# SHIELDALLOY METALLURGICAL CORPORATION

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April 24, 2007

Patricia B. Swain
Environmental Review and Performance Assessment Directorate
Division of Waste Management and Environmental Protection
Office of Federal and State Materials and Environmental Management Programs
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

**Re: Response to "Request for Additional Information for Environmental Review of Proposed Decommissioning Plan for Shieldalloy Metallurgical Corporation, Newfield, New Jersey"**

Dear Ms. Swain:

Shieldalloy Metallurgical Corporation (SMC) is in receipt of your March 19, 2007 request for additional information on the "Decommissioning Plan for the Newfield Facility" (Report No. 94005/G-28247, Rev. 1a), hereinafter referred to as the "DP". The purpose of this letter is to respond to your requests. Specifically, the enclosure to this letter transmits additional information, modifications to Rev. 1a of the DP and other commitments pertinent to your inquiries.

If you have any questions or if I can provide you with additional information, I can be reached at (856)362-8680. We look forward to the timely completion of the Environmental Impact Statement (EIS) and approval of the DP

Sincerely,

David R. Smith,
Radiation Safety Officer

cc w/enc. (electronic): Eric Jackson
David White
Robert Haemer, Esq. - Pillsbury Winthrop Shaw Pittman
Carol D. Berger, CHP - Integrated Environmental Management, Inc.
Jean Oliva, PE - TRC Environmental
Ken Kalman - USNRC HQ
Mark Roberts - USNRC Region I

# ENCLOSURE

## Shieldalloy Metallurgical Corporation Response to the USNRC's Request for Additional Information of March 19, 2007

**RAI No. 1:** Provide background information of range of alternatives considered but eliminated. Please provide the following information:
**RAI No. 1a:** Reports/correspondence on concrete use/reuse opportunities that were examined, including information regarding the Pennsylvania State University studies and contact with the U. S. Army Corps of Engineers Baltimore District.

> **SMC Response**: Pennsylvania State University (PSU) was asked to evaluate a variety of materials issues associated with various slag types generated at the Newfield plant. Once the PSU testing was complete, a report was prepared and submitted to SMC. A copy of the PSU report for chromite ore, showing the type of testing performed on the materials and the information solicited by SMC, is enclosed herein as Attachment 1a.[1]
>
> In regard to contacts with the U. S. Army Corps of Engineers, the first contacts occurred in June of 2003. Since that time, exploratory conversations have been held with not only representatives of the Baltimore District, but with a variety of reef foundations who operate under the jurisdiction of the USACE. Communications records associated with discussions with the USACE and others are also included in Attachment 1a.
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> **Action to be Taken**: A copy of the PSU report on the ferrocolumbium slag will be forwarded as soon as it is located and reproduced.

**RAI No. 1b:** Reports/correspondence on concrete use/reuse opportunities that were examined with respect to contaminated slag/contaminated material reuse reports prepared for the SMC Cambridge, Ohio facility.

> **SMC Response**: An assessment of the re-use potential for the slag at SMC's Cambridge facility was completed on December 29, 2005. A copy of the report is included herein as Attachment 1b. Included as well is purchasing correspondence on the sale of baghouse dust (BHD) for beneficial re-use.
>
> **Action to be Taken**: None required.

**RAI No. 1c:** Reports/correspondence with the countries of Malaysia and China that explored the beneficial reuse of contaminated slag /contaminated materials and the resulting economic analysis/information. Include information regarding market prices, material quantities, and relevant extraction and processing costs associated with processing and beneficial reuse of these materials. Include all assumptions and parameters used to determine the feasibility of each beneficial reuse considered.

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[1] In regard to the testing of ferrocolumbium slag, after the initial technical applications review, review of the materials characterization data and assessment of regulatory barriers, PSU concluded that the regulatory requirements for the product were too great to realistically use the material in conventional construction applications. As a result, PSU agreed to expand the chromite sand physical testing and return the ferrocolumbium slag to SMC, untested.

**SMC Response**: With respect to Malaysia, SMC assessed the market potential for the sale of the slag to various steel manufacturers in that country. Included in the assessment were a number of meetings which took place the week of April 10, 2006. While the sale of SMC's slag to groups within this country appears possible, no specific agreements have been discussed to date. A copy of the assessment report from the April campaign is included herein as Attachment 1c.

