Request for Additional Information

Shieldalloy Metallurgical Corporation
Decommissioning Plan
Docket No. 04007102

The U.S. Nuclear Regulatory Commission (NRC) staff is conducting its safety review of Shieldalloy Metallurgical Corporation's (SMC 's) proposed plan for decommissioning its Newfield, New Jersey site. SMC submitted a Decommissioning Plan (DP) (Rev. 1) on October 24, 2005, and a Supplement to the DP (Rev. 1a), on June 30, 2006. Based on NRC staff review of these reports and previously submitted information, the NRC staff is requesting the following additional information to support its evaluation of the potential safety impacts of SMC's proposed DP.

1. (Section 3.6.2) Update the data on surface water flow in the Hudson Branch at and near the site to account for the impact of site decommissioning activities and other changes on this flow.

Basis:

Surface water flow in the Hudson Branch is an important parameter impacting the interrelationship of groundwater and surface water at this site. Vol. III of the DP (Rev. 1) (the Environmental Report) (ER) (page 3-20) states that a surface water inventory of Hudson Branch was performed from 1993 to 1995. However, decommissioning and other activities at the site could have impacted the onsite surface water drainage and discharge outlets to the Hudson Branch. Thus, the surface water inventory should be updated to account for any changes that the previous activities may have had on the Hudson Branch stream flow. If SMC believes that an update is not needed, then it should justify why this is not necessary.

Path Forward:

SMC should update the stream flow inventory of the Hudson Branch, or provide a justification for why an update is not necessary.

SMC should tabulate the most recent surface water withdrawals that have occurred since the 1990 to 1999 values listed in Figure 3-13 of the ER and summarized on page 3-26 of the ER.

Enclosure

2. (Section 3.7.2) Update the data in Table 3-4 of the ER, on the existing monitoring wells (both onsite and offsite) for the SMC site.

Basis:

SMC has evaluated groundwater analytical results in over 50 wells during the past 15 to 20 years. However, the status of these wells for future radiological monitoring should be addressed. SMC should update the data in Table 3-4 of the ER (Monitoring/Extraction Well Construction Details) to provide the following additional well statistics: well location (legal location or referenced to a figure), well ownership, well status (active, damaged, or abandoned), hydro stratigraphic unit screened, and well type (monitoring, private, municipal, industrial, or irrigation). The well statistics in Table 3-4 of the ER should be updated so that future and past sampling and radiological analysis can be adequately evaluated.

Path Forward:

SMC should provide the updated well statistics mentioned above for the wells listed in Table 3-4 of the ER. SMC should also indicate which existing figure(s) displays all of these wells or provide a new figure that shows all wells.

3. (Section 3.7.7) SMC should provide the input data, other pertinent model procedures, and model results for the groundwater flow and transport modeling performed using the MODFLOW-SURFACT model referenced in Appendix D of the DP (Rev. 1a).

Basis:

The NRC staff must independently evaluate the groundwater flow and transport modeling to provide assurance that the model results and procedures are appropriate for the physical system at this site.

Path Forward:

The model results should include the calibration model run and the simulation scenario run in which the engineered barrier for the slag pile fails, radionuclides leach from the slag pile into the groundwater, and a well about 100 feet down gradient of the Storage Yard provides groundwater for a residential use. SMC should provide electronic versions (CD or DVD) of the input data, model procedures, and aforementioned model results of its groundwater flow and transport modeling using the MODFLOW-SURFACT model.

4. (Section 3.7.8) SMC should provide the existing radiological data for the SMC site from the 1990's to the present for all onsite, and offsite groundwater, surface water, and stream sediment monitoring sites.

Basis:

The NRC staff must evaluate the impact of site-generated radionuclides on the groundwater, surface water, and stream sediment to understand existing and potential fate and transport of site-generated radionuclides at the SMC site. Furthermore, SMC has not demonstrated whether site-generated radionuclides have moved offsite. Data on the aforementioned parameters are essential for the NRC staff to assess whether these radionuclides have migrated offsite.

The radiological data for the site's groundwater (the 2004 and 2005 sampling events in the ER) do not contain an adequate number of samples up gradient or down gradient (with respect to groundwater flow) of the slag pile area to characterize the radiological conditions.

Path Forward:

Provide a tabular summary of all groundwater, surface water, and stream sediment investigations conducted at the site. SMC should provide all existing radiological data for this site from the 1990's to the present for all upgradient (including background), onsite, and downgradient groundwater, surface water, and stream sediment monitoring sites. Provide those data not previously transmitted to the NRC for radiological characterization.

SMC should provide an updated figure delineating the location of all groundwater, surface water, and stream sediment monitoring sites from the 1990s to the present. The figure should include background, upgradient, onsite, and downgradient sampling locations.

If the existing data for these parameters are not adequate for characterization, then SMC should develop additional upgradient, onsite, and downgradient groundwater monitoring sites to collect the radiological data.

SMC should list its sampling and analytical procedures, minimum detectable concentrations, and uncertainty for all radiological analyses performed on the above requested water and sediment samples.

SMC should summarize how the measured characterization data support the volume estimates of radioactive materials accumulated in the Storage Yard and in other areas (such as the T12 Tank and the sediments in the Hudson Branch), and the estimated labor and waste disposal volumes required for the proposed action.

5. (Section 3.7.8) An evaluation of potential leachate (radionuclides and other inorganic materials) movement from the consolidated radioactive materials (slag and baghouse dust) to the saturated zone (Upper Cohansey sands) needs to be provided for current and future conditions.

Basis:

The NRC staff is unable to adequately assess the potential dose to humans and the impact on the environment without an understanding of the potential for leaching of radionuclides from the consolidated radioactive materials into the vadose and saturated zones.

Path Forward:

SMC should perform an evaluation of current and potential leachate generated from the consolidated radioactive materials. This evaluation should include the current and potential leachate transport through the vadose zone into the saturated zone with site developed/estimated hydraulic conductivities (K) and distribution coefficients (Kd).

The evaluation of current and potential leachate generated by the proposed action should consider all types of accumulated materials including the various types of slag, baghouse dust, building rubble, and soil.

6. (Section 5.2.2.2.1) SMC should indicate the volume and type of soil that will be used in the engineered barrier that will overlie the consolidated radionuclide-bearing materials in the Storage Yard.

Basis:

The NRC staff will need the volume and type of soil used in the engineered barrier to evaluate both runoff and evapotranspiration from the cap.

Path Forward:

SMC should identify the volume and type of soil that will be used in the engineered barrier and its appropriate soil parameters that impact runoff and evapotranspiration from the cap.

7. (Section 4.4) Provide bases for the radionuclide concentrations for materials to be consolidated into the restricted area cell.

Basis:

Descriptions of the radionuclide concentrations proposed for consolidation in the engineered cell in the restricted area are needed to support the dose assessments for the restricted area. Based on the information provided in the DP (Rev. 1 and Rev. 1a), SMC has not provided a sufficient basis for the radionuclide concentrations for these materials. Without support for this information, the NRC staff cannot conclude that the dose assessments are acceptable.

Section 5.2.1.2 of the DP (Rev. 1a) discusses the restricted area source term to be used in the dose assessments. This section refers to Section 4.4 and Table 17.7 of the DP (Rev. 1) for radionuclide content of the various materials to be consolidated in the restricted area.

Generally, Section 4.4 does not provide references for the statements about radionuclide content of the materials to be consolidated. Section 4.4.1 does include footnote 54, which briefly describes that the radionuclide concentrations for materials formerly in the haul road were estimated to be 18 pCi/g for each of the uranium and thorium series, based on exposure rates relative to exposure rates for the ferrocolumbium slag. Details of this calculation were not provided.

Table 17.7 summarizes radionuclide concentrations for three materials: slag, baghouse dust, and radioactive soil, and provides a derived source term to represent the combination of materials proposed for consolidation in the restricted area cell. Table 17.7 provides references, given in footnotes 167–171. Footnote 167 cites the 1992 characterization report (IT 1992a). However, the NRC staff was unable to find information describing radionuclide concentrations in the slag, baghouse dust, or the excavated haul road soils that are now stockpiled in the Storage Yard in that characterization report.

Footnote 168, related to the slag material, refers to a written communication from Integrated Environmental Management (IEM) to SMC (Berger 1994). This document is a report of the radiological analysis of seven samples of ferrocolumbium slag. The document includes a table of concentrations estimated from gamma spectroscopy analyses of different progeny of the uranium and thorium decay series, with average values from the different progeny measurements. The average values are those SMC has used in Table 17.7 of the DP (Rev. 1); however, SMC has not justified that all measurements were equal in quality. In particular, from examining the measurement results for Bi-214 and Pb-214, the NRC staff has concerns that the samples may not have been sealed or fully equilibrated before the gamma spectroscopy was performed. The results for these two radionuclides are substantially lower than the Ra-226 results, indicating possible disequilibrium. The Tl-208 measurements for the thorium series may also be affected (the average adjusted Tl-208 measurement is lower than the Th-232 and Th-228 measurements). In addition, the sample locations are not described. Thus SMC has not demonstrated that the averages of the seven sample results are representative of the slag, which is the most radioactive source in the Storage Yard.

Footnote 169, related to the baghouse dust, refers to a 1992 SMC ER (SMC 1992). Table 6 of this ER provides information on the mass of thorium and uranium contained in slags and the baghouse dust (called the “lime pile”). The NRC staff has two concerns. First, the mass values were converted into equivalent activity concentrations of Th-232 and U-238. These activity concentrations differ substantially from the values reported in Table 17.7 of the DP (Rev. 1). In particular, the 1992 ER values indicate a much higher concentration of Th-232 than of U-238, which differs from the values provided in Table 17.7 of the DP (Rev. 1). Second, the 1992 ER data are not supported with any references, so the basis of the information is unknown.

In its April 24, 2007, response to the NRC staff request for additional information, SMC provided additional information on radionuclide concentrations in the baghouse dust material. An ORISE report (1997) and a letter from IEM (Berger 1995) indicate radionuclide concentrations substantially different from that provided in Table 17.7 of the DP (Rev. 1).

Footnote 170, related to the radioactive soil, refers to a final status survey of the haul road (IEM 1999). The materials of concern are radioactive soils from the haul road, that were removed and transferred to a pile in the Storage Yard. No information on radionuclide concentrations in the soils that were scraped from the haul road and moved to the Storage Yard could be located in this document (IEM 1999).

Footnote 171 relates to the derived source term that is intended to represent all material proposed for consolidation in the restricted area cell. This footnote states that the derived source term values were calculated from the concentrations in the slag, baghouse dust, and soil, weighted by the masses of the three components. Masses for 12 areas of radioactive materials are provided in Table 17.1 of the DP (Rev. 1). It is unclear to the NRC staff which type of material (i.e., slag, baghouse dust, or radioactive soil) is assumed for some of these areas. The DP (Rev. 1) does not fully describe how the weighted average concentrations for the derived source term was determined.

