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Sent: Monday, March 29, 2021 6:09 PM
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Cc: McCloskey, Jennifer <jennifer.mccloskey@em.doe.gov>; Buschman, Nancy <Nancy.Buschman@em.doe.gov>
Subject: [External_Sender] NRC 1757 NUREG-1757, Volume 2, Revision 2

Cynthia, see attached comments regarding the NRC 1757 NUREG-1757, Volume 2, Revision 2 "Consolidated Decommissioning Guidance, Characterization, Survey, and Determination of Radiological Criteria." We appreciate the opportunity to review and we are grateful for the extension. Please note there is a chance for a few additional comments from one of our sites, if they prove to have comments we will submit those as well prior to the deadline. We have provided the attached table with comments identified by page and paragraph. Feel free to reach out to me with any concerns. Thank you again so much for the opportunity, Jennifer

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Review Comments of the NuReg 1757, Vol 2, Rev 2

JANUARY 2021

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Page No.	Sect. No.	Para. No.	Comment(s)
2-14	2.6	2	For site-specific analyses, the peak of the mean dose over time (e.g. 1,000 years) may be used to estimate dose for compliance with 10 CFR Part 20 Subpart E. This 1,000 year time period is consistent with requirements of Subpart E. However, some licensees may be required to evaluate peak dose beyond 1,000 years. Would the NRC still consider the peak of the mean approach acceptable for time periods beyond 1,000 years?
2-18	2.7	Footnote 7	Footnote 7 advises caution when using a peak of the mean that is significantly greater than the mean of the peaks. What does the NRC consider to be significantly greater?
3-5	3.3	1	Insignificant radionuclides and exposure pathways may be eliminated from "*further consideration*" and "*further detailed consideration*". Suggest using specific examples in this paragraph rather than presenting the examples in the second paragraph of page 3-6.
5-8	5-2	3	"*The intake-to-dose conversion factors from Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," issued September 1988 (EPA 520/1-88-020) (EPA, 1988b), which are based primarily on adults, should be used when calculating internal exposures*." Is use of EPA 1988b a firm requirement or can licensee's substitute

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			other internal dose conversion factor (DCF) reference documents? More recent internal DCF are available in DOE's *Derived Concentration Technical Standard* (DOE 2011), which are based on ICRP Publication 72 (ICRP 1996),
5-12	5.2	1	If the "mean of the peaks" dose is significantly higher than the "peak of the mean" dose, then "risk dilution" may be an issue in the probabilistic model. What does the NRC consider as significantly higher?
5-33	5.4.2	1	"…*site conditions, such as soil type or groundwater quality, may remove potential exposure pathways from consideration with the appropriate level of justification*". What type of justification would the NRC consider acceptable to exclude site groundwater or surface water as a potential exposure pathway? Are federal and State drinking water standards acceptable? "*In rare instances, an exposure scenario involving offsite use of residual radioactivity may be the critical exposure scenario*". Does the NRC expect offsite exposure scenarios to be evaluated in the DP and what is NRC's criteria for evaluating offsite exposure scenarios? Offsite use of residual radioactivity may include exposure pathways immediately downstream of a licensee's facility to an exposure pathway associated with a low-level waste disposal facility located 1,000's of miles from the facility in the western United States.
5-51	5.5.2	5	"*Justification of water quality and quantity of the saturated zone should be based on the classification systems used by EPA or the State, as appropriate*." Does this also apply to the potential use of

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			untreated surface waters for drinking purposes? Should licensee's assume that EPA or State classification systems governing groundwater or surface water drinking water sources will be in effect throughout the 1000-year compliance period? Why can the fish pathway be eliminated in cases where the aquifer is not a viable source of drinking water?
5-53	5.5.2	10	There will be differences in dose or DCGLs calculated by the "peak of the mean" and the "mean of the peaks". Can NRC provide guidance on deciding when one is more appropriate to use than the other?
5-55	5.5.3	3	"*However, it is important to note that in the case that institutional controls are assumed to no longer be in effect, it may be necessary to evaluate the exposure scenarios and pathways eliminated for the case when institutional controls are assumed to be effective.*" In addition to considering loss of institutional controls should licensee's assume that EPA or State classification systems governing groundwater or surface water drinking water sources will be in effect throughout the 1000-year compliance period?
G-7	G.3.1	1	Is NRC expecting that licensee's develop a contamination concern map (CCM) as part of their decommissioning plan submittal? Should this be included in NUREG 1757 Vol 1 Appendix D?
G-11	G.3.2.1	1	Sheet pilings would preclude surveys of the walls of the excavation. The excavation would require stepped or sloped sidewalls to allow surveying.