With respect to China, telephone contacts were made with the Nuclear Control/Management Office in the China National Nuclear Corporation (CNNC), a Central Government controlled corporation. To date, the contacts were made only to be prepared in the event that a Chinese purchaser of the slag could be identified. As of the date of this letter, no such identification has been made. A copy of the correspondence with Chinese connections is also included in Attachment 1c.

**Action to be Taken**: None required.

**RAI No. 1d:** Please 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 valuable constituents (i.e. uranium extraction). Identify the specific uranium mills considered.

**SMC Response**: SMC has contacted International Uranium Corporation (IUC) several times in the past to inquire about the potential for extraction of the uranium/thorium in the slag. The first contact was made in 1999, and the most recent in 2006. To date, there has been no interest on the part of IUC in extracting the uranium/thorium from SMC's slag. The telephone communication and e-mail notes from discussions with IUC are included herein as Attachment 1d.

The sale to and disposal of slag at IUC would not be a viable decommissioning option because the cost of delivery of the slag to the site for processing, the high cost of extraction of the uranium and thorium relative to the potential revenues from the sale of the concentrates, and the tipping charge for disposal of the residuals in IUC's mine add up to a cost higher than that of disposal at the EnergySolutions facility in Clive, Utah.

**Action to be Taken**: None required.

**RAI No. 2:** Please provide the cost information identified below related to the offsite disposal alternative to support gaining a full understanding of all the assumptions and parameters used in developing costs for the proposed off-site disposal alternative in consideration of the EIS cost benefit analysis.

**RAI No. 2a:** Please provide copies of the two EnergySolutions letters/proposals provided to SMC referenced in the Request for Additional Information (RAI) teleconference of March 13, 2007. The NRC staff understands that these letters contain cost estimates for off-site disposal by rail.

**SMC Response**: SMC was provided with a letter dated March 8, 2005 from Envirocare (now EnergySolutions), and a Power Point presentation given in that same year. In addition, there was an exchange of information by e-mail between SMC and Envirocare in late 2005 and a letter proposal from Envirocare to SMC dated October 26, 2005. Finally, EnergySolutions provided a revised quote to SMC on October 9, 2006. Attachment 2a contains the March 8, 2005, October 26, 2005 and October 9, 2006 letters, the Power Point presentation, and the e-mail exchange.

**Action to be Taken**: None required.

**RAI No. 2b:** Please also provide the results of any SMC independent analysis of the off-site disposal cost. For example, to the extent it is available, please provide either the cost spreadsheets or information on the derivation of costs to excavate and to dispose of the tonnage of materials. Provide any statistical uncertainty for this estimate or for confidence intervals associated with the total tonnage estimates. Provide the data and calculations that show the number of rail cars needed to accommodate tonnage, their size and load capacities, how many cars would move per day over the full removal period, how long the entire cleanup would take, assumed rail trip routes, planning and project management costs, excavation costs, loading costs, any onsite pulverizing/crushing and related equipment costs, and environmental controls and barriers, including labor estimates by task over the construction period.

**SMC Response**: SMC conducted an analysis of the off-site disposal cost, as documented in the spreadsheet presented as Table 17.15 of Rev. 1a of the DP. Information on the derivation of the costs, including data regarding the number of rail cars needed to accommodate tonnage, their load capacities, how many cars would be required per day over the full removal period, and the estimated length of cleanup, were presented within Section 4.2.2 of the Environmental Report and within the information presented in Appendix K of the Environmental Report (the second set of tables presented in Appendix K was used for estimating emissions associated with the off-site disposal [License Termination] alternative). For ease of review, this information is reproduced again in Tables 1 and 2 of Attachment 2b to this enclosure.

Table 17.15 of Rev. 1a of the DP also includes planning and project management costs (noted as indirect costs within the estimate), excavation costs, loading costs, crushing and related equipment costs, and environmental controls and barriers. This information is also summarized in Attachment 1b herein. No statistical uncertainties or confidence intervals were developed for cost estimation parameters.

**Action to be Taken**: None required.

**RAI No. 2c:** With respect to past SMC independent estimates, have any of the input parameters or physical variables (outside of price inflation) used to calculate these estimates changed substantially (since the time they were completed) to render the previous estimates either not applicable or useful to assess this disposal option? If so, please indicate which parameters and physical variables have changed and update the estimate accordingly.