To summarize, based on the above inconsistencies, lack of supporting data, and lack of transparent calculations, the radionuclide concentrations used for the derived source term of the materials proposed for consolidation in the restricted area cell are insufficiently supported for use in the dose assessments.

Path Forward:

Provide a detailed discussion of the development of the radionuclide concentrations used for the derived source term of the materials proposed for consolidation in the restricted area cell. Supporting measurement data should be provided.

8. (Section 4.4 and Table 17.1) Provide bases for the volumes of materials proposed for consolidation into the restricted area cell.

Basis:

The volumes of materials proposed for consolidation in the engineered cell in the restricted area should be described to support the dose assessments for the restricted area (in part, the volumes are used to develop the “derived source term” or average source term concentrations). The volume of materials are also needed to support the cost estimates for alternatives and to support the cost-benefit analysis and ALARA evaluation. Based on the information in the DP (Rev. 1 and Rev. 1a), SMC has not provided a sufficient basis for the volumes for these materials. Without support for this information, the NRC staff cannot conclude that the dose assessments and ALARA evaluations are acceptable.

Section 5.2.2.2.2 of the DP (Rev. 1a) discusses the contaminated zone layer of the proposed cell in the restricted area, including the total volume of 65,800 m^3. This section refers to Table 17.1 of the DP (Rev. 1) for volumes of the various materials to be consolidated in the restricted area (that make up the total). Table 17.1 does not reference the source for this volume information.

In addition, Section 4.4.1 of the DP (Rev. 1) discusses volumes of ferrocolumbium slag, baghouse dust, and soil excavated during the haul road remediation. Though there is not a clear one-to-one correspondence between these materials and the areas described in Table 17.1, the volumes are inconsistent.

Path Forward:

Provide a detailed discussion of the volume estimates developed for the materials proposed for consolidation in the restricted area cell. Supporting measurement data should be provided, as appropriate.

9. (Chapters 4 and 5) Provide a complete discussion about radiological contamination in the Hudson Branch, and how the radiological criteria are or will be met.

Basis:

The status of radiological contamination in the Hudson Branch has not been sufficiently described for the NRC staff to be able to conclude that the radiological criteria will be met.

Section 4.4 of the DP (Rev. 1) indicates that residual radioactivity was identified in the Hudson Branch watershed in the late 1980s. It is stated that a radiological risk assessment for the Hudson Branch (IT 1992b) showed that the radionuclide concentrations presented an insignificant risk to members of the public. The staff notes, however, that SMC needs to demonstrate that the radiological criteria for unrestricted use (the Hudson Branch is located in the proposed unrestricted use area of the site) have been met. In addition, the staff notes that the risk assessment indicated that the concentrations of contaminants were based on conditions as they existed in 1991 and that the effect of future (i.e., post-1991) releases were not considered. For the characterization to be applicable, it needs to relate to current and future conditions in the Hudson Branch.

Section 4.4 of the DP (Rev 1.) also refers to the ER (Appendix 19.9 of the DP (Rev 1.)) for additional data on soil sampling. The ER contains, in Maps 6, 7, and 8 of Appendix B, locations and results of soil, sediment, and surface water sampling for U-238, Th-238, and Ra-226. These maps show elevated concentrations compared to background.

Section 4.6 of the DP (Rev. 1) states that surface water collected from the vicinity of the site does not exhibit concentrations elevated above background. The citation for this statement is the Remedial Investigation (RI) report (TRC 1992). However, the RI report

does not contain information on radiological constituents; it only addresses non-radiological contaminants. In addition, the NRC staff notes that the statement (that surface water did not exhibit concentrations elevated above background) appears inconsistent with data in the ER maps [which were taken from the 1992 site characterization report (IT 1992a)], which shows concentrations of U-238, Th-232, and Ra-226 in surface water in or around the Hudson Branch that appear to be elevated above background concentrations.

Section 3.11.1.2 of the ER (Appendix 19.9 of the DP (Rev 1.)) discusses radionuclide concentrations in the Hudson Branch. This section of the ER refers to the 1992 Characterization report (IT 1992a), and states that the characterization report concluded "that the presence of uranium and thorium plus progeny in the sediment samples do not contribute significantly to the ambient background exposure rate in the area." The NRC staff could not find such a conclusion in the IT characterization report (IT 1992a).

The licensee has not demonstrated that the residual radioactivity in the Hudson Branch is acceptable under the dose criteria of the LTR (i.e., 25 mrem/year and ALARA for unrestricted use).

In summary, the information presented in the DP regarding sediment and surface water contamination in the Hudson Branch appears dated, is inconsistent, and is not well supported.

Path Forward:

If the licensee intends no remediation in the Hudson Branch, then SMC should provide a detailed discussion of the residual radioactivity in the Hudson Branch and the basis for concluding that the existing conditions are within the radiological criteria for unrestricted use (i.e., 25 mrem/year and ALARA). Supporting measurement data should be provided.

If the licensee intends to perform radiological remediation in the Hudson Branch, then SMC should describe the planned remediation, and should demonstrate that the remediation will achieve the radiological criteria for unrestricted use (i.e., 25 mrem/year and ALARA). Supporting measurement data should be provided.

10. (Section 4.5) Describe the remedial characterization data that will be needed to evaluate residual radioactivity in soils that have not been identified or sufficiently characterized.

Basis:

Section 4.5 of the DP (Rev. 1) discusses the possible subsurface residual radioactivity that may exist on the site, indicating that slag may have been used as fill at a number of locations throughout the site. This section discusses two such areas, the southwest fence line and the T12 Tank Area, however, the NRC staff could not find a figure in the DP that outlines the locations of these areas. The DP neither describes any plan for remediating these areas, nor provides a plan for determining if remediation is needed or if the current concentrations would meet the dose criteria for unrestricted use.

Footnote 65 of the DP (Rev. 1) states that these areas will be addressed during the site-wide final status survey. This is not sufficient for the NRC staff because a final status survey is designed to demonstrate that areas meet the dose criteria, not to locate areas of contamination nor to evaluate the extent of contamination and the need for remediation. The NRC staff notes that Section 14.1 of the DP (Rev. 1) discusses characterization surveys, but that section does not describe any additional planned characterization work.

The NRC staff is also concerned that SMC mentions the existence of possible subsurface contamination in a number of locations; however, no information on plans to either locate or evaluate areas other than the two described above have been discussed. The NRC staff recognizes that all contamination requiring remediation may be identified before remediation begins. However, characterization should be sufficient to bound the range of contamination present at the sites. Without further plans in this regard, the NRC staff is unable to conclude that SMC will be successful in identifying all radioactive material on the site that could require remediation to meet the unrestricted use criteria.

Path Forward:

SMC should identify additional locations where residual radioactivity exists and evaluate the data needed for those areas (including the two areas already identified) to determine if they meet the dose criteria for unrestricted use or if remediation would be necessary.

In addition, the licensee should describe the locations of the southwest fence line and the T12 Tank Area, including the use of figures or maps, as appropriate.

11. (Section 5) Provide additional input for the responses to the Environmental RAIs (Numbers 7 through 14) that were submitted on March 19, 2007.

Basis:

SMC noted that it will be providing additional input for many of the dose analysis RAIs at a later date. It is stated that this input will be included along with the response to RAI No. 11. However, some of the NRC staff questions were not answered, and it's unclear if SMC will be providing a response to those RAIs at a later date. For example, for RAI No. 9, staff asked for SMC to provide the approach used to identify sensitive parameters, but no description was provided. For the action to be taken related to RAI No. 9, SMC does not state whether it will be providing a response to this question at a later date.

Path Forward:

Provide complete responses to each of the questions that NRC staff transmitted on March 19, 2007.

12. (Section 5) Identify the category for each type of scenario analyzed.

Basis:

SMC based its compliance scenario(s) on reasonably foreseeable land use. NRC guidance (NUREG-1757, Vol. 2) recommends that the licensee identify what land uses are less likely but plausible (i.e. not for compliance but to provide insights) and evaluate scenarios consistent with these less likely but plausible land uses when choosing the reasonably foreseeable land use. SMC has identified and evaluated various scenarios but does not provide a clear distinction between those that are considered reasonably foreseeable and used for compliance and those that are less likely but plausible and presented for information purposes. SMC uses various terms for describing the types of scenarios such as, reasonable, possible although not likely, unlikely and applicable. Using terminology consistent with NRC guidance would allow staff to clearly understand the intended category for each scenario.

Path Forward:

Clearly identify each scenario analyzed according to the terminology provided in Table 5.1 of NUREG-1757, Vol. 2.

13. (Section 5.3) Provide additional support for assumptions made regarding the receptor location.

Basis:

In determining what are considered reasonably foreseeable land uses of the site, SMC needs to provide additional support to bolster its assumptions. Specifically, SMC makes assumptions about the unlikelihood of residential and farming encroachment, but doesn't relate this to how the existing surrounding land-use has or has not changed over time. SMC's basis for why encroachment of residential and/or farming will not occur is reliance on the long-term control (LTC) license. The LTC license applies only to the restricted area. Therefore, staff does not see how the LTC license would prevent encroachment outside of and up to the fence line of the restricted area. The NRC staff also questions the validity of this assumption considering that there is evidence of residences being built in the area. Also, according to Figure 3-2 of Vol. III of the DP (Rev. 1), a portion of the SMC site is considered a suburban planning area and the remainder of the site as a rural/environmental sensitive planning area. Further, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) restrictions related to soil contamination do not provide a strong basis for preventing future construction after soil remediation is complete.

It is also unclear why it is appropriate to assume that a residence will not be located closer to the engineered barrier than 1000 feet away from the restricted boundary[1]

[1]SMC's Supplement to the DP (Rev. 1a) assumes that the hypothetical resident is to be located 1000 feet from the boundary of the restricted area; however, the Microshield analysis seems to reflect an assumption that the receptor is 1000 feet from the pile. In addition, Section 1.2 of the DP (Rev. 1) states that the nearest off-site resident is located 100 feet from the property. This statement contradicts the assumption that was made in the dose assessment.

(Section 5.3.3.2), especially in light of the fact that part of the site will be released for unrestricted use. Under the controls-fail scenario, no discussion is provided as to why a residence could not be located within the boundaries of the restricted area, even if the residence is not assumed to be located on top of the engineered barrier. Based on Figure 18.6, which shows the planned layout of the engineered barrier following decommissioning, there appears to be more than an acre of available land within the restricted area. Further, no discussion or explanation is provided as to why an industrial worker will only be located outside of the restricted area. This assumption is questionable, especially if access controls to the restricted area fail.