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G-12	G.3.2.1	2	Is the NRC requiring that licensee's analyze soils proposed for backfilling excavations, and to submit the radioanalytical data for review and approval? Does this apply only to excavated onsite impacted soils or does it also apply to soil imported from offsite non-impacted sources?
G-14	G.3.2.2	1	Are licensee's required to submit radioanalytical data for backfill soils used during license termination activities? Does this apply to soil imported from non-impacted offsite sources? Is radioanalytical data for backfill soil expected to be provided as part of the decommissioning plan or final status survey report?
G-14	G.3.2.3	1	Are soil re-use plans a required deliverable of the decommissioning plan or the final status survey process? If a decommissioning plan requirement should re-use plans be referenced in the NUREG-1757 Appendix D decommissioning plan checklist? Do the re-use plans require review and approval from the NRC? Does NRC expect to review characterization and radiological survey plans and results to authorize the re-use of impacted on-site soils?
J-22	J.3	3	The NRC allows elimination of groundwater, and presumably surface water, as a drinking water pathway based on current ambient water quality standards promulgated and enforced by State agencies. Is this assumption valid for future dose evaluations that must consider loss of institutional controls, as loss of institutional controls may be accompanied by loss of regulatory controls?
N-23	N.3.7	2	Residual radioactivity in a licensee’s groundwater or facility may discharge into surface waters that are utilized downstream as a drinking water source. Is there an expectation that collective dose

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			be included in the ALARA calculation when the concentrations of residual radioactivity in these downstream drinking water supplies are, or nearly are, indistinguishable from background? Large collective doses can be achieved by large populations consuming residual radioactivity that is nearly indistinguishable from background.
P-5	P.1.2	3	NUREG-1623 provides guidance for designing erosion protection at uranium mill tailing sites located in arid and semi-arid regions of the western United States. Does the NRC consider the guidance in NUREG-1623 applicable for designing erosion protection for facilities in the humid eastern United States?
P-16	P.1	4	Compacted Clay Barrier *"..laboratory and field studies have shown that compacted clay can develop, even within ten years, distinct soil structures such as aggregates and planes of weakness due to pedogenic processes such as wet-dry and freeze-thaw cycling*." Are these pedogenic changes associated with compacted clay barriers located/exposed at the surface? Would these changes be expected and/or observed with compacted clay barriers that are located at the base of a multi-layer cover system where the clay barrier is well beneath the frost line?
P-17	P.1	5	United States not Unites States.

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P-23	P.2.1	1	The PMP and PMF are calculated from historical site-specific hydrometeorological characteristics, which are likely to change with future climate change. When preparing erosion protection designs for covers and streams in decommissioning plans, is NRC expecting licensee's to evaluate the potential changes in hydrometeorological characterisitcs of their sites that may be associated with future climate change and incorporate these climate change effects in its PMP and PMF calculations? Should future climate change impacts also be incorporated into dose modeling hydrologic input parameters such as precipitation?
P-27	P.2.6	4	When designing engineered barrier designs to control radioactive material in excess of 1,000 years, should licensee's incorporate estimates of climate change impacts when calculating the PMP and PMF?
P-28	P.2.6		"…*the staff will approve a design that would likely incorporate: (1) covers designed to resist erosion for a stability period exceeding 1,000 years, (2) a long-term surveillance program that monitors the magnitude and rate of erosion;, and (3) sufficient funding for the surveillance, repair, and replacement of some of the erosion protection. The staff will work closely with the expected long-term custodian to determine the amount of funding needed*." Items 2 and 3 assume institutional controls would be in place for a period exceeding 1,000 years. What long-term custodian would be expected to maintain erosion controls for 1,000 years? Most governments have not managed to exist for such time frames. Since restricted release scenarios require two dose evaluations, one assuming institutional controls in place the other loss of

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			institutional controls, would the NRC approve designs
P-31	Table P-3		Was the decision to move the Atlas Title II site tailings pile the result of an NRC disapproval of the erosion barrier design?

