair of measurements could be found by taking the square root of each of the individual measurements. Further statistical analysis could proceed from there. There is a substantial question about whether or not the NAD is an appropriate analytical tool for other reasons. There is no justification presented for the use of the NAD for a sample size of two. It is mathematically correct that a sample size of two is the minimum sample size (N-1 degrees of freedom) for a parametric analysis of a normally distributed sample population and that the 95th percentile is a reasonable decision level. However, both the theoretical and practical usefulness of doing this parametric analysis on a sample size of two is questionable. On a practical level, the usual caution is that a sample size of three is the absolute minimum for parametric analysis of normally distributed sample populations, and a sample size of ten is the minimum for truly meaningful results. So even if for the sake of argument it were conceded that the NAD is the appropriate statistical tool, the sample size is too small a data set from which to draw meaningful conclusions. The use of the NAD should be abandoned for this data set. Instead, this decision rule should be applied: if the RPD is greater than 50%, use the highest value of the two. The table should be rewritten without the NAD.		Revision 2.5 Nov 09 as Duplicate Error Ratio (DER). NAD is also referenced in DOE's Evaluation of Radiochemical Data Usability, ES/ER/MS-5, April 1997, under contract DE-AC-05-84OR21400 documenting evaluation of precision for radiological sample and duplicate/replicate analyses. The NAD equation is the absolute difference of the sample and respective duplicate value divided by square root of the sum of the squares of the associated total propagated uncertainty of the sample and duplicate result subject to comparison. The total propagated uncertainty assigned to each result is the counting uncertainty that the instrument assigns at the time of analysis that factors in the uncertainties associated with background subtraction, efficiency, and individual sample uncertainty. The total propagated uncertainty is individual to the sample and requires some consideration when evaluating sample results compared with a duplicate or replicate in laboratory radiological analyses. The radiological instrumentation used are High-purity Germanium (HPGe) detectors to quantify gamma spectroscopy results and Alpha Spectrometry using Passivated Implanted Planar Silicone (PIPS) detectors to measure alpha radiation. The use of these radiological instruments provide the justification for using normalized absolute difference/duplicate error ratio to evaluate individual sample analyte results with the respective duplicate analyte result and associated total propagated uncertainty. If the results were from chemical analyses such as those obtained by Mass Spectroscopy through Inductively Coupled Plasma/Mass Spectrometer (SW846 6020), then only

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				RPD at 50% would have been used as the statistical comparison. The NAD calculation was used to incorporate total propagated uncertainty from the sample and duplicate/replicate supporting the RPD values calculated in the evaluation of sample and duplicate/replicate.
57.	Appendix B, Section B 4.3	"These very low MDCs are achieved through the use gamma spectrum [analysis] for all radionuclides of concern with additional analyses from alpha spectrum for thorium and ICP for metals." Uranium has a large number of closely spaced low energy gamma emissions. These emissions are interspersed in the natural background, unlike some radioisotopes such as CO-60 which has two very characteristic and unique high energy gamma emissions that stand above the background radiation. Given large number of low energy emissions from uranium, it is not practical to identify or quantify uranium with gamma spectrum analysis. So why was gamma spectral analysis set forth as a technique for uranium analysis when it is not a practical technique to use?		The practicality of using gamma spectral analysis to identify and quantify uranium can be justified and is a common industry radiological laboratory method for uranium analysis. Gamma analysis uses High-purity Germanium (HPGe) gamma spectroscopy detectors for reported gamma results. HPGe detectors have very good (low FWHM) peak resolution across the entire spectrum. In the past, gamma analysis was performed using scintillation detectors, typically Sodium Iodide (NaI). A substantial difference exists between the HPGe semi-conductor detectors relative to measurements using scintillation detectors. Scintillation detectors are not capable of the peak resolution necessary to identify or quantify the uranium low energy gamma emissions. HPGe detector peak resolution is significantly better (lower) than scintillation detectors; FWHM values for scintillation detectors range from 9 to 100 keV and HPGe detectors produce FWHMs below 3 keV. Scintillation detectors are primarily used for in the field gross detection of gamma emitting radionuclides. The HPGe gamma spectroscopy detectors are known for their resolution of gamma emissions lines producing peak FWHM values less than 3 keV. The typical FWHM peak identification setting in gamma analysis software is 1.5 FWHM. The gamma analysis