**SMC Response**: SMC is not aware of any significant changes in input parameters or physical variables used to calculate the cost estimates (outside of price inflation) that would render the previous estimates either not applicable or not useful for assessing the off-site disposal (License Termination) option. The costs associated with the hauling and disposal components, with disposal at the EnergySolutions facility in Clive, Utah, were based on the information shown in NUREG-1543, Table 5.1-6 (Cambridge closure estimate), adjusted for inflation. The information provided to SMC by EnergySolutions (see response to RAI No. 2a, above) was not sufficiently detailed to permit a meaningful comparison with SMC's own estimates (i.e., the per railcar price includes but does not segregate the costs for excavation, loading, transportation and off-site disposal, making it difficult to compare the EnergySolutions costing with SMC's). In summary, no significant changes to input parameters have been identified and the cost estimate for the License Termination (LT) disposal option (i.e., off-site disposal) has not been revised.

**Action to be Taken**: None required.

**RAI No. 3:** Provide more detail on assumptions, parameters, and calculations used in the "as low as reasonably achievable" (ALARA) cost benefit analysis.

**RAI No. 3a:** Provide more detail on how the man rems were calculated for each category of cost, i.e. worker on-site and offsite exposure scenarios for each alternative. These details should include assumptions and explanations used to document the provided dose response coefficients and examples of how they were applied.

**SMC Response**: Section 7.4 of the DP contains a simple cost-benefit analysis with respect to the radiological impacts only for the three decommissioning alternatives.[2] In the calculation, the cost of each decommissioning option and a "cost per person-rem averted" amount is required, along with the collective dose associated with each alternative. The cost of implementing the decommissioning options are described in Section 7.3.1 of the DP. The "cost per person-rem averted" was taken from NUREG/BR-0058, NUREG-1757, and 62 FR 39058.[3,4,5] The collective dose for each alternative was determined as follows:

$$D_C = (D_{worker} \times N_{worker}) + (D_{gen.\ pop.} \times N_{gen.\ pop.})$$

where $D_C$ = the collective dose (person-rem), D = the hypothetical dose to a maximally-exposed individual (rem) and N = the number of individuals with exposure potential. If N was not known, as was the case for the LC alternative, it was determined as follows:

$$N = A \times PD$$

where A = the area of the Newfield property (square meters) and PD = the population density (persons per square meter of land). The PD was assumed to be 0.0004 persons per square meter, as recommended in NUREG-1496.[6] The following table shows the variables used as input to the aforementioned equations for each of the applicable decommissioning alternatives:

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[2] In the DP, the three options are designated as follows: (1) License Continuation Alternative (or LC Alternative), which is a "no action" alternative; (2) Long Term Control Alternative (or LTC Alternative), which is the preferred decommissioning option for the site that would result in License No. SMB-743 being amended to a long-term control license; and (3) License Termination Alternative (or LT Alternative), which is the removal of all residual radioactivity about the DCGL and release of the site for unrestricted use.

[3] U. S. Nuclear Regulatory Commission, NUREG/BR-0058, "Regulatory Analysis Guidelines of the U. S. Nuclear Regulatory Commission", Rev. 2, November, 1995

[4] U. S. Nuclear Regulatory Commission, NUREG-1757, "Consolidated NMSS Decommissioning Guidance; Decommissioning Process for Materials Licensees", September, 2003, Vol. 2, Appendix N (Section N.4).

[5] U. S. Nuclear Regulatory Commission, *Federal Register*, Vol. 62, Page 29058, July 21, 1997.

[6] NUREG-1496, ""Generic Environmental Impact Statement in Support of Radiological Criteria for Decommissioning of NRC-Licensed Nuclear Facilities."