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Iv	*ABSTRACT*	*Para. 1, Line 3*	Clarify what Scenario B is - Change "implementation of Scenario B" to "implementation of final status survey statistical test Scenario B".
viii	*Table 2*	*5th item under Subject*	Change "implementation of Scenario B" to "implementation of final status survey statistical test Scenario B".
xxxi	*Glossary*	*Para. 2, Line 9*	Change "RESRAD Code" to "RESRAD-ONSITE Code" and add in the discussion "RESRAD code, RESRAD (onsite) and RESRAD-ONSITE in the document all refer to current RESRAD-ONSITE code." RESRAD code is identified as RESRAD-ONSITE beginning July 2016, with version 7.2.
4-19	*4.5.1.2.3*	*Line 27 & 29*	Change "DCGLW" to "DCGLw".
4-20	*4.5.1.2.4*	*Line 31*	Define Type I and Type II errors or reference where they are defined in the document.
5-21	*5.5.2*	*Line 15*	Provide reference for dissolved solids of 30,000 milligrams per liter limit in groundwater use, or change this to read as "a licensee may eliminate the use of groundwater for drinking or irrigation because the near surface aquifer has total dissolved solid that exceeds the water quality for drinking or agriculture use".
5-27	*Table 5.2*	*1st row left column, 2nd bullet*	It mentions that residual radioactivity is present in approximately the top 30 cm of soil for screening. DandD code is used for screening analysis and DandD code assumes 15 cm soil thickness in the resident farmer scenario (see Page I-59, Line 8). Explain why 30 cm is used here?

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F-13	F.10	Footnote 4	Current footnote: RESRAD-OFFSITE 3.2 considers sources located below the water table, although guidance on potential use of RESRAD-OFFSITE to consider existing groundwater contamination has not yet been developed. A future revision to this volume may include evaluation of this tool and its efficacy in considering existing residual radioactivity in groundwater. Comment: Section G.5 of the "User's Manual for RESRAD-OFFSITE Code Version 4" has a description of the submerged primary contamination. Sections G.11 through G.14 have the mathematical outline of the formulations to model the submerged primary contamination.
F-16	F.10.2	Para. 3, Line 31	Current text: Notable differences between initial simulations run with RESRAD-ONSITE and RESRAD-OFFSITE included travel times to the point of compliance that were attributable to differences in use of porosity in the transport calculations (i.e., effective porosity is used in RESRAD-ONSITE, while total porosity is used in RESRAD-OFFSITE). Comment: The default expression for retardation factor in the release versions of RESRAD-OFFSITE is the same as the one in RESRAD-ONSITE. The expression for retardation factor used in the prototype version of RESRAD-OFFSITE is available as a user selectable option.
F-16 Also in I-71	F.10.2 I.5.3.6	Para. 3, Line 35 Para. 1, Line 1	Current text: Another noteworthy difference in results was observed for the water-dependent pathways due to accumulation of radioactivity in soil from application of contaminated irrigation water that is considered in RESRAD-OFFSITE but is not considered in RESRAD-ONSITE.

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			Comment: RESRAD-ONSITE considers accumulation over a single growing season, while RESRAD-OFFSITE models accumulation over multiple years.
F-16	F.10.2	Footnote 7	Add "-ONSITE" as highlighted in the sentence copied as follows. "It is important to note that RESRAD-OFFSITE also has the capability of mimicking the RESRAD-ONSITE code for calculation of doses to an onsite receptor."
F-17	F.10.2	Para. 3, Line 24	Current text: Another important difference between the codes tested is related to the calculation of retardation. Because RESRAD-OFFSITE is the only code to consider immobile pore water in the calculation of the retardation factor, the calculated retardation factors can be significantly higher for radionuclides with low retardation factors and if the effective and total porosity are significantly different (e.g., in the Gnanapragasam et al. (2000) study RESRAD-OFFSITE calculated retardation factors are higher by a value of 0.56 (unitless) for all radionuclides due to the difference in total and effective porosity at 0.39 and 0.25, respectively). Differences in retardation factors also have a more significant impact on relatively short-lived[10] radionuclides. Comment: The default expression for retardation factor in the release versions of RESRAD-OFFSITE is the same as the one in RESRAD-ONSITE. The expression for retardation factor used in the prototype version of RESRAD-OFFSITE is available as a user selectable option in the released version.
H-7	Table H.2	NA	According to Appendix I, DandD is inappropriate for analyzing sites that contain hydrogen H-3 and C-14 in soil (see page I-42 lines 11, 12, and 13). Therefore, either remove H-3 and C-14 from Table H.2 or explain