Path Forward:

Provide a map that identifies the location of the CERCLA well restriction area. Provide a map that identifies the location of the nearest residence relative to the SMC site, and correct the DP, as appropriate. Justify the assumed location of the residence and industrial worker in relation to the proposed engineered barrier, in light of potential uses of the site, failure of access controls to the restricted area, and given current surrounding land-use trends. Alternatively, re-evaluate the potential doses for these scenarios considering a closer location relative to the proposed engineered barrier, including one within the restricted area when controls fail.

14. (Section 5.3) Provide additional information on agricultural uses in the area.

Basis:

SMC does not analyze a resident farmer scenario but does not justify its exclusion as a plausible scenario. Section 3 of Vol. III of the DP (Rev. 1) explains that several acres of land in Gloucester County and Cumberland County are used for agricultural purposes, and it states that prime and unique farmlands (based on soil type) were identified in the vicinity of the SMC facility. Figure 1.1 of Vol. III shows farmland that is owned by SMC. However, uses for this farmland are not explained. In response to RAI No. 11 of the March 19, 2007, Environmental RAIs, SMC mentions anticipated continued agricultural use of the surrounding area. SMC needs to provide justification for excluding the resident farmer scenario.

Path Forward:

Identify farms or agricultural activities occurring within the vicinity of the SMC site and give their proximity to the site. Specifically, explain whether the farmlands in the area are used for cattle grazing. Identify what crops, if any, are grown on the adjacent farmlands. Provide details (i.e. type of agricultural activities and location) on the type of agricultural activities that SMC references in the aforementioned RAI responses. Explain any other future plans for agricultural activities in the area. Provide justification for excluding the resident farmer scenario or include a resident farmer scenario in the dose analysis. The justification should explain how potential uses of the site differ from current agricultural land use trends in the region.

15. (Section 5.3.3.1) Clarify the discrepancy regarding the cover erosion rate under the controls-fail scenario.

Basis:

In Section 5.3.3.1 of the DP (Rev. 1a), SMC assumes that the cover will be maintained and does not erode while institutional controls are in place. This statement is inconsistent with the corresponding scenario, which is analyzed under the conditions when controls fail.

Path Forward:

Revise the statement regarding the cover erosion rate for the recreational scenario when controls fail. Explain whether SMC assumes that this cover will or will not erode. In addition, provide a basis for this assumption given the proposed cover design and performance of that design over 1000 years.

16. (Section 5.3.3.3) Justify exclusion of the ingestion and inhalation pathways for the excavation scenario.

Basis:

In Section 5.3.3.3 of the DP (Rev. 1a), SMC states that slag is hard and difficult to chip or pulverize, which eliminates the potential for ingestion or inhalation of radioactive materials. However, soil and baghouse dust will also be a part of the slag pile matrix which allows for the potential for ingestion or inhalation of radioactive materials.

Path Forward:

Provide stronger justification for the elimination of the ingestion and inhalation pathway for the excavation scenario or include these pathways in the analysis.

17. (Section 5.4.3.3) Provide appropriate characterization of the radioactive solids, slag, baghouse dust, and soil, to support a source term for the performance assessment model.

Basis:

The slag at the SMC site is a result of a thermoelectric process to extract niobium and tantalum from ore for use as additives in steelmaking. Characterization of slags resulting from similar extraction processes on similar ores at other sites in the eastern U.S. suggest that they are generally composed of relatively exotic minerals in a glassy matrix. NUREG-1703 (Veblen et al., 2004), entitled “Characterization of Radioactive Slags,” describes material from these other decommissioning sites where niobium and tantalum were extracted from ores likely similar to those used at SMC. The radionuclides at these other sites were distributed variably in some of the crystalline and glass phases that constitute the slags. Some of the crystalline phases appear to be refractory, i.e. weather resistant, while other phases could be more susceptible to weathering. Glass, for example, generally, weathers to clays. The weathering process can result in the release of radionuclides dissolved in the various phases. The slag at

the SMC site has not been adequately characterized to constrain its performance as a source term.

Various standardized methods have been used to determine the radionuclide release rate from the slag, the slag leachability or solubility-limited concentration of radionuclides in groundwater in contact with the slag at SMC. For example, in 1991 and 1992, the slag was analyzed using the American National Standards Institute/American Nuclear Society Standard (ANSI)16.1-1986 (letters from Rieman to Fawaz). The DP (Rev. 1) mentions that a sample of slag was analyzed using EPA's Toxicity Characteristic Leaching Procedure (TCLP) 13.1. Three slag samples were also analyzed using ASTM D4319. However, application of the results of each of these standardized methods to constrain the performance of the slag as a source term suffers from the non-site-specific physical and chemical aspects of the methods.

For example, the ANSI 16.1 test involves the leaching of a cylinder of dimensions specified by the standard method. However, leaching of the slag is most likely surface-area dependent. Over the regulatory period, weathering of the slag could result in an increase in surface area. The surface area effect on leachability is uncertain.

SMC applied the TCLP to several slag samples to determine leachability. It is unclear how the results of those leaching procedures were used in the performance assessment. TCLP is a relatively aggressive procedure, but its non-site-specific chemistry makes application of its results uncertain. The licensee recognizes the unique physical and chemical characteristics of the slag as evidenced in the September 16, 2005, letter from Carol Berger to David Smith (Appendix 19.4) which states that "While default distribution coefficients are available as part of the code's supporting database, the unusual physical and chemical characteristics of the slag and baghouse dust were thought to present actual distribution coefficients that differ significantly from the defaults." The code that is referred to is RESRAD.

SMC modeled the site performance with RESRAD. One abstraction method to describe a source term in RESRAD involves using Kd values of the contaminated zone. SMC used the ASTM D4319 standardized procedure to determine the Kd values of the slag and baghouse dust. Distribution coefficients describe the ratio of the concentration of radioelements on the solids to the concentration in the coexisting liquids when the processes controlling the distribution are sorption and desorption. However, if the slag at SMC is similar to those described in NUREG-1703, the radionuclides are most likely dissolved in the phases of the slag. Consequently, applying a distribution coefficient, Kd, to describe the partitioning of radionuclides between the solids and the coexisting groundwater, is inappropriate. The ASTM D4319 analytical method describes contacting uncontaminated granular material with groundwater traced with a radionuclide of concern for no more than 14 days. Using radioactive slag and uncontaminated groundwater would be inconsistent with this procedure, especially if the processes affecting radionuclide partitioning are not sorption-desorption.

Instead of characterizing the isotopic composition of the slag in the DP, SMC assumes secular equilibria among the decay progeny. This assumption is intended to maximize the concentration of contaminants in the source term for the performance assessment. However, maximum concentrations in the source term do not necessarily lead to conservative estimates of dose to the receptor when multiple exposure pathways are

expected. Valuable information on leachability may be obtainable by analysis of the isotopes of the decay series. For example, Ra-228 is a decay product of Th-232. With a half-life of 5.76 yrs, Ra-228, in a 20 year-old undisturbed slag, should approach secular equilibrium with the Th-232 parent. If this is not the case, then leaching would be suggested over the time period since the slag has been stored. NUREG/CR-6632, Solubility and Leaching in Site Decommissioning Management Plan (SDMP) Slags (Felmy et al., 2002), describes an example where isotopic analyses of slag from another decommissioning site in the eastern U.S. showed progeny that were not in secular equilibrium with the Ra-226 parent. The authors suggested that the material was porous enough that gaseous Rn-222, the first decay product of Ra-226, had time to escape, (half-life 3.3 days), before itself decaying to solid Po-218. At another site described in this study no disequilibria was evident, suggesting this material was less permeable.

The leachability of the slag over the 1000-year regulatory period is uncertain. As the slag weathers, physical degradation and mineral alteration could affect the leach rate or release of radionuclides. An increase in surface area could result in higher release rates as the surfaces dissolve or possibly lower rates due to increased sorption sites. NUREG/CR-6632 (Felmy et al., 2002) also demonstrated that Th solubility increased significantly at low pH values. Whether low pH could occur within the regulatory period at SMC is uncertain.

Path Forward:

Characterize the stored materials to estimate the leachability of the slag and baghouse dust. This would include an analysis of the existing radionuclides, parents and decay products, to determine the extent of secular equilibrium. Also, SMC should identify in which phases in the slag the radionuclides are contained. This information would help to justify the leaching mechanism responsible for release of the radionuclides. Sampling should capture the variability of material types (e.g. slag, baghouse dust, radioactive concrete, and radioactive soils). Leaching/solubility procedures should include determining the effects of surface area/particle size, experiment duration, and range of future water chemistries on radionuclide concentrations in the groundwater.

18. (Section 5.4.3.3) Provide adequate characterization of sorption parameters for use in the performance assessment.

Basis:

Table 17.5 lists Kd values for actinium, protactinium, lead, radium, thorium, and uranium in the contaminated zone, unsaturated zone, and the saturated zone. It is noted that for actinium and protactinium, different Kd values are provided for the saturated zone compared to the contaminated and unsaturated zones. The source for these values was Sheppard and Thibault 1990. The lead values are the same for all three zones with the source being RESRAD default (Yu et al., 2001). On the other hand, the partition coefficients for radium, thorium and uranium are site-specific, determined by laboratory analysis. These site-specific parameters do not vary for the different zones.

Given that SMC chose Kd values for some of the radionuclides that depend on the zones in which they are located, it seems inconsistent that the site-specific measurements would not also show a zone dependency. This may be a result of limited sampling.

The Kd values associated with the slags are large. Large Kd values for the soil underlying the contaminated zone is not demonstrated. By assuming large Kd values, the leached radionuclides can be stored on the solids, reducing the exposure to the receptor.

Path Forward:

Determine the Kd values for each of the zones to be used in the performance assessment or explain why the values in the DP are adequate.

19. (Appendix E) SMC should provide information regarding riprap gradations, riprap durability, and quality assurance procedures for rock production and placement.

Basis:

Staff review of the DP (Rev. 1 and Rev. 1a) indicates that little or no information is provided regarding the gradations, durability, and quality assurance procedures that will be used for the side slope rock and the apron rock. Riprap gradation information is needed to determine if the gradations meet minimum criteria for size and uniformity. The gradation information should be provided for staff review and approval prior to production of the rock. Examples of acceptable gradations may be found in NUREG-1623 and NUREG-1757.

Additional information is needed to assess the durability of the proposed rock. SMC should select a rock source, perform durability testing using the tests suggested in NUREG-1623 and NUREG-1757, perform petrographic examination(s), and provide the data for staff review.

Path Forward:

Provide additional information regarding the quality assurance (QA) programs, quality control (QC) programs, testing procedures, and inspection procedures that will be used during construction to confirm rock gradations, rock layer thicknesses, and rock quality. The information should include the specific tests and the frequency of testing. General guidance may be found in NUREG-1623 and NUREG-1757.