| Alternative | Population | D (millirem) | | N | |
|---|---|---|---|---|---|
| | | Value | Basis | Value | Basis |
| LC | Worker | 600 | 20 millirem TEDE for 30 years (Section 7.2.1.1 of the DP | 109 | Calculation assuming A = 67 acres (Section 1.2 of the DP) |
| | General Population | 7,000 | 100 millirem TEDE for 70 years (Section 7.2.1.2 of the DP) | 109 | Calculation assuming A = 67 acres (Section 1.2 of the DP) |
| LTC | Worker (during remediation) | 17.1 | Section 7.2.1.1 of the DP | 9 | Section 7.2.2 of the DP (6 to 12 workers at any one time assumed for costing) |
| | General Population (post remediation) | 1,766 | Section 7.2.1.2 of the DP | 109 | Calculation assuming A = 67 acres (Section 1.2 of the DP) |
| LT | Worker (during remediation) | 51.4 | Section 7.2.1.1 of the DP | 9 | Section 7.2.2 of the DP (8 to 10 workers at any one time assumed for costing) |
| | General Population (post remediation) | 1,750 | 25 millirem TEDE for 70 years (Section 7.2.1.2 of the DP) | 109 | Calculation assuming A = 67 acres (Section 1.2 of the DP) |

**Action to be Taken**: None required.

**RAI No. 3b:** Please clarify if the man rems calculated in the cost benefit analysis represent the cumulative year's worth of exposure that corresponds to the remedial construction period work length. If so, please document the time periods used and cross reference to the number of workers or relevant potentially exposed populations.

**SMC Response**: For the cost/benefit analysis in Section 7.4 of the DP, the time periods used were different for each of the decommissioning alternatives. The following are the time periods used to derive the values shown in Section 7.2.1.2 of the DP:

- LC Alternative - A time period of 30 years was used for industrial workers, which is reasonably representative of a working lifetime. A time period of 70 years was used for members of the general population, which is reasonably representative of a nominal human lifetime.
- LTC Alternative - The time period of interest for the worker population is the time period that corresponds to the remedial construction phase of the decommissioning action (i.e., 512 hours). The time period for the general population is again 70 years.
- LT Alternative - The time period of interest for the worker population is the time period that corresponds to the remedial construction phase of the decommissioning action (i.e., 840 hours per year for two years, which totals 1,680 hours). The time period for the general population is again 70 years.

The numbers of workers and population members used for the analysis was again dependent on the alternative. The following are brief descriptions of how these values were derived:

- LC Alternative - Pursuant to the recommendations of NUREG-1496, a population density of 0.0004 persons per square meter of land was used to approximate the number of people who might occupy the property in the future.[7] Since the Newfield property has a footprint of approximately 67 acres, this translates into 109 industrial workers. For the general population, an equivalent number was used (i.e., 109 people).

- LTC Alternative - During the construction phase, an average of nine workers were costed to be present on-site in order to implement the provisions of the DP. For the general population, the same number was assumed as for the LC Alternative (i.e., 109 people).

- LT Alternative - During the construction phase, an average of nine workers was again assumed to develop the costs. For the general population, the same number was assumed as for the LC Alternative (i.e., 109 people).

**Action to be Taken**: None required.

**RAI No. 3c:** Please define the relevant populations considered in the radiological risk analysis for both on-site and off-site disposal options. Specifically, how were these populations measured, from what year and what population base?

**SMC Response**: In Section 7.3.6 of the DP, the cost associated with the radiological risks was assessed for each of the three decommissioning alternatives. For the LC Alternative, the relevant worker population was estimated as recommended in NUREG-1496 (i.e., 0.0004 persons per square meter of land).[8] The general public population for this scenario was deemed equivalent to the worker population. For the LTC and the LT Alternatives, the average number of workers that will be on-site for the duration of construction activities was used for the worker populations, with the general public populations equal to that for the LC Alternative.

**Action to be Taken**: None required.

**RAI No. 4:** Provide the following technical documents and materials.
**RAI No. 4a:** Any studies that provide results of radon characterization from baghouse dust and slag.

**SMC Response**: Requested documents included herein as Attachment 4a.

**Action to be Taken**: None required.

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[7] NUREG-1496, "Generic Environmental Impact Statement in Support of Radiological Criteria for Decommissioning of NRC-Licensed Nuclear Facilities."

[8] The current work force at the SMC site was deemed not applicable as there are only warehousing, security, and license compliance operations on-going, with a labor demand of less than 10 persons.

**RAI No. 4b:** Any radiological and non-radiological analytical data that exists for slag and baghouse dust.

**SMC Response**: Requested documents included herein as Attachment 4b.

**Action to be Taken**: None required.

**RAI No. 4c:** Results from baghouse materials testing studies conducted in the mid-1990s.

**SMC Response**: The requested document has not been located as of the date of this response. However, the search through the SMC archives continues.