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				software calculates the peak width and applies that to the spectrum, including area 1.5 FWHMs on either side of the peak centroid. This is the total area calculated for the identified peak; the next step evaluates and calculates the area underneath the peak (Compton) and removes that baseline background area from the peak area. This produces a net peak area in which an activity can be calculated. Instrument background is subtracted in later gamma analysis processing steps which also includes all other processing variables resulting in a final peak activity. The large sample size used in gamma spectroscopy analysis and the ability of the HPGe's to produce narrow peak widths that are easily identifiable above the Compton baseline result in low uranium MDCs and allow for the use of this method in data reporting. Direct gamma analysis of Uranium-238 is not possible by using the gamma emission lines of 113.50 keV @ 0.01 % and 49.55 keV @ 0.07%. These Uranium-238 gamma emission lines have a percent abundance that is too low and the 49.55 keV line is below the typical calibration range. Gamma analysis of U-238 is accomplished using gamma emission lines from the Thorium-234 daughter at 63.29 keV @ 3.8 %, 92.4 keV @ 2.7%, 92.8 @ 2.7% keV (average energy and abundance), and Thorium-234's daughter Protactium-234m at 1001.03 keV @ 0.84%. Gamma analysis of Uranium-238 by measuring the daughter products can be validated by the physics of the secular equilibrium decay process. When Uranium-238 decays it forms Thorium-234, Protactinium-234 meta-stable, Protactinium-234 and then to Uranium-234. The half-lives of the daughter products are used to

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				determine the applicability of measuring Uranium-238. Secular equilibrium occurs in the radioactive decay chain when the daughter products have a much shorter half-life than the parent, thus ensuring that the activity between the parent and daughters are equal. The parent Uranium-238 half-life is 4.468 billion years, the daughter Thorium-234 has a 24 day half life and Protactium-234m has a 1.2 minute half-life. Due to the age of FUSRAP material that was separated in the 1940's and 1950's, secular equilibrium is guaranteed due to the fact that many years have elapsed since the chemical separation processing of the samples analyzed by gamma spectroscopy. Gamma analysis of Uranium-235 is accomplished using two gamma emission lines that are directly associated with the specific radio-nuclide. The gamma emission Uranium-235 lines used for identification and quantification are 163.35 keV@ 4.7 % and 205.31 keV @ 4.7%. There are also additional Uranium-235 gamma emission lines that can be used but their applicability is dependent on the sample material which may have other interfering gamma emission lines. The accuracy, practicality, and low MDCs obtained through gamma analysis of uranium can be substantiated by the laboratory's participation in blind Performance Evaluation (PE) programs. DoD ELAP accredited laboratories must participate in two separate PE programs annually and report the analyte listed on their scope, in this case Thorium-234. Two common radiological PE programs are DOE's MAPEP and ERA's MRAD. Both programs provide blind PE samples with Thorium-234 as an analyte to

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				be reported. The typical Thorium-234 value that will be reported for these PE programs is in the range of 1 pCi/g to 30 pCi/g. Laboratories must be successful at reporting Thorium-234 by gamma spectroscopy in this range twice annually to maintain their DoD ELAP accreditation. This demonstrates that gamma analysis of Uranium by measuring the daughters resulting in low MDCs is substantiated by the laboratory reporting accurate PE results at activity levels well below the established Uranium DCGLs in this report. The following was added as the third paragraph of Section B4.3, "*The accuracy and low MDCs obtained through gamma spectroscopy analysis of uranium is substantiated by the laboratory's participation in blind Performance Evaluation (PE) programs. Accredited laboratories participate in two separate PE programs annually and report Thorium-234 by gamma spectroscopy. The blind PE programs provide samples that contain the analyte Thorium-234 for reporting, which is in secular equilibrium with Uranium-238. Twice annually, laboratories must successfully report Thorium-234 by gamma spectroscopy within the PE program's respective acceptance range to maintain their accreditation. The typical Thorium-234 value that will be reported for PE programs is in the activity range of 1 pCi/g to 30 pCi/g. Accurate reporting of Thorium-234 in multiple PE programs validates the laboratory gamma spectroscopy method used for analysis of Uranium-238 by measuring the daughters resulting in low MDCs, well below the established Uranium DCGLs*