SMC should select a rock source and indicate the quarry and source that will be used. As discussed above, SMC should provide detailed information and test data regarding gradations, durability, and QA/QC procedures that will be used for the selected rock source. If there is significant variability in the rock source at the quarry, SMC should provide additional information regarding the QA/QC programs that will be implemented at the quarry to assure consistency in rock production.

20. (Sections 5.2.2.2.1, 5.3.3, and 5.4.3.2) Correct the statements related to the use of a geomembrane in the engineered barrier

Basis:

In the DP (Rev. 1a), SMC has indicates in drawings that the geomembrane has been eliminated from the engineered barrier design. However, Section 5.2.2.2.1, Section 5.3.3, and Section 5.4.3.2 of the same DP still refer to a geomembrane.

Path Forward:

Correct these and any other inconsistencies in the DP so the entire document reflects the latest design information.

21. (Section 5.3) Correct discussion in the DP regarding the engineered barrier and its relation to the groundwater pathway considerations.

Basis:

Section 5.3 of the DP (Rev. 1), Exposure Scenarios, indicates that one reason for excluding the groundwater pathway is that the engineered barrier is designed to prevent rainwater infiltration into the radioactive material. This is not the case, as the engineered barrier no longer includes a geomembrane in its design, and SMC has not yet identified and characterized the soil cover material.

Path Forward:

Clarify and correct statements made regarding the engineered barrier and its relation to the groundwater pathway considerations of the dose assessment.

22. (Sections 5.4.3.2 and 8.3): Provide an appropriate and complete engineered barrier design and degradation analysis.

Basis:

A complete and accurate assessment of the performance of the engineered barrier system must be provided. To determine compliance with Subpart E for restricted use, an analysis is required of: 1) the contribution of the engineered barrier system toward compliance with the criteria of 10 CFR 20.1403 with institutional controls in place (25 mrem/yr dose); and 2) the contribution of the engineered barrier system toward compliance with the criteria of 10 CFR 20.1403 assuming loss of institutional controls and maintenance such that the barrier may degrade over time (100 mrem/yr dose). NUREG- 1757, Vol. 2, Section 3.5.3, provides guidance on the elements that should be provided to support the assessment of the performance of the engineered barriers, including the degradation mechanisms and real-world conditions expected for the barriers (see RAIs on dose assessment and scenarios).

Path Forward:

Provide an analysis of the impact of the range of disruption/degradation mechanisms and scenarios, and either a comparison of those impacts to the non-conformance level of degradation or a comparison of the resulting doses to the 10 CFR 20.1403 dose criteria. In this analysis, include the engineered barrier geotechnical degradation mechanisms of slope stability, settlement, liquefaction, freeze/thaw, and root penetration, particularly under the loss-of-control conditions. Figure 18.8 of the DP (Rev. 1) shows vegetation on the cover surface. Identify the type of seed mixes to be used and provide a planting schematic that shows the type and location of vegetation that would be planted on the engineered barrier.

23. Evaluate the effect of additional leach test results on the engineered barrier design.

Basis:

SMC's engineered barrier design in the DP (Rev. 1), including the absence of engineered elements to limit infiltration, is based in part on the assumption that there will be insignificant leaching to affect performance. However, this risk-informed basis for the existing cover design is not clearly described. As a result, questions and concerns are raised about the lack of an infiltration barrier, geomembrane, or liner. Furthermore, there is insufficient evidence to support the assumption of no leaching and future leach testing is needed.

Path Forward:

Evaluate the effect of additional slag and baghouse dust leach testing results on dose assessments, and, if necessary for compliance, revise the engineered barrier design and related monitoring and maintenance as appropriate. This revaluation could result in the potential need for added elements to the cover design to reduce potential leaching and transport of radionuclides, such as an infiltration layer to reduce infiltration or a composite rock/vegetative cover to increase evapotranspiration, or both. To risk-inform the design process and evaluate uncertainties in long-term natural processes and engineered barrier performance, consider conducting sensitivity analyses of a range of assumptions for leaching, infiltration, evapotranspiration, cover degradation, and other factors to demonstrate the significance of these key factors and design elements on compliance with the dose criteria. Use the results from these analyses to describe the risk-informed basis for the engineered barrier design.

Furthermore, if the engineered barrier cover design is revised, the proposed long-term monitoring and maintenance activities and annual costs may also need revision along with the trust fund amount.

24. (Sections 5.4.3.2 and 5.4.3.3) Explain or correct inconsistencies in assumptions for material properties.

Basis:

Page 77 of the DP (Rev. 1a), indicates that native site soils have a measured hydraulic conductivity of $6.4x10^{-3}$ cm/sec. However, on page 79, the DP (Rev. 1a) indicates that native materials have a hydraulic conductivity of $5.4x10^{-8}$ cm/sec.

Page 74 of the DP (Rev. 1a), indicates that cover densities were assumed based on density of site material, yet in other sections, the DP indicates SMC's plans to use unidentified off-site materials.

Path Forward:

Explain or correct the apparent inconsistencies in the dose assessment assumptions for hydraulic conductivity and density of cover materials and sub-soils. Identify the source for the off-site materials.

25. (Section 8.3) Provide information related to the final design, construction, monitoring, and maintenance of the engineered barrier.

Basis:

Section 8.3 of the DP (Rev. 1) indicates that a "final design and specification for the engineered barrier" will be provided in a subsequent submission after the DP has been approved. This same section provides a long list of information, analyses, and plans that SMC will include in this future, post-DP-approval submission. Lacking this information, a typical statement provided at this time in the DP is, "Soil material for the engineered barrier will be secured from a certified off-site source, and will be of appropriate grain size and quality to be stable." Much of the information planned for the future submission is necessary for the scenario analysis of the dose assessment, and thus is needed to enable a complete review of the DP. Further, in opposition to the SMC intention to submit monitoring and maintenance plans after DP approval, Section 17.7.4 of NUREG-1757, Vol. 1, indicates that site maintenance and long-term monitoring information needs to be provided in the DP. The specifics are necessary at this time to provide a solid basis for revising the projected costs for monitoring and maintenance provided in Table 17.14 of the DP (Rev. 1).

Path Forward:

Provide more specific and detailed information on the engineered barrier design, sequence of engineered barrier construction activities, monitoring, and maintenance as itemized in the list in Section 8.3, page 95. Include engineered barrier design details, geotechnical characterization and testing of materials, QA and QC plans for construction, the Operation and Maintenance Plan, information on post-closure monitoring, and revisions to the current surveillance and monitoring costs (Table 17.14) once the actual monitoring and maintenance has been identified. Supporting

information should include schematics and cross sections of the restricted area cell/engineered barrier. Provide a description of the equipment (for example, bulldozers and front-end loaders) that will be used for constructing the engineered barrier and plans for survey and decontamination of the equipment.

26. (Section 8.3) Additional information and analyses should be provided if SMC intends to use rounded rock for erosion protection.

Basis:

Based on discussions during the on-site technical meeting, SMC indicated that rounded rock may be used for erosion protection at this site. However, the method used to calculate rock sizes (Abt-Johnson Method in NUREG-1623) is based on the use of angular rock. If rounded rock is used, the rock may need to be about 40% larger.

Path Forward:

SMC should select a rock source as soon as possible. If rounded rock will be used, SMC should discuss the effects on the required size of the rock.

27. (Sections 7 and 16) Eligibility criteria of 10 CFR 20.1403(a): Demonstrate clearly what method SMC is using to show compliance with 10 CFR 20.1403(a), the eligibility requirements for use of restricted use.

Basis:

The NRC regulation in 10 CFR 20.1403(a), which the staff often refers to as the eligibility requirements for restricted use decommissioning, provides two options for demonstrating eligibility. For eligibility, the licensee may demonstrate that further reductions in residual radioactivity to comply with the unrestricted use criteria either: (1) would result in net public or environmental harm; or (2) were not being made because the residual levels associated with restricted conditions are ALARA. In the DP, the licensee has stated that the proposed approach is ALARA (Rev. 1, Section 7), and (Rev. 1a, Section 16.1) and has also stated that "further reductions in radioactivity at the site, such as that associated with the LT Alternative [i.e., license termination for unrestricted use], would result in net public harm." The licensee has not clearly demonstrated either of these two options, and it is unclear which option (or whether both options) is intended.

Path Forward:

To demonstrate compliance with 10 CFR 20.1403(a), clarify which of the two options (or both) is intended to demonstrate compliance: that further reductions in residual radioactivity to comply with the unrestricted use criteria: (1) would result in net public or environmental harm; or (2) were not being made because the residual levels associated with restricted conditions are ALARA.

28. (Section 7) Eligibility criteria of 10 CFR 20.1403(a): If asserting net public or environmental harm, then demonstrate net harm.

Basis:

Section N.2 of NUREG-1757 (Vol. 2, Rev. 1), provides guidance on demonstrating net public or environmental harm. The calculation of net public or environmental harm is a special case of a general cost-benefit comparison that calculates net harm by comparing benefits to the cost of doses, injuries, and fatalities incurred. The calculation does not consider the monetary cost of performing remediation. In the DP (Rev. 1), the licensee has calculated net harm, without the cost of remediation.

Path Forward:

If the licensee asserts net public or environmental harm as the basis for compliance with 10 CFR 20.1403(a), then the licensee must demonstrate that there is net harm, and the public or environmental benefits must be compared to detriments, without including the cost of the action in the equation.

29. (Section 7) Eligibility criteria of 10 CFR 20.1403(a): If asserting ALARA for the eligibility requirements, then incremental changes to the proposed restricted use approach should be evaluated.

Basis:

Appendix N of NUREG-1757, Vol. 2, provides guidance on performing ALARA analyses for decommissioning. In typical ALARA analyses, incremental changes in the approach, which would reduce doses, are evaluated to determine if the changes are ALARA. This could be thought of as fine tuning the approach, from the ALARA perspective. The DP does not provide any consideration of incremental changes to the proposed restricted use approach.

Path Forward:

Include, as part of the ALARA analysis, consideration of incremental changes to the proposed restricted use approach. If the licensee believes there are no such incremental changes to evaluate, the licensee should provide a justification.

30. (Section 7) Eligibility criteria of 10 CFR 20.1403(a): If asserting ALARA for the eligibility requirements, benefits and detriments should be compared.

Basis:

Appendix N of NUREG-1757, Vol. 2, provides guidance on performing ALARA analyses for decommissioning. An ALARA analysis should compare costs (detriments) with benefits to determine if the costs are reasonable for the benefits provided. Table N.1 of Appendix N lists some of the benefits and detriments that may be applicable. The primary (but not the only) benefit is generally the collective dose averted in the future.

The NRC staff notes that SMC has considered the doses *incurred* for each alternative to be costs, rather than evaluating averted doses as benefits. This approach makes it difficult to understand the benefits potentially achieved for the costs of a given alternative.