**Action to be Taken**: A copy of the report, which was prepared by IT Corporation's materials testing division, will be forwarded as soon as it is located and reproduced.

**RAI No. 4d:** Quarterly surveillance reports for ferrocolumbium campaign - including bioassay, air monitoring and personnel dosimetry - from a representative/active year.

**SMC Response**: Requested documents included herein as Attachment 4d.

**Action to be Taken**: None required.

**RAI No. 4e:** NRC inspection results occurring approximately in the 1994/1995 time frame regarding side by side comparisons for air quality and areal contamination.

**SMC Response**: Requested documents included herein as Attachment 4e.

**Action to be Taken**: None required.

**RAI No. 4f:** Analytical results from stack monitoring, if available.

**SMC Response**: Requested documents included herein as Attachment 4f.

**Action to be Taken**: None required.

**RAI No. 4g:** Groundwater Focused Feasibility Study, TRC 1994

**SMC Response**: Requested document included herein as Attachment 4g.

**Action to be Taken**: None required.

**RAI No. 4h:** A copy of the Administrative Consent Order (ACO) between TRC and NJDEP (date unknown)

**SMC Response**: Requested document included herein as Attachment 4h.

**Action to be Taken**: None required.

**RAI No. 4i:** Annual Groundwater Monitoring Report, TRC 2006.

**SMC Response**: Requested document included herein as Attachment 4i.

**Action to be Taken**: None required.

**RAI No. 4j:** Air quality sampling/modeling data associated with site contaminants.

**SMC Response**: The only air sampling/testing that has been conducted at the site for non-radiological constituents was related to stack testing conducted on the D.115 Aluminum Master Alloy furnace operations. Such testing was performed in 1973 by Princeton Chemical Research, Inc. and again in 1991 by Air Nova. There was no air emissions modeling done as a result of those two stack sampling events. For radiological constituents, stack testing of the former AAF and Flex-Kleen baghouses, with associated air modeling, was performed in 1997. Attachment 4f contains a copy of the 1991 Emission Test Program report and the 1997 stack testing and air modeling reports for radioactive constituents.

**Action to be Taken**: None required.

**RAI No. 4k:** A summary report documenting the closure of the on site wastewater lagoons prepared in 1996. If there was no final report submitted to the New Jersey Department of Environmental Protection documenting the closure, please provide a summary of remedial method(s) for closure, contaminants present prior to closure, and a map of cleanup boundaries with resulting cleanup concentrations.

**SMC Response**: A copy of the final lagoon closure report submitted to the NJDEP is included herein as Attachment 4k.[9] In addition, soil sampling for radiological constituents conducted after remediation was complete was summarized in a 1998 facsimile transmission that is also contained in Attachment 4k.

**Action to be Taken**: None required.

**RAI No. 4l:** A copy of the "CANAL Paper".

**SMC Response**: The "CANAL Paper" was drafted to assist SMC in the marketing of ferrocolumbium slag to steel mills. The document has never been published and it has not been subjected to peer review outside of SMC and its technical consultants. A copy of "CANAL - A Synthetic Slag for Steelmaking" is included herein as Attachment 4l.

**Action to be Taken**: None required.

**RAI No. 5:** Provide the following electronic materials: Geographic Information Systems (GIS) shape files/AUTOCAD files and the drawings for all figures developed for the DP and ER will be used as base maps to permit expeditious production and reproduction of legible figures for the EIS.

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[9] *Closure Report - Surface Impoundments B6, B7 & B8 Liner and Contaminated Soil Removal and Disposal, Volumes I-III* (note that the closure of surface impoundments B1, B2, B3, B5, B11 and B12 is addressed in Appendices D and E).

**SMC Response**: A list of the AUTOCAD drawings used in the DP and ER for which electronic files are being provided is included herein as Attachment 5. The electronic versions of those files are on the CD that accompanies this communication to the USNRC.

**Action to be Taken**: None required.

**RAI No. 6:** Please provide the following traffic/transportation related information for use in the evaluation of transportation impacts.

**RAI No. 6a:** For the no action alternative (non-radiological impacts - emissions and traffic accidents) - The number of cars and trucks that enter and leave the site on a daily basis and an estimate of the number of miles traveled.