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				in this report."
58.	Appendix B, Section B 5.2, Data Evaluation	"The minimum instrument efficiency was greater than 0.17 for alpha radiation, which was sufficient to achieve the desired limit of detection." Please show a sample calculation for minimum instrument efficiency showing actual measured background for some relevant portion of the project.		An attachment to Appendix B was added that contains the instrument MDC calculation.
59.	Appendix E	In every table of radioisotope values there appear negative results for minimum measurement values. For example, in Table E-1 the minimum value of Th-230 is listed as -95.80 pCi/gm. Of the nine radioisotopes in Table E-1 five of the summary minimum values listed are negative, less than zero. How is it possible to have negative pCi/gm values? These negative values must be the result of some computational formula. However, for presentational purposes computations should be truncated at zero. There should be a footnote stating that the negative values were truncated at zero. Are these negative values included in the averages presented in the tables? If so, the averages are wrong since the averages should be calculated using zero in place of the negative table values. These table values should be recalculated and the table changed.		Consistent with the *Multi-Agency Radiological Laboratory Analytical Protocols Manual* (MARLAP), USEPA 402-B-04-001A, July 2004, a document developed in large part by USEPA representatives and approved by the USEPA Science Advisory Board: "MARLAP recommends that the reported value of a measurement result: (1) be reported directly as obtained, with appropriate units, even if it is are negative, (2) be expressed in an appropriate number of significant figures, and (3) include an unambiguous statement of the uncertainty. The appropriate number of significant figures is determined by the magnitude of uncertainty in the reported value. Each reported measurement result should include the value and an estimate of the combined standard uncertainty (ANSI N42.23) or the expanded uncertainty." The following footnote has been added, *"Negative results are less than the laboratory system's background level."*
60.	Appendix E	In all of the tables of radiological data in Appendix E, there is a letter G behind the symbol of every radioisotope in the table. For example, there are columns labeled U-235G. The chemical symbols for the elements do not include the letter G as a suffix. If the letter G has a meaning, that meaning should be set forth in a footnote to the table. If it has no meaning it should be removed.		The "G" that is included in radioisotope identification represents that these are "Gross" values, rather than net values (background values have not been subtracted from the results in this table). The "G" has been removed and a footnote has been added stating *"Results are gross values"*.
61.	Appendix E	Tables in this appendix present data associated with data qualifiers, such as "U" or "J", etc. Please		The following footnote has been added to all applicable tables: *"Validation Qualifier (VQ) symbols*

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		provide footnotes to these tables providing their definitions, or, indicate where, in the ISOU RI Report, to find their definitions. Perhaps Appendix B.32 is appropriate.		*indicate: "=" for positively identified results, "U" for not detected, "J" analyte was identified as estimated quantity, "UJ" analyte was not detected and had QC deficiencies, and "R" for rejected with serious deficiencies."*
62.	Appendix E Tables	The tables in Appendix B need to be carefully re-edited. In Table B-1 both Th-230 columns are labeled "RPD". In the Th-232 columns the headings "RPD" and "NAD" are reversed. These errors are also found in B-2 and B-5 and almost every other table in Appendix B.		Corrections were made to Appendix B Tables B-1, B-2 and B-5.
63.	Appendix F, Table F-1	In Table F-1 there is a column labeled "Surface Eff*". Is this "surface efficiency"? What is surface efficiency? Why is there an asterisk? An asterisk is used to indicate to the reader that there is an explanation somewhere else in the text, but there is no explanation in Table F. If the asterisk is important it should be explained. If it is not important it should be eliminated. Furthermore, all the numerical values in the "Surface Eff*" columns are 1. If would make the table less cluttered and more readable if these columns were eliminated and a footnote was placed in the table defining the concept of surface efficiency and stating that it was assumed to have a numerical value of one. If there are calculations involved in Table F-1, there should be an example calculation included in the text so the reader may understand the values presented.		Surface Eff *does stand for "Surface Efficiency." Per NUREG-1757, the surface efficiency (or source efficiency) is defined as " the ratio between the number of particles of a given type emerging from the front face of a source and the number of particles of the same type created or released within the source per unit time (ISO 7503-1)." The Surface Eff*columns have been removed to de-clutter all applicable tables. The surface efficiency used is 0.25. MARSSIM notes on page 6-25, that "A source efficiency of 0.5 is recommended for beta emitters with maximum energies above 0.4 million electron-Volt (MeV). Alpha emitters and beta emitters with maximum beta energies between 0.15 and 0.4 MeV have a recommended source efficiency of 0.25" (DoD 2000). The 1's that are noted in the Surface Eff* columns are referring back to Table F-1a where a formula instructs the use of 0.25. An example of this equation has been footnoted in all applicable tables.
64.	Appendix I	In complete contrast to Appendix E, this appendix provides a masterful presentation of the data, a complete and coherent explanation of the statistical analyses used, and tables with complete footnotes and listings of the abbreviations used and devoid of useless and distracting duplicate data in the table. It is recommended that the author of Appendix I be		Appendix E has been re-edited per this comment and comment numbers 59 through 62 in mind. The comment regarding Appendix I is acknowledged.