Path Forward:

For the ALARA analysis, the licensee should compare benefits to detriments or costs. The licensee should evaluate the doses *averted* as a benefit of each alternative.

31. (Section 7) Eligibility criteria of 10 CFR 20.1403(a): Address minimal incremental actions necessary to achieve unrestricted use.

Basis:

Based on the wording of 10 CFR 20.1403(a), the NRC staff considers that the demonstration of compliance should evaluate incremental measures that could be taken to comply with the unrestricted use criteria. In the DP, the licensee evaluated an "LT" (license termination under unrestricted use conditions) alternative, which assumes removal and offsite disposal of all residual radioactive materials in the Storage Yard. The licensee has not demonstrated that complete removal and offsite disposal is necessary to achieve the unrestricted use criteria. If the amount of remediation work is overestimated, then the cost of the LT alternative would also be overestimated, which would bias the net harm or ALARA comparison away from the unrestricted use option. Thus, the unrestricted use option considered should be an option with minimal incremental remedial actions to achieve the unrestricted use criteria.

Path Forward:

Whether using either the net public or environmental harm option or the ALARA option, the licensee should either evaluate what minimal incremental actions or measures (compared to the proposed action) would be necessary to meet the unrestricted use criteria, or demonstrate that the LT alternative provides the minimum further reduction in residual radioactivity and dose necessary to meet the unrestricted use criteria.

32. (Section 7) Eligibility criteria of 10 CFR 20.1403(a): The licensee's eligibility ALARA analysis should address other societal and socioeconomic considerations.

Basis:

The NRC regulations, in 10 CFR 20.1403(a) and 20.1403(e) require residual radioactivity be ALARA. The regulations define ALARA (§20.1003) as follows:

> "ALARA (acronym for "as low as is reasonably achievable") means making every reasonable effort to maintain exposures to radiation as far below the dose limits in this part as is practical consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements

> in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to utilization of nuclear energy and licensed materials in the public interest."

Based on the definition, ALARA must take into account improvements relative to other societal and socioeconomic considerations. The Statements of Considerations for the LTR (62FR39069, July 21, 1997) state:

> "To support a request for restricted use, a licensee would perform an ALARA analysis of the risks and benefits of all viable alternatives and include consideration of any detriments. This could include estimated fatalities from transportation accidents that might occur as the result of transport of wastes from cleanup activities, and societal and socioeconomic considerations such as the potential value to the community of unrestricted use of the land."

Guidance in NUREG-1757, Vol. 2, Rev. 1, Section N.1.1, discusses that licensees should account for benefits including changes in land values, aesthetics, and the reduction in public opposition to decommissioning activities the licensee is pursuing. The guidance in Section N.1.1 also states that some benefits can be difficult to quantify; the NRC staff does not require that all benefits be quantified.

The licensee did qualitatively address changes in land value due to restrictions on use, and regulatory costs, but other factors have not been addressed in the ALARA evaluation. In Section 16.5.4 of the DP (Rev. 1a), the licensee describes input obtained from seeking public advice from the site-specific advisory board (SSAB). Part of the advice was that detriments include preventing development of the rest of the site and surrounding properties, concerns about not being able to sub-divide the property, and concerns about property values and rateables. These detriments identified by the public are societal and socioeconomic considerations, and thus should be addressed in the ALARA evaluation.

Path Forward:

SMC's eligibility analysis, for compliance with 10 CFR 20.1403(a), needs to more fully discuss the costs and benefits of the proposed action, and of alternatives to the proposed action. In the eligibility analysis, SMC should include societal and socioeconomic considerations, including the undue burdens identified by the SSAB, considerations identified in the Statements of Consideration for the LTR, and the considerations identified in the NRC staff guidance (NUREG-1757). The licensee should quantify benefits and costs that can reasonably be quantified, to allow better comparison between alternatives. Alternative decommissioning activities such as removal of the radioactive material may produce a societal benefit of reduction in public opposition, which may be difficult to quantify. One approach that would be acceptable to the NRC staff is for the licensee to determine the bases of the public opposition, and to quantify those bases (e.g., quantification of the benefit of avoiding impact on property values versus costs of removing the contaminated material). For other benefits or costs that cannot be

quantified, the licensee should discuss the benefit or cost and should indicate that it cannot quantify that aspect.

33. (Section 7) Eligibility criteria of 10 CFR 20.1403(a): Provide justification for concluding that sale to, and disposal of slag at, the International Uranium Corporation (IUC) uranium mill is not a viable decommissioning option.

Basis:

In the environmental RAIs dated March 19, 2007, the NRC staff asked SMC to provide feasibility analysis calculations and reports that were prepared to examine the economic potential of selling slag material to a uranium mill and/or extracting uranium from the slag. In its responses to the RAIs, dated April 24, 2007, SMC provided correspondence related to discussions with the IUC uranium mill about selling slag material to IUC for uranium extraction. In its responses, SMC concludes that the sale of and disposal of slag at IUC would not be a viable decommissioning option. However, SMC did not provide any supporting information for that conclusion. In the correspondence that SMC provided, there was documentation of SMC's inquiry to IUC, but no documentation of a response from IUC.

Path Forward:

Provide documentation to support the conclusion about the non-feasibility of sending the slag to IUC for uranium extraction.

34. (Section 7 and 16) ALARA analysis under 10 CFR 20.1403(e): Provide an ALARA evaluation of the residual radioactivity under conditions of institutional controls no longer in effect, to demonstrate compliance with 10 CFR 20.1403(e).

Basis:

NRC regulation 10 CFR 20.1403(e) requires that residual radioactivity be reduced such that the dose for conditions when institutional controls are no longer in effect will be ALARA. Chapter 7 of the DP (Rev. 1) and Chapter 16 of the DP (Rev. 1a) discuss ALARA, but do not provide an ALARA discussion of doses for the condition when institutional controls are no longer in effect.

Path Forward:

Provide a demonstration of compliance for §20.1403(e), ALARA for conditions when institutional controls are no longer in effect. This demonstration should evaluate potential incremental changes to the proposed approach and their impact on doses for conditions when institutional controls are no longer in effect.

35. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: Calculate doses or dose averted over the 1000-year compliance period.

Basis:

In Section 7.2.1.2 of the DP (Rev. 1), SMC calculates the collective dose to members of the public over a single lifetime of exposure, that is, 70 years. The compliance period for the dose criteria of the LTR is 1000 years (see 10 CFR 20.1401(d)). Thus, for soil contamination, doses for ALARA evaluations should be calculated over 1000 years.

Path Forward:

For the eligibility and ALARA analyses, the licensee should either calculate doses or doses averted over the 1000-year dose compliance period or justify the alternative used. See NUREG-1757, Section N.1.2.

36. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: For changes in land values, consider land use over the 1000-year compliance period.

Basis:

In Section 7.3.8 of the DP (Rev. 1), SMC discusses changes in land values. In the discussion for the LT alternative, SMC indicates that the existing soil contaminant levels (presumably, the nonradiological contaminants) will likely prevent future residential use of the unrestricted area of the site. While this may be valid for some length of time, SMC is working to complete remediation of the nonradiological contamination of the site. Thus, at some time in the future, it is reasonable that the nonradiological contamination would be reduced such that residential use might be plausible. The compliance period for the LTR is 1000 years, and this time frame should be considered for changes in land values.

Path Forward:

For evaluating changes in land values, the licensee should consider the reasonably foreseeable land uses over the 1000-year compliance period and discuss the status of non-radiological, investigations at the soil site. The licensee should either include evaluation of land uses foreseeable after nonradiological contaminants have been substantially reduced or justify that nonradiological contaminants will not be reduced sufficiently for residential land use.

37. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: Provide a comparison among alternatives of all costs and benefits evaluated.

Basis:

Some of the costs and benefits that SMC has evaluated for the eligibility and ALARA requirements are not quantified in the DP (Rev. 1). In particular, SMC has provided only qualitative discussions of licensing and regulatory costs (Section 7.3.7), change in land values (Section 7.3.8), and environmental impacts (Section 7.3.9). While qualitative evaluations can be acceptable, the licensee has not compared the costs and benefits for all alternatives.

Path Forward:

The licensee needs to compare all the costs and benefits among the alternatives, to complete the eligibility and ALARA analyses. In particular, for costs or benefits that have not been quantified, SMC should still provide sufficient discussion to qualitatively compare the alternatives.

38. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: Provide an evaluation using zero discount rate or with a sensitivity analysis of the discount rate for the present worth calculations for the value of future doses.

Basis:

In Section 7.3.6 of the DP (Rev. 1), SMC calculates the cost of the radiological risks, and applies a discount rate of 3% to calculate the present worth of the future doses. Based on the very long half life of the residual radioactivity at the SMC site, the NRC staff is concerned that use of this discount rate essentially eliminates any value in doses averted in the later years of the compliance period.

The NRC staff guidance on use of discount rates is provided in NUREG-1757, Vol. 2, Section N.5. That guidance refers to NUREG/BR-0058 ("Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission), the most recent version of which is Vol. 4, dated September 2004. Section 4.3.5 of NUREG/BR-0058 indicates that for certain regulatory actions, such as those involving decommissioning and waste disposal, special considerations arise when considering benefits and costs across generations. That section indicates that the analysis should be supplemented with an explicit discussion of intergenerational concerns. This could be done by performing the analysis based on costs and impacts at the time they are incurred, with no present worth conversion, or by performing a sensitivity analysis using lower discount rates.

Path Forward:

The licensee should include some method for analyzing the intergenerational concerns, by including an analysis with no discounting or with a sensitivity analysis of the discount rate. (The NRC staff acknowledges, that as it currently stands, the DP (Rev. 1) is somewhat unclear about whether discounting is applied. The calculations of Section 7.3.6 include use of a 3% discount rate. However, it appears that the costs of the doses included in the Table in Section 7.4 do not include any discounting.)

39. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: Correct the use of the formula and recalculate the results for present worth in the eligibility and ALARA analyses.

Basis:

In Section 7.3.6 of the DP (Rev. 1), SMC calculates the cost of the radiological risks, and applies a discount rate to calculate the present worth of the future doses. In these

calculations, the NRC staff finds acceptable the use of equation N-2 in Appendix N of NUREG-1757, Vol. 2. This equation essentially calculates the present worth as the product of the number of people exposed, the annual dose or dose averted, and the discounting function. In the calculations SMC performed in Section 7.3.6 of the DP (Rev. 1), it appears that rather than using annual dose, a cumulative dose, over 70 years or 30 years, was used. This approach incorrectly calculates present worth.

Path Forward:

If SMC continues to use a discount rate to calculate the present worth of future doses, the calculation should be corrected.

40. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: For doses to members of the public after decommissioning, use more site-specific, unbiased analyses for the dose assessments.

Basis:

Some of the dose calculations for the eligibility and ALARA analyses of Chapter 7 of the DP (Rev. 1) use the regulatory limit as the dose expected for that alternative. This approach is in contrast to SMC's use of site-specific analyses for the dose assessments used to demonstrate compliance with the dose criteria. Use of the generic values, rather than site-specific values may bias the results of the ALARA analyses. Appendix N of NUREG-1757, Vol. 2, recommends that ALARA analyses use unbiased dose estimates.

Path Forward:

The licensee should either use more site-specific, unbiased dose estimates for the ALARA analyses or demonstrate why the values used do not inappropriately bias the results of the eligibility and ALARA analyses.

41. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: Correct inconsistencies in the eligibility and ALARA analyses.

Basis:

As noted elsewhere, the DP (Rev. 1) has inconsistently used discount rates. As a result, the dollar values attributed for the three alternatives are inconsistent amongst Section 7.3.6, the table in Section 7.4, and Table 17.9 of the DP (Rev. 1). In addition, the dollar value of doses has been used inconsistently. In some cases, a value of $20,000 per person-rem is used, while in other cases, a value of $2,000 per person-rem is used.

Path Forward:

The licensee should either be consistent in the eligibility and ALARA analyses, or should justify the inconsistencies.

42. (Section 7) Calculations of costs and benefits for eligibility and ALARA analyses: Provide more complete justification for the analysis of rail accidents.

Basis:

The licensee discusses rail transportation accidents and risks in Section 7.2.3 of the DP (Rev. 1). The NRC staff has two concerns with the assessment of rail accident fatality risk for the LT (unrestricted use license termination) alternative. First, SMC has used a fatality risk coefficient of 2.3×10^{-7} (units were not provided in the DP). The reference for the risk coefficient is data from 2004 from the Federal Railroad Administration (FRA), as detailed in footnote 187 of the DP (Rev. 1). The NRC staff downloaded the rail safety data from 2004 (FRA 2007), but the overall fatality risk coefficient does not appear consistent with the value used by SMC.

Second, it appears to the NRC staff that SMC has incorrectly used the railroad fatality data. Based on how SMC applies the fatality risk coefficient, the units appear to be fatalities per rail car mile. However, the FRA describes the units used for reporting fatalities as per train-mile, and defines train and train-mile in its guide to preparing accident reports (FRA 2003). If the fatality coefficient is multiplied by the number of rail car miles rather than train-miles, the expected fatalities would be overestimated.

Path Forward:

The licensee should provide additional details on and justification for the rail fatality risk coefficient used in the eligibility and ALARA analyses. If appropriate, the licensee should revise the calculation to correctly apply the risk coefficient.

43. (Section 9.2) SMC should provide information on how Radiation Work Permits (RWPs) are developed, reviewed, and implemented.

Basis:

Radioactive material work procedures/practices (such as RWPs) are developed, reviewed, implemented, and managed so that the licensee's proposed health and safety program complies with the regulatory requirements of 10 CFR Parts 19 and 20, and is adequate to protect workers from ionizing radiation during decommissioning activities (see NUREG-1757, Section 17.2.5).

The DP (Rev. 1) states that details of how individuals performing procedures in the RWP will be informed of those procedures, will be provided to NRC by the decommissioning contractor before start up of on-site work. This information should be included in the DP rather than before start up of on-site work.

Path Forward:

Provide information about how radioactive material work procedures/practices (such as RWPs) will be developed, reviewed, implemented, and managed to comply with the regulatory requirements and protect workers from ionizing radiation during decommissioning activities.

44. (Section 9.3) Provide information to describe responsibilities, authorities and minimum qualification of all positions listed in Figure 18.10.

Basis:

The NRC staff needs to determine whether individuals performing the various project management and safety functions are qualified for these functions. SMC did not provide this information for anyone below the Site Health & Safety Officer on Figure 18.10. In addition, SMC did not provide NRC with the qualifications of any newly hired employees or replacements for the positions noted on Figure 18.10.

Path Forward:

SMC should submit information regarding responsibilities and authorities and minimum qualifications of all positions listed in Figure 18.10. SMC also should describe how it will provide NRC with the qualifications of any newly hired employees or replacements for these positions.

45. (Section 9.3) Provide information regarding the authority to stop work.

Basis:

Information should be sufficient to allow the NRC staff to understand the relationship between the various organizational units within the decommissioning organization (such as remedial activities and health and safety units), including the responsibilities and authority to revise or stop work. In reviewing Section 9.3 of the DP (Rev. 1), it appears that the only positions with authority to stop work are the Radiation Safety Officer and the Site Health & Safety Officer. The NRC staff believes that the Quality Assurance Officer (QAO) should also be able to stop work.

Path Forward:

SMC should describe which positions have the authority to stop work and under what conditions. If the QAO does not have the authority to stop work, provide an explanation for this position.

46. (Section 9.3.1) The Radiation Safety Officer (RSO) needs to meet more stringent requirements than those described in the DP.

Basis:

The DP (Rev. 1) description of qualifications of the RSO position is deficient in meeting the criteria described in NUREG-1757. The RSO needs to have at least 1 year of health physics experience and the specialized knowledge described in the Evaluation Findings of NUREG-1757, Section 17.2.3.1.

Path Forward:

SMC should revise the DP (Rev. 1) description of its qualifications for the RSO.

47. (Sections 9.4.2 and 9.4.3) SMC should provide information on how it will determine qualifications of its general employees and radiation workers.

Basis:

Information needs to be provided to document that the licensee has the personnel resources to safely conduct and manage the decommissioning of its facility. DP (Rev. 1) Sections 9.4.2 (General Employee Training) and 9.4.3 (Radiation Worker Training) rely on self-graded exams to test employee proficiency.

Path Forward:

SMC should identify who will have authority over the general employees and the radiation workers, and how those in authority will determine the qualifications of the general employees and radiation workers.

48. (Section 13) The DP does not discuss the revision of quality assurance (QA) documents.

Basis:

Information needs to be provided regarding SMC's procedures to ensure that changes to documents are reviewed and approved by the same organizations as those that performed the initial review and approval, or by other qualified responsible organizations delegated by SMC. The procedures should ensure that documents are available at the location where the activity will be performed prior to commencing work. Furthermore, procedures should be established to ensure that obsolete or superseded documents are removed and replaced by applicable revisions in work areas in a timely manner.

Path Forward:

SMC should address how its QA documents will be revised. In addition, SMC should explain how its process for revising the documents will be as rigorous as the process used to develop them.

49. (Section 13.1) There appear to be inconsistencies in the titles and functions of personnel.

Basis:

The QA program should have adequate controls in place to support the decommissioning activities. Furthermore, the licensee's description of its organizational structure should be such to document that persons and organizations performing quality affecting activities have sufficient authority and freedom to identify quality problems, provide solutions, and verify that solutions have been implemented. The authority and duties of persons and organizations performing functions related to meeting the performance objectives must be clearly established and delineated in writing, including both the performing functions of attaining the requisite quality of work (quality achieving) and the assurance functions of verifying the attainment of quality (quality assuring). Designated QA personnel should be sufficiently free from direct pressures resulting from cost and schedule, have the responsibility, delineated in writing, to stop unsatisfactory work, and control further processing or delivery of nonconforming material.

Section 13.1 of the DP (Rev. 1) refers to the "Project Manager" and the "Decommissioning Project Manager". Are these positions the same? Only the Project Manager appears on the Organization Chart provided in Figure 18.10. Similarly, reference is made to the QAO yet Section 13.1.1 refers to a Quality Assurance Manager.

Furthermore, as evidenced by the Organization Chart provided in Figure 18.10, it appears that the QAO reports directly to the Decommissioning Contractor. The NRC staff is concerned that this position in the organization may not give the QAO the necessary independence. Also, the QAO should have stop work authority. According to the DP (Rev. 1), it appears that only the SMC Radiation Safety Officer and the Site Health & Safety Officer have the authority for stop work decisions.

Path Forward:

Be consistent in terminology, and correct Figure 18.10 to reflect the actual organization. Explain how the QAO will be afforded sufficient authority and freedom to identify quality problems, provide solutions, stop work, and verify that solutions have been implemented. Explain whether the QAO is a contractor or an SMC employee. It must be clear that quality is the responsibility of SMC, not the contractor.

50. (Section 13.1) Overall control and authority rests with the licensee.

Basis:

The licensee needs to have adequate controls in place to support the decommissioning activities. Major delegations of work should be fully described, and in each case, organizational responsibilities and methods for control of the work by the applicant should be described, including how responsibility for delegated work is to be retained and exercised.

The licensee and its contractors should evaluate the performance of work delegated to other organizations, including audits/surveillances of the contractor's QA programs and audits/surveillances of subcontractors, consultants, and vendors furnishing equipment or services to the applicant or its contractors. The frequency and method of this evaluation should be specified.

However, Section 13.1 of the DP (Rev. 1) states that ultimate responsibility for implementing the elements of the QA Program rests with the Decommissioning Project Manager. Elsewhere, Section 13.1 of DP (Rev. 1) states that overall control and authority for radiation protection will rest with the Project Manager. These and similar statements should be revised as the overall control and authority always rests with the licensee.

Path Forward:

SMC should revise its organizational structure so that overall control and authority rests with the licensee. Major delegations of work should be fully described and in each case, organizational responsibilities and methods for control of the work by the applicant should be described, including how responsibility for delegated work is to be retained and exercised.

51. (Section 13.1) The DP refers to the use of a summary of the Decommissioning Contractor's corporate QA policy rather than the licensee's corporate QA Policy.

Basis:

As previously noted, overall control and authority rests with the licensee. Therefore, the corporate QA policy should be that of the licensee.

Path Forward:

Pursuant to NUREG-1757, Section 17.6.2, the licensee should submit a summary of the licensee's corporate QA policy.

52. (Section 13.2) The DP is inconsistent with NRC's policies in stating that the Quality Assurance Program Plan (QAPP) will be provided to the NRC for review and acceptance.

Basis:

There is no need to submit the QAPP for NRC review and acceptance. The NRC staff does not review and approve QAPPs. However, the NRC staff does review the overall QA program to assure that adequate controls are in place to perform decommissioning activities. NRC inspectors review and evaluate implementation of the QA procedures during inspection of the site.

Path Forward:

SMC should explain how it will develop, implement and revise its QAPP and demonstrate that revisions to the QAPP will be made with the same rigor as the original development of the QAPP. Furthermore, the frequency and method of revisions to the QAPP should be specified.

53. (Section 13.2.3) The DP states that the off-site laboratory will be responsible for assuring that all appropriate laboratory personnel are thoroughly familiar with the QAPP.