**SMC Response**: Currently the cars and trucks that enter and leave the site on a daily basis are those associated with the on-site wastewater treatment operators and SMC limited warehousing activities. It is estimated that eight (8) cars and five (5) trucks enter and leave the site daily. The miles traveled by the personal vehicles (8) are estimated to total approximately 220 miles daily (based on estimated actual commuting distances for existing employees) and miles traveled by the commercial trucks are estimated to total approximately 2000 miles (based on five long-haul vehicles per day and eight hours driving per day at an average of 50 miles per hour).

**Action to be Taken**: None required.

**RAI No. 6b:** For the alternative involving off-site shipment of materials (radiological and non-radiological impacts): - The number of cars and trucks that would enter and leave the site daily and an estimate of the number of miles traveled - The amount of radiological, non-radiological, and RCRA materials that would be transported offsite - The amount of materials that would be shipped by truck and/or rail - Physical characteristics (e.g., volume, density) of shipped materials - Radiological characteristics (radionuclide concentrations, total curies) of shipped materials - Shipping configurations (e.g., 40 foot vans, roll off containers, gondola cars) and geometries of shipping containers.

**SMC Response**: The number of cars and trucks that would enter the site on a daily basis during implementation of the off-site shipment of materials alternative will vary, based on the activities on any given day. Estimates of the numbers of construction-related vehicles required to bring materials on/off site are presented in the Environmental Report, Section 4.2.2, and Appendix K, Off-site Disposal and License Termination Tables. As indicated in Section 4.10.2, an estimated 8 to 10 decommissioning workers would also be bringing personal vehicles on-site (in addition to existing vehicle traffic noted in response to item 6a). For ease of review, this information is also summarized in Table 1 of Attachment 2b of this enclosure. Additional requested information is as follows:

- In general, vehicle miles (other than rail miles associated with slag shipment to Utah) were not estimated for the off-site disposal (License Termination) alternative.
- Amount of radiological materials transported off-site = 76,000 cubic yards.
- Amounts of non-radiological and RCRA materials to be transported off-site - not estimated (not expected to be significant).

- Amount of materials to be shipped by truck and/or rail: 76,000 cubic yards of radiological materials from Storage Yard to be shipped off-site by rail; 11,500 cubic yards of clean cover material to be shipped on-site by truck.

- Physical characteristics (e.g., volume, density) of shipped material - see Table 2 of Attachment 2b for volumes and estimated densities.

- Radiological characteristics (radionuclide concentrations, total curies) of shipped materials - as shown in Tables 17.1 and 17.7 of the DP.

- Shipping configurations (e.g., 40-foot vans, roll-off containers, gondola cars) and geometries of shipping containers - Railcar shipment estimates were based on an assumed capacity of 90 tons per railcar. The shipment of materials via railcar will be required to meet the applicable NRC and DOT requirements for the transportation of licensed material. Should gondola railcars be used (gondola railcars are typically used for the rail transport of bulk materials and EnergySolutions has a special gondola railcar rollover system for accepting materials via gondola railcar), their typical dimensions are approximately 66 feet long by nearly 9 feet wide by nearly 6 feet tall. Incoming clean soil shipments were based on the use of dump trucks with an assumed capacity of 20 cubic yards per load.

**Action to be Taken**: None required.

**RAI No. 6c:** If any transportation analyses have been performed using the RADTRAN, WebTRAGIS, or MicroShield computer codes, the following information would be useful since they will either be used or verified: - Input and output files for all RADTRAN computer runs - Input and output files for all WebTRAGIS computer runs - Input and output files for all MicroShield calculations (i.e., transport index computations for all truck and rail shipping containers and radioactivity concentrations).

**SMC Response**: Other than as described in Chapter 7 of the DP, and as summarized in a 1994 safety assessment for the transportation of slag, no computer codes were used for transportation analysis. A copy of the 1994 assessment is included herein as Attachment 6c.

**Action to be Taken**: None required.

**RAI No. 6d:** For the proposed action, please provide an estimate of both the number of cars and trucks that would enter and leave the site daily and of the number of miles traveled.