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		assigned to rewrite Appendix E to the same high standards.		
65.	Appendix K2.0, Page K-3	The text says "In order to facilitate this evaluation, it is assumed that all inaccessible soil at each property has become accessible, so that inaccessible and accessible soil can be assessed under one consistent set of (accessible) exposure scenarios." How does this statement relate to the statement on page 115, which says "The CSM does not consider future scenarios in which the inaccessible soil areas become accessible…"? Please reconcile.		The CSM has been reconciled with the BRA per this comment and comment 46.
66.	Appendix K2.3.2, Page K-11	EPA recommends that the construction worker scenario be evaluated at the plant properties and Vicinity Properties (VPs), in addition to the industrial worker scenario, for transparency purposes.		Construction worker evaluations have been added for the plant properties and industrial/commercial VPs.
67.	Appendix K2.3.2.2, Page K-14	The text says that "Data were incorporated into the EPC calculations that included locations above screening levels, as well as nearest sample locations that exhibited no screening level exceedances" Why were sample results that did not exceed screening levels specifically included in the EPC calculations? What impact did this have on the EPCs? Clarification is needed.		Please refer to the response to comment 51 above. The elevated measurement areas were drawn around only the area containing the elevated sample location(s) and immediately adjacent non-elevated sample in an attempt to realize that exposure within that area could occur with equal probability at a hotspot or non-hotspot location, with equal weight being given to all individual locations within the area. Because of the limited number of sample locations within each area, the EPC is truly an upper limit value based on the 95% UCL, and perhaps even more often, the maximum detected hotspot location. Other methods (e.g., the 100 m^2 rule) rely on averaging hotspot concentrations with non-hotspot locations, with equal weight being given to all samples in the area. The applied approach is therefore, considered to be health conservative. Although the evaluations of elevated measurement areas were removed from the RI/BRA, they will be more of a focus during the FS.

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68.	Appendix K2.5.3.8, Page K-31	The text says, "However, because of the unique toxicological properties of lead, risk is not quantitatively evaluate for this COPC, as was discussed in Section 6.4.2.5." There appears to be no Section 6.4.2.5. Regardless, the "unique toxicological properties of lead" are not justification for excluding it from the risk assessment.		The correct section citation should have been Section K2.4.2.5, and not 6.4.2.5. However, the portion of Section K2.5.3.8 that discusses lead in soil borings adjacent to sewer lines has been re-written to reflect that USEPA's adult lead model (ALM) has been applied. In accordance with USEPA guidance, the lead EPC at each soil borehole was calculated as the mean concentration. Use of the mean lead concentration is representative of soil mixing that would occur due to excavation.
69.	Table K-2A	It is not apparent to us how in some instances a radiological compound can have an EPC of 0.00 when numerous positive data points exist, and a 95% UCL has been determined (for example Ra-228 at Plant 1).		The EPC of 0.00 is an applied default value for instances where the lesser of the 95% UCL and the maximum detected concentration, minus the mean background, is a negative value. A negative value cannot be entered into RESRAD as the source concentration.
70.	Table K-2A	It is not apparent to us how in some instances a radiological compound can have a positive EPC value when no data are apparently available (e.g., Pb-210 at Plant 1).		Pb-210 and U-234 are decay products of Ra-226 and U-238, respectively, and are calculated based on the concentrations of those isotopes in accordance with Table 2-15 of the 1993 BRA (see footnote *"a"* of Table K-2A). To estimate the concentration of Pb-210, the Ra-226 (+D) concentration is multiplied by 1.3. The concentration of U-234 is estimated to be equivalent to the concentration of U-238 (+D).
71.	Appendix K4.2 (p.K-46)	Similar to General Comment 3, this section states that a qualitative ecological assessment was conducted in the 1993 Department of Energy Baseline Risk Assessment. However, the 1993 BRA states that "no investigations have been conducted at the St. Louis Site to assess the extent to which biota have been contaminated or affected as a result of exposure to site wastes". Please provide an explanation.		Please refer to the response to General Comment 3 above.
72.	Appendix M, EPC Calculations ISOU Structures -	There is no title or number on the first table so I assume that it is Table M-1. A title and page numbers should be added.		Because Appendix M has been revised and the tables are now numbered sequentially, no page numbers were added.