Basis:

It is not necessary for the off-site laboratory personnel to be thoroughly familiar with the QAPP. Use of a chain-of-custody process would be acceptable to the NRC staff.

Path Forward:

Shieldalloy should consider whether to hold the off-site laboratory responsible for being thoroughly familiar with Shieldalloy's QAPP or use a chain-of-custody process. If SMC opts to use the chain-of-custody process, it should be described including responsibilities of the individuals involved.

54. (Section 13.4) The DP discusses control of Measuring and Test Equipment but does not provide a summary of Measuring and Test Equipment that will be used during decommissioning activities.

Basis:

Pursuant to NUREG-1757, Section 17.6.4, the information supplied by the licensee should be sufficient to allow the staff to fully understand the methods and procedures that the licensee will use to ensure that only accurate and calibrated test and measurement equipment will be used during the decommissioning project.

Path Forward:

The description of the test and measurement equipment QA program should include: a summary of the test and measurement equipment used in the program; a description of how and at what frequency the equipment will be calibrated; a description of the daily calibration checks that will be performed on each piece of test or measurement equipment; and a description of the documentation that will be maintained to demonstrate that only properly calibrated and maintained equipment was used during the decommissioning.

55. (Section 14) Submit final status survey plan.

Basis:

Section 14.3.2 of the DP (Rev. 1) states that a final status survey plan (FSSP) will be prepared using guidance in NUREG-1757 and in the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), NUREG-1575. The licensee has included some general plans in the DP, but details are generally not provided. The NRC staff cannot complete its review until the FSSP is provided. Based on the information submitted in Chapter 14 of the DP (Rev. 1), the NRC staff has initial concerns described in the following RAIs.

Path Forward:

The licensee should submit the FSSP.

56. (Section 14) Justify the approach for determinations of area classification for final status surveys.

Basis:

Section 14.3.4 and Figure 18.11 of the DP (Rev. 1) describe the classification of areas for the final status surveys, generally using the MARSSIM designations. The NRC staff is concerned with the approach presented. Section 14.3.4 states that the classifications for the site and surrounding areas are based on current radiological information. Yet it appears to the NRC staff that radiological information is not yet available for all survey units. The DP (Rev. 1) does not describe the individual survey units; Figure 18.11 is not detailed enough to describe the actual survey units, and does not clearly describe the bounds of the expected FSS. The staff suggests that historical site assessment information (historical operational information and measurement data) should be used in determining area classifications. In addition, Section 14.3.4 states that all areas that are not Class 1 or Class 2 areas will be designated Class 3. This is opposite to the usual MARSSIM approach, which is to assume that all areas are Class 1, unless there is information to demonstrate otherwise (see the MARSSIM, Section 4.4).

Path Forward:

The licensee should either provide additional justification for its approach to determining area classifications, or should consider modifying the approach. The licensee should use all available information (including historical and current radiological information) to determine area classifications.

57. (Section 14) Provide justification for statements about adequacy of characterization.

Basis:

Section 14.1 of the DP (Rev. 1) contains conclusions about the adequacy of characterization surveys, some of which are not supported in the DP. The characterization appears to be based primarily on the 1991 survey by IT Corporation. That study did not cover all areas of the site and surrounding area. Section 14.1.5 of the DP (Rev. 1) discusses unimpacted areas, but the DP does not show any areas considered to be unimpacted.

Section 14.1.6 of the DP (Rev. 1) states that information from characterization and other surveys confirms that no significant quantities of residual radioactivity have migrated past the restricted areas. However, the DP describes areas of contamination that are outside of the restricted areas shown in Figure 18.2. Also, results of the 1991 characterization indicate some contamination outside the site boundaries, including on the north side of the Storage Yard and in and along the Hudson Branch on the south side of the site. The NRC staff believes that these areas have not yet been adequately characterized to demonstrate the absence of significant contamination.

Section 14.1.6 also states that all areas of the Newfield facility have been surveyed or sampled as part of the 1991 characterization effort, routine surveillance efforts, or as part of a facility-specific decommissioning effort. This is not supported in the DP.

Path Forward:

If the licensee is relying on statements or conclusions about the adequacy of characterization efforts, it should support those statements by explaining how and when these areas were characterized and why that was sufficient. If, instead, the licensee plans further characterization of certain areas prior to the Final Status Survey (FSS), then the licensee should indicate this.

58. (Section 14) Provide complete plans for final status surveys of buildings.

Basis:

Section 14.3.2 of the DP (Rev. 1) indicates that building surfaces will be surveyed as part of the FSS, and Derived Concentration Guideline Limits (DCGL) for building surfaces are discussed (here and in Table 17.11). However, most of the rest of Section 14.3 does not mention the FSS for building surfaces. Section 14.3.6 only discusses survey unit size for outdoor soil survey units and Section 14.3.11 only discusses survey and sampling for soils.

In addition, it appears that the minimum detectable concentrations (MDCs) for surface scanning measurements, given in Table 17.12 of the DP (Rev. 1), are inconsistent with the proposed DCGLs for building surfaces. From Table 17.11 of the DP (Rev. 1), the proposed gross alpha DCGL (accounting for uranium and thorium decay series) is 9 dpm/100 cm^2. Per MARSSIM guidance, the scan MDCs should usually be as low as (or lower than) the DCGL, the scan MDC is 100 dpm/100 cm^2 according to Table 17.12.

Path Forward:

The licensee should provide a FSS Plan that addresses building surface surveys. The licensee should justify adequacy of the MDCs, relative to the DCGLs for building surfaces.

59. (Section 14) Clarify the applicability of the proposed criteria for release of materials and equipment.

Basis:

Section 14.2.1 of the DP (Rev. 1) describes release surveys for materials and equipment used during decommissioning. The criteria proposed are intended for materials that are only contaminated surficially. However, the licensee has not indicated that the approach and criteria are to be used only for surface-contaminated materials and equipment. The NRC staff notes that in Section 8.1 of the DP (Rev. 1), SMC proposed release of portions of concrete pads. Such concrete may be volumetrically contaminated.

Path Forward:

The licensee should clarify that the criteria will only be applied to surface-contaminated materials. If the licensee intends to release materials or equipment that becomes volumetrically contaminated, the licensee should describe and justify criteria to be used.

60. (Section 15) Update the cost estimate for decommissioning and the amount of funding necessary for the long-term control and maintenance fund.

Basis:

The license needs to make adequate arrangements to ensure that the site will be maintained in accordance with the proposed institutional controls.

Path Forward:

To the extent that costs to meet the conditions of the LTC license may change in response to the RAIs transmitted here, update the cost estimate for decommissioning and the amount of funding necessary for the long-term control and maintenance fund. The update should include changes that affect cost such as changes in the volume of material proposed for consolidation in the cell, changes in cap construction, and changes in long-term monitoring and maintenance.

61. (Section 16.3.1) Update the status of the State's response regarding the State government role in providing a durable institutional control or independent third party arrangement.

Basis:

NRC recognizes that on May 24, 2006, SMC forwarded a letter to the State of New Jersey formally asking if the State would accept responsibility for ownership, control or independent third-party oversight of the Newfield site. The State requested information about these roles from NRC, and NRC provided a response in an October 11, 2006, letter. The State also requested financial disclosure information from SMC in letters dated January 25, 2006, and August 3, 2006. SMC responded to the State in a letter dated May 31, 2007. It is not yet clear how the State will respond. However, NRC will proceed under the assumption that the State will not accept a role. This assumption is based on the written record that documents the State's apparent objection to the restricted use alternative in general and to the LTC license as a legal mechanism to provide institutional controls. This assumption is also based on the following statement made by the State representative and member of the SSAB during the September 21, 2005, SSAB meeting: "They put out the plan without asking first whether or not we would be interested in working with it. And after we saw the revision of the original document, no, we're not interested in overseeing it." Finally, NRC does not know when or even if the State might provide its decision based on the following quote from a State official attending the December 6, 2006, NRC public meeting, "the State has not determined if it will accept the material at Shieldalloy for ownership control or third party oversight. So we don't believe that the NRC can accept a decommissioning plan if the State has not made a decision."

Path Forward:

SMC should revise Section 16.3.1 of the DP (Rev. 1) to describe the status of its request and indicate that it will continue to propose the LTC license option based on the record summarized above that indicates the State of New Jersey is likely to reject a role. However, SMC should continue its communications with the State and provide NRC with the State's response when it is received. The DP should also explain that the State's response is not part of the initial eligibility requirement for restricted use under 10 CFR 20. 1403(a), as stated in the State's April 5, 2007, letter. The State's response is part of NRC's institutional control selection process described in the decommissioning guidance and as such is not a regulatory requirement. In that regard, if no response from the state is received prior to the amendment for the LTC license, NRC will interact with the State to determine if it will accept the oversight role. Note that the discussion of selecting institutional controls and the LTC license should be presented in Section 16.3.1 and not in Section 16.2, "Eligibility Demonstration".

62. (Section 16.3.1) Clarify the basis for not selecting a local government role with durable institutional control or independent third party arrangements.

Basis:

The DP (Rev. 1a) incorrectly states that NRC rejected the Borough of Newfield as a durable institutional control (page 23, Appendix H). NRC rejected the SMC proposal in DP (Rev. 0) for institutional controls because it simply stated that SMC would eventually transfer their site ownership to some local or state government entity, and no discussion or commitment was given regarding the capability or willingness by any government entity to accept institutional control responsibility in perpetuity. However, NRC's guidance on the graded approach in NUREG-1757 identifies that State or Federal government ownership or control would be appropriate rather than a local government when durable institutional controls are necessary, such as for sites with long-lived radionuclides.

Path Forward:

Revise Section 16.3.1 of the DP (Rev. 1) to reflect the discussion above and correct the record.

63. (Section 16.3.1) Correct the discussion in the DP that NRC has agreed to issue the LTC license as part of the overall approval of the DP.

Basis:

In Section 16.3.1 of the DP (Rev. 1a), SMC states that "The USNRC has agreed to issue the LTC license as part of the overall approval of this Decommissioning Plan." This statement is unclear and could be misunderstood. NRC did not agree to issue the LTC license at the time of DP approval. NRC agreed that SMC could propose the LTC license as a legally enforceable and durable institutional control in its revised DP. NRC's interim guidance for SMC and the guidance in NUREG-1757 clearly indicate that the license would be amended (not issued) to become the LTC license after decommissioning activities are completed and approved by NRC. These activities would include construction of the restricted area cell and cover, the final status survey report that confirms compliance with the dose criteria of the LTR, and submittal/approval of the Long-Term Control Plan. Therefore, at the time NRC would approve a DP, the future use of the LTC license would be conditionally approved pending completion and approval of the activities noted above. This general approach is consistent with the discussion of schedules in Section 8.5 of the DP (Rev. 1).