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			how the surface soil screening values for H-3 and C-14 were determined.
I-4	I.2.1	1st para., Line 4	To be consistent with discussion in Appendix F, use "systems and components" instead of "systems".
I-14	I.2.3.2	Footnote 5	Current footnote: When a value of "-1" is input into the field for the contaminated fraction for plant food, and the size of the contaminated zone is equal to or greater than 1,000 m^2, RESRAD-ONSITE and RESRAD-OFFSITE assume that 50 percent of the crops consumed by the receptor come from a garden grown in contaminated soil (i.e., no more than 50 percent of the produce comes from the contaminated garden and 2,000 m^2 is needed to support 100-percent home grown produce ingestion rates). For areas less than 1,000 m^2, RESRAD-ONSITE and RESRAD-OFFSITE linearly scale the consumption rates of contaminated produce down from 50 percent for 1,000 m^2 areas to 0 percent for 0 m^2 areas. Comment: -1 flag works as described in the footnote in RESRAD-ONSITE. Can override this by entering a positive value between 0 and 1 to indicate the fraction of contaminated produce from the site. RESRAD-OFFSITE does not use the flag as the agricultural field is not constrained to be atop the primary contamination/contaminated zone. Fraction of produce, meat and milk from the contaminated area is a user input.
I-42	I.4.3.1	Para. 3, Lines 11 - 13	"As an example, DandD is inappropriate for analyzing sites that contain hydrogen H-3 and C-14 in soil, because DandD considers only the inhalation dose from particulates in the air and does not consider the loss of H-3 and C-14 from the soil to the air as a gas or vapor." Based on this statement, clarify upfront that DandD screening analysis is not appropriate for H-3 and C-14 and explain how the screening values for H-3 and C-14 were derived. Also see Comment on Page No. H-7.
I-57	I.5.3.2	Line 14	Use 2003 version of RESRAD-BUILD User's Manual (ANL/EAD/03-1) instead of "ANL/EAD/LD-3" (ANL 1994).

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I-61	I.5.3.6	Lines 7 - 28	This section references old RESRAD-ONSITE and RESRAD-BUILD user's manuals, please update these references with the latest user's manuals.
I-70	I.5.3.6	Line 29	Suggest delete "CE Yu" between "against RESRAD-ONSIE (" and ""benchmarking of".
I-71	I.5.3.6	Line 29	Current text: discharge from surface water Comment: likely refereeing to contribution from groundwater.
I-72	I.5.3.6	Line 16	Current text: Removal processes include dry and wet deposition, as well as radiological decay. Comment: Ingrowth and decay of short-lived radon progeny during transport in air are modeled.
I-76	I.6.2.3	3rd para, Line 30	Delete Tables 6-1 and 6-3 because these tables do not list default behavioral and metabolic parameters.
I-78	Table I.11 Footnote	Line 12	Current text: There is only one ingestion rate in RESRAD-BUILD. Comment: RESRAD-BUILD has two ingestion rates: receptor indirect and direct ingestion rates (see Table A-6 in NUREG/CR-7627). Receptor indirect ingestion rate: The rate at which an individual ingests deposited dust after it has transferred to hands, foods, or other items at each receptor location. This parameter is used in one of two ingestion pathways. The other pathway is direct ingestion of the contaminated material. The dose from indirect ingestion could be 0 if the ingestion rate is 0 or the deposition velocity is 0. Unlike the direct ingestion rate, the dose from this pathway might be nonzero when the source of contamination and the receptor points are in different rooms Direct ingestion rate: The incidental ingestion rate of contaminated material directly from the source by any receptor in the room. For a volume source, each receptor will ingest the source at a rate determined