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	Industrial Workers	Also, footnote 2 on this table states: "Individual radionuclide exposure point concentration input values are calculated by multiplying the gross alpha UCL-95 value by the radionuclide specific activity values." That definition is correct; but, the numerical values in the table do not reflect that definition. An example is Ac-227, in which 1268 is the gross alpha and 0.022 is the specific activity value for building 25. Ac-227 in Bldg 25: (1268 x 0.022) = 27.89 Column D value = 1272. The problem is in column C, "Activity Fraction " (0.022 in the example). The conversion factors from pCi/g to pCi/m2 were not included in the values found in this column. The correct activity fraction value for Ac-227, including the units conversion, is 1.0035, not 0.022. Multiplying (1268 x 1.0035) yields 1272, which is the correct value found in Column D. The table should be rewritten and all of the Activity Fraction values restated to include the units conversion factors. A sample calculation should be included in the rewritten table.		The conversion factor is applied to convert gross alpha surface concentrations (*dpm/100* cm^2) to surface activity concentrations (*pCi/*m^2), in order to facilitate input of the concentration term into the RESRAD-Build model. It is not intended to incorporate the conversion factor into the activity fraction term, which is a unitless ratio of the radionuclide-specific soil concentration, obtained from the 1993 BRA, to the sum of all radionuclide concentrations. Therefore, the activity fractions have not been changed. To help alleviate confusion over the EPC calculations used for building/structural surfaces, the spreadsheet has been rearranged, with the unit conversion factor (*45* cm^2*-pCi/*m^2*-dpm*) now being presented. Also, the equations associated with the following EPC calculation steps are now provided in the footnotes: 1) unit conversion of the gross alpha 95% UCL concentration from *dpm/100* cm^2 to *pCi/*m^2 (footnote "a"), 2) calculation of radionuclide-specific, soil activity fractions (footnote "c"), and 3) calculation of the EPC for each radionuclide as the product of the converted gross alpha 95% UCL and the soil activity fraction (footnote "d"). Additionally, it should be noted that the columns previously shown for radionuclide-specific EPCs for DT-4 Warehouse/Office Building have been removed from the table since the slightly elevated gross alpha readings for that structure is attributed to NORM present in the clay brick caps.
73.	Appendix M, Table DT-8 (PSC Metals, Inc.)	There is no number for this table. The title of the table seems to be "Radiological Analytical Data Results for Inaccessible Soil". However, the section is entitled "EPC Calculations-DT-8 ISOU Industrial". There are no EPC calculations presented in the table, only what seem to be radiological measurements. Furthermore, there are a great many negative radiological measurements in the table. This is		The DT-8 ISOU Industrial Worker EPC calculation file is labeled correctly and all EPC calculations are present in the file. The Utility Worker EPC calculation Excel files were incorrectly named. The names of these files have been changed to reflect the appropriate scenario and location. All DT-8 Excel files contain all the appropriate data and accurate EPC calculations as formulas within the cells. The EPC