Path Forward:

Revise the statement in Section 16.3.1 to be consistent with Section 8.5 and the NRC guidance on the LTC license as summarized above.

64. (Section 16.3.1) Correct the statements regarding NRC terminating the LTC license.

Basis:

Section 16.3.1 of the DP (Rev. 1a) states that "In the event of SMC default in the terms and conditions of the LTC license, the USNRC has the authority to terminate the license, assume control of the funds held in trust, and contract the services of a third party to implement the license requirements." This statement is unclear and could be misunderstood.

Path Forward:

Section 16.3.1 should be revised as follows: "Under the LTC license, SMC would be legally required to remain in compliance with the conditions of the license and, as with any licensee, take the necessary corrective actions if they are not in compliance." Furthermore, NRC could take a variety of actions, including enforcement, to correct compliance problems.

65. (Section 16.3.1) Clarify the purpose of the proposed deed notice.

Basis:

In Section 16.3.1, a deed notice is proposed as a secondary means of ensuring institutional controls by prohibiting listed uses and notifying future owners of the LTC license and restrictions on the land. NRC guidance only envisions the deed notice as a secondary institutional control for the single purpose to notify future landowners of the restricted area under a NRC LTC license. Therefore, the deed notice is not recognized by NRC as a legally enforceable method of restricting future land use. NRC relies on the LTC license for this purpose.

Path Forward:

SMC has two options. First, Section 16.3.1 could be revised to discuss the purpose of the deed notice as described above and in NRC's guidance (note that footnote 97 of Section 5.3 provides a better discussion of the deed notice and LTC license than Section 16.3.1). Second, SMC could describe why it believes the deed notice is a legally enforceable institutional control that can restrict future site use, in addition to simply informing future owners of NRC's LTC license.

66. (Section 16.3.1) Identification of institutional controls and their role in compliance.

Basis:

Section 5 of the DP (Rev. 1) appears to take credit for restrictions associated with

existing institutional controls, including the natural resources conservation area adjacent to the restricted area. However, these types of institutional controls are not identified or described in Section 16.3.1 of the DP (Rev. 1) on institutional controls. Therefore, the DP is unclear regarding these institutional controls and their role in compliance.

Path Forward:

Clarify the discussion in Section 16.3.1 to indicate the existing institutional controls and their role, if any, in demonstrating compliance.

67. (Section 16.3.1) The discussion of prohibited and permitted uses of the restricted area is scattered and unclear.

Basis:

Section 16.3.1 discusses prohibited and permitted uses under the deed notice, but no prohibited and permitted uses are discussed under the LTC license which is the primary institutional control. Furthermore, Section 16.3.2, identifies some other uses of the restricted area that would be restricted, such as excavation and drilling.

Path Forward:

Section 16.3.1 should be revised to provide one clear and comprehensive discussion of both prohibited and permitted uses based on the risk insights from dose assessments and analyses of human processes that could disrupt the performance of the engineered barrier. It should be clear that both prohibited and permitted uses should eventually be incorporated into the LTC license, LTC Plan, and be provided for information in the deed notice. For permitted uses, the licensee should reference dose assessment results as a basis for demonstrating that the hours per year that workers would need for inspection and maintenance will be safe and thus permitted. These results could also be used for concluding that inspections by others, such as NRC or the State will also be safe, and therefore permitted.

68. (Section 16.3.2) Clarify the use of barricades to restrict access to the restricted area.

Basis:

Section 16.3.2 identifies activities to control access including fencing, warning signs along the fence line and all access points (gates). Section 16.4 also identifies maintaining the barricading of roads that surround or approach the restricted area.

Path Forward:

Further discuss the purpose, extent, and method proposed for barricading the restricted area, including the roads. If major excavation that requires use of heavy equipment is considered an adverse disruptive human process, the design of the engineered barriers should discourage the potential for future excavation of the cover with heavy equipment.

Describe the barricade materials such as very large sized durable rock that may be low maintenance and not need replacement, or concrete that could need maintenance and replacement.

69. (Section 16.4) Long-term monitoring plans in Section 16.4 are incomplete and no risk-informed basis is given.

Basis:

To ensure a complete long-term monitoring plan, NRC's decommissioning guidance describes a risk-informed process that would result in a sound basis for the long-term monitoring activities. This process includes a systematic identification of disruptive processes that could lead to non-compliance with NRC's dose criteria and then an analysis of each process to identify the type of monitoring, detection of indicators or precursors of disruptive processes, location and frequency.

Path Forward:

Reevaluate the monitoring activities in the DP using the process described above and in NRC's decommissioning guidance. Revise the discussion of monitoring activities based on this evaluation, and describe the basis for the monitoring identified. Consider long-term monitoring of: groundwater contamination; slag and baghouse weathering and leaching; settlement of the cover and disruption of the shielding and erosion cover. The LTC plan that would eventually be proposed after decommissioning activities are completed should identify the detailed procedures.

Revise the cost estimates in Section 15.1 of the DP (Rev. 1) to reflect the revised long-term monitoring plan as described in the DP (Rev. 1).

70. (Section 16.4) Long-term maintenance plans in Section 16.4 are incomplete and no risk-informed basis is given.

Basis:

To ensure a complete long-term maintenance plan, NRC's decommissioning guidance describes a risk-informed process that would result in a sound basis for the long-term maintenance activities. This process includes a systematic identification of disruptive processes that could lead to non-compliance with NRC's dose criteria and then an analysis of each process and planned monitoring to identify the type of maintenance/corrective actions that would be conducted.

Section 16.4, page 158 of the DP (Rev. 1) briefly notes that the engineered barrier was designed to perform even if maintenance does not take place. However, this brief statement does not provide an understanding of how the engineered barrier was designed to accomplish this and that NRC's decommissioning guidance describes how to design robust erosion barriers that would not need active ongoing maintenance. This regulatory approach is consistent with the approach required by the Uranium Mill Tailings Radiation Control Act and implemented by NRC for erosion covers at uranium mill tailing impoundments.

Path Forward:

Reevaluate the maintenance activities in the DP using the process described above and in NRC's decommissioning guidance. Revise the maintenance activities based on this evaluation, and describe the basis for the maintenance identified. Consider long-term maintenance of the following actions: cover settlement, disruption of the shielding and erosion cover, and the duration of maintenance.

Revise the cost estimates in Section 15.1 of the DP (Rev. 1) for the revised long-term maintenance plans.

Add a discussion of the robust design of the erosion barrier and how the design provides the basis for no ongoing active maintenance or periodic repair.

71. (Section 16) An opportunity should be provided for continued SSAB meetings to inform the SSAB of changes that might result from the NRC RAIs.

Basis:

SMC's response to NRC Issue No. 18 in the June 30, 2006 letter on SSAB interactions, identified an action to be taken to schedule a follow-on meeting with the SSAB as soon as there is sufficient SSAB interest. Additional information will be available from the SMC response to NRC RAIs. Therefore, as a matter of good practice SMC should keep the SSAB informed if there is SSAB interest. NRC recognizes that some members of the SSAB will continue to provide their input as part of the EIS and hearing processes.

Path Forward:

As a follow-on to NRC issue No. 18 and as a matter of good practice, SMC should determine if there is interest in future SSAB meetings to keep the SSAB informed. SMC could discuss the NRC RAIs related to the four questions and its responses. SMC and the SSAB may also want to discuss other topics for general information and background for the four questions.

72. (Section 16.5) Provide a response to the SSAB, local community, and other affected parties that explains the reasons why SMC believes it cannot select the removal alternative.

Basis:

The SSAB members, local community, and State officials have strongly expressed their opposition to SMC's proposed alternative to leave accumulated materials in place and to restrict future site use with an NRC LTC license. They also have identified what they believe are undue burdens that would result from this alternative. NRC recognizes that a licensee can propose its preferred decommissioning alternative for NRC review and that for restricted use sites, it must also seek advice from the affected parties on four questions related to the use of institutional controls and sufficient financial assurance. While licensees are not required to follow or incorporate the advice of the affected parties, they are required by 10 CFR 20.1403 (d) to incorporate, as appropriate, following

analysis of that advice. The evaluation of SSAB advice in Section 16.5.4 of the DP (Rev. 1) identified and evaluated numerous issues and three undue burdens identified by the SSAB. While the SMC evaluations addressed the specific issues and burdens, the evaluations did not provide insight on why SMC continues to propose the LTC alternative even after evaluating the undue burdens and the continued strong opposition by the SSAB and community. NRC's guidance states that a licensee should describe its reasons for not incorporating the advice provided by the affected parties. It would be insightful and useful to understand what reasons are preventing SMC from proposing the removal alternative. Although limited funding has been generally discussed, specific funding limitations and supporting evidence should be documented.

Path Forward:

Discuss the reasons why the removal alternative is not feasible for SMC and provide evidence that documents the reasons. Include a discussion of obstacles to removal for reuse and removal for disposal. For example, if applicable, include a thorough discussion and evidence of insufficient funds for disposal, considering all potential sources of funds such as funds available to SMC, as well as funds which some parties might assume could be available from the SMC holding company and disposal options, such as partial removal of radioactive material, potential disposal at facilities other than Energy*Solutions*.

73. (Section 16) No identification or description of the total system, its elements and contribution to protection was provided.

Basis:

As noted in NUREG-1757, Sections 17.7.1 and 17.7.3, the NRC staff needs to understand what total system of controls SMC plans to use or has provided for, and the manner in which these controls contribute to protection.

Path Forward:

Use NRC's decommissioning guidance to prepare a description of the total system of controls used to provide protection, its elements, and the purpose and contribution to protection of each element. SMC should provide a discussion that could enhance the NRC staff's understanding of its proposed alternative and help affected parties understand how SMC believes all the elements of their total system work together to provide sustained protection.

MINOR ISSUES / TYPOGRAPHICAL ERRORS

1. In many places in the DP, SMC discusses quantities of thorium and/or uranium. In some cases, the description is unclear as to whether total thorium (or total uranium) is being described, or whether a particular isotope (e.g., Th-232 or U-238) is described. For example, Section 4.4 of the DP (Rev. 1) discusses "23 curies each of uranium and thorium" in the slag and baghouse dust, while the top portion of Table 17.7 of the DP (Rev. 1) reports concentrations of "thorium series," "uranium series," and "actinium series." "Thorium," in Section 4.4 of the DP (Rev. 1), could refer to total thorium, natural thorium, or just Th-232.

"Thorium series," in Table 17.7 of the DP (Rev. 1), could refer to natural thorium (i.e., Th-232 plus Th-228) or to Th-232 (with the assumption that all progeny are also present in equilibrium). SMC should be clear and precise, so that the intended meaning is unambiguous.

2. Section 4.5 of the DP (Rev. 1), first paragraph refers to Figure 18.11 for the location of all deposits, but this is an incorrect figure reference.

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