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			by the product of the ingestion rate and the amount of contamination in the source at that time. For a point, line, or area source, each receptor will ingest the source at a rate determined by the product of the ingestion rate, the removable fraction, and the amount of contamination in the source at that time.
I-114	I.8	Line 35	ANL/EAD-4 is the reference for RESRAD Manual as stated on Page I-108, Line 16, not for Yu, C., 1999. Please update this reference.
I-115	I.8	3rd para	Line numbers are missing for the last reference. This reference should be moved up in the list of references.
J-1	J.1.1	Lines 28 - 29	Suggest replacing RESRAD with RESRAD-ONSITE. They are also other places in this Appendix, e.g., Section J.3.2, page J-13, Lines 36 and 38, etc.
L-1	L.3.1	Line 31	This section mentions 30 cm soil thickness as surface soil. This is conflict with DandD code default assumption of 15 cm soil thickness as surface soil. Please clarify or change to 15 cm.
M-8	M 2.2.2	Lines 1 – 10 and Lines 35 - 36	Pond may also get contamination from soil erosion, water runoff, and direct deposition. Deleting aquatic exposure just based on GW availability at a reasonable depth may not be appropriate in all situations.

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2-3	*2.1*	*7*	The risk-informed approach to site-specific dose modeling for compliance demonstration through allowing for the site-specific selection of risk-significant exposure scenarios, exposure pathways, and critical groups, selection of conceptual models, numerical models, and computer codes incorporating risk-significant elements of a site, as well as expecting site-specific data for the more risk-significant input parameters is an essential add to the document. May want to include the required verbiage in the contract documents used to ensure the site-specific data is provided. Noting it is *expected* may not indicate it is a requirement.
5-1	5.1	2	The documents notes, the NRC staff *should* review all of the dose modeling information submitted by the licensee. In addition, the NRC staff *should* review the ALARA analyses, which are based, in part, on the dose modeling. Consider changing the word *should* to shall or will in these instances.
I-15	1.2.3.2	1	The document notes, that although the geometry and locations of the elevated areas or "hot spots" differ in the "conceptual model" versus the "actual" configuration, the assumed geometry and elevated area location tends to *overestimate the dose* with the receptor standing directly on top of the hottest contaminated area on the site and in relatively close proximity to the second most contaminated area on site. Depending on the actual size and geometry of the elevated areas being simulated, this method may produce overly conservative results. If less conservative methods are needed to demonstrate compliance, the licensee may propose alternative methods that will require approval by NRC reviewers on a case-by-case basis. May want to provide further direction on how this can be achieved.
P-1	P.1.1	3	The NRC's philosophy is robust engineered barriers and additional bases for engineered barrier performance should be provided for higher risk sites. Higher risk sites are those sites with projected doses greater than 35

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			1.0 mSv/y (100 mrem/y) with no institutional controls in place and sites that must rely on engineered barriers for relatively long periods of time (i.e., longer than 100 years) due to the presence of risk-significant quantities of long-lived radionuclides. Uncertainty in the performance of engineered barriers increases with time with limited data available on long-term performance. This coupled with an increasing likelihood of disruption of the engineered barriers makes it especially important to design a robust cover. Generally, "robust" means more substantial, reliable, and sustainable for the time period needed without reliance on ongoing active maintenance. May want to include how are the robust covers are being validated.
Throughout			The significant notations referring to Lessons Learned and their incorporation into the document is excellent. In each case the references provide a clearer and more specific account and path forward for the approaches and methodologies to be used. The lessons learned updates in the areas of proposed restricted release scenarios; updated regulatory citations and guidance related to discounting and the monetary value of collective dose averted is very useful and effective.
E-5	E.6	3	Document denotes, the surveyor will decide whether the signals represent only the background activity, or whether they represent residual radioactivity in excess of background. Some factors that may affect the surveyor's performance include the costs associated with various outcomes—e.g., cost of missed residual radioactivity versus cost of incorrectly identifying areas as containing residual radioactivity—and the surveyor's expectation of the likelihood of residual radioactivity being present. For example, if the surveyor believes that the potential for residual radioactivity is very low, as in an unaffected area, then a relatively large signal may be needed for the surveyor to conclude that residual radioactivity is present. NUREG/CR–6364, "Human Performance in Radiological Survey Scanning," issued 21 March 1998, contains a

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			complete discussion of the human factors as they relate to the performance of scan surveys. Is there a universal protocol used to ensure the evaluation is more objective.