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		absurd. There can be some radioisotopes present or zero radioisotopes present but there cannot be negative radioisotopes present. If this table is supposed to present EPC calculations it needs to be completely rewritten as there are currently no EPC calculations there at all.		calculation Excel files contain multiple spreadsheets, the number of which depends on the property and scenario being evaluated. In general, the first tab includes the determination of the EPC for the particular area, including backgrounds if applicable, maximum result values, the distribution curve type, 95% UCL, and the final EPC calculation for each radionuclide. EPCs were determined as the lesser of the 95% UCL and the maximum detection. Formulas used to calculate the EPCs are also present within the appropriate cells in this table. Because Pro-UCL is used to calculate the 95% UCLs, no descriptions of equations of the various UCL statistics applied by Pro-UCL is necessary. These equations are presented in USEPA's Technical Guidance. An additional footnote was added to this table to define the distribution types. The second tab includes the Pro-UCL output which gives the 95%UCL values that were used. The third tab contains the "Raw Data" which includes the dataset that was evaluated for that particular scenario and property, including identifying information such as Station ID, Sample ID, Date collected, and Start and End Depths. The footnote *"Negative results are less than the laboratory system's background level"* was added to the Raw Data table.
74.	Appendix M, Table DT-8, PSC Metals North Tract 4	Again there is no table number or obvious title. Behind every radioisotope listed in this table is the letter "G". For example, Ac-227G. This "G" has no place in the radioisotopes. To not know the standard chemical nomenclature seems to belie a disturbingly elementary level of ignorance.		As discussed in the response to comment 73, the Utility Worker EPC calculation Excel files for DT-8 were named incorrectly. The file name has been corrected to reflect the scenario and property evaluated. The "G" that is included in radioisotope identification represents that these are "Gross" values, rather than net values (background values have not been subtracted from the results in this table). For the purposes of this table, however, this information is unnecessary and therefore the "G" has been removed

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				from the Raw Data tab table.
75.	Appendix M, Tables	The entire set of tables in Appendix M is unacceptable as it stands. They should be rewritten. Correctly calculated values should replace the present ones, the tables should be correctly numbered and titled, and a sample calculation should be included in each table.		The EPC calculation Excel files included in Appendix M are provided so that the calculations can be repeated. Reader-friendly, comprehensive EPC tables are presented in Appendix K (radiological EPCs for soil are presented in Tables K-2A, K-3A, K-4A, K-5A and K-8A). The Excel files in Appendix M are provided so the reader has access to the process and formulas that were used to calculate the EPCs. An explanation of the tabs within the Excel files is given in the response to comment 73. To better present these files in a more organized fashion, a word file has been added to Appendix M, which includes a list of all tables contained in the appendix. All calculations are presented as formulas in the appropriate cells of the spreadsheets. No sample calculations are provided for the EPC determination, which is simply just the lesser of the 95%UCL and the maximum detection. Because Pro-UCL is used to calculate the 95% UCLs, no descriptions of equations or sample calculation are necessary for the various UCL statistics applied by Pro-UCL. These equations are presented in USEPA's Technical Guidance. In addition, table titles have been corrected and revised for further clarity. Every EPC calculation that was used in RESRAD is present in Appendix M and these files have undergone an additional review for accuracy, as well as revisions based on regulator comments which have resulted in implementing new a EPC calculation methodology. A more simplified file folder system to organize the files has also been implemented. To reduce the number of file folders, the excel tables are now numbered M-1 through M-56 and are located within the same file folder.
76.	Appendix N: Table N-11, Metal COPCs and EPCs for	There is only one contaminant of concern. It is not clear how to derive the value given for the Entire Property Area from the values given for the accessible and inaccessible property areas,		The equations used to calculate the area-weighted average of the inaccessible and accessible soil EPCs are now presented in a new Section K2.5.3 in

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	Property-Wide Inaccessible and Accessible Soil at Thomas and Proetz Lumber (DT-10) Industrial Worker	respectively. The calculation of the area-weighted average should be set forth.		Appendix K.
77.	administrative /editorial	Superscripts used in tables are so small they are extremely difficult to read. Please increase the font size.		Font size in tables have been increased.
78.	administrative /editorial	Please add the following to the acronym list: SLAPS and USCS.		SLAPS and USCS have been added to the acronym list.
79.	administrative /editorial	Table 2-2: Please define "NA" and "RR" as footnotes.		"NA" and "RR" have been added as a footnote.
80.	administrative /editorial	Section 4.5.2.2, paragraph two, first sentence: Please insert a space between "Figure" and "C-21".		Section 4.0 was re-written in due to the changes in screening levels. Please see comment 19 above.
81.	administrative /editorial	Appendix F, Table F-1: Please correct the page layout for this table to ensure it prints properly.		Page layout has been corrected to ensure proper printing.

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