**SMC Response**: The number of cars and trucks that would enter the site on a daily basis during implementation of the long-term control alternative will also vary, based on the activities on any given day. Per the Environmental Report, Section 4.2.1 and Table 3 in Attachment 2b to this enclosure:

- For this alternative, materials for the engineered barrier would be brought on-site. Volumes of the various types of barrier materials were estimated based on the final Storage Yard configuration (see Figure 18.6 of Rev. 1A) and based on the configuration of the various layers which make up the engineered barrier, as shown in Figure 18.8 of Rev. 1A. Engineering calculations for the associated volumes of materials are provided in Attachment 2b of this enclosure.

- Estimates of the numbers of vehicles required to bring in the materials for the engineered barrier are provided in Table 3 of Attachment 2b to this enclosure.

- As specific sources of engineered barrier materials have not yet been identified, the existing ALARA analysis presented in Section 7.2.3 of Rev. 1 of the DP was based on an assumed round-trip distance of 5 miles. When the design of the engineered barrier was revised in Rev. 1A to include a stone barrier layer, potential sources of stone for the barrier layer were researched. While a local provider of sand and gravel (approximately 8 miles from the site) could provide the material, it is likely that it could come from quarries as far as approximately 65 miles from the site (e.g., Eureka Stone Quarry in Warrington, PA).

- As indicated in Section 4.10.1, an estimated 6 to 12 decommissioning workers would also be bringing personal vehicles on-site (in addition to existing vehicle traffic noted in response to item 6a).

**Action to be Taken**: None required.

**RAI No. 7:** Provide a traceable and transparent dose analysis. Clarify the derivation of doses for the suburban resident scenario. Revise the tables in Chapter 17 to include both RESRAD and MicroShield parameters. Address any discrepancies between RESRAD and MicroShield inputs. Address discrepancies between information in the tables and the discussion. Provide an electronic copy of the inputs for all analyses. This includes both deterministic and probabilistic RESRAD files and the MICROSHIELD analysis. Provide a cross-walk between all analyses described in Table 17.8 and the model runs.

**SMC Response**: See Action to be Taken, below.

**Action to be Taken**: See response to RAI No. 11, wherein a commitment is made to modify the RESRAD dose modeling to include the groundwater pathway in all applicable scenarios. As part of that effort, the relevant tables in Chapter 17 of the DP will be modified as requested, and consistency between all modeling efforts will be confirmed, and a cross-walk will be prepared. These materials will be submitted on the same schedule as that for the response to RAI No. 11.

**RAI No. 8:** Provide a basis for the assumed source term for the dose analysis involving the restricted release area of the site. The source term used in the MicroShield analyses (i.e., $1 \times 10^{-3}$ microcuries per cubic centimeter) is totally unsupported. NRC staff was unable to derive comparable activities based upon the concentrations reported in Table 17.7. In addition, not all radioisotopes expected to be present within the pile are included in the assessment. For example, Pa-231 is not included in the assessment, and a number of short-lived radioisotopes are not considered. Provide a detailed description of the derivation of the source term used in the MicroShield analysis. Justify the omission of any radioisotopes that are expected to be present within the pile.

**SMC Response**: The source term used for the MicroShield analysis was derived by multiplying the average activity presented in Table 177 of the DP by a conservatively-derived material density (i.e., 2.8 grams per cubic centimeter was used, which is the measured density for the slag only, even though the weighted mean density of the materials is lower as shown in Table 2 of Appendix K to the Environmental Report). The source term concentration for Uranium-238, for example, which was listed as being 182 picocuries per gram in Table 17.7 of the DP, was thus converted to a MicroShield input value of $5.1 \times 10^{-4}$ microcuries per cubic centimeter when that density is applied. The same approach was followed for thorium, and both were used as input to the MicroShield analysis. The resulting dose rate was exceedingly low (i.e., $10^{-13}$ millirem per hour), thus a conservatively high source term of $1x10^{-3}$ microcuries per cubic centimeter was assumed.

Radionuclides with a half-life of less than six (6) months were omitted from the MicroShield analysis in order to make the analysis consistent with the RESRAD approach. The dose conversion factors used in RESRAD take progeny contribution into account, whereas the MicroShield factors do not.

**Action to be Taken**: The source term used for the MicroShield analysis and its basis will be clearly specified in the dose modeling revision to be submitted as described in the response to RAI No. 11. Only calculated values, no matter how low, will be used. In addition, all photon-emitting radionuclides in the uranium and thorium decay series will be included in the re-analysis.

**RAI No. 9:** Identify and justify key parameters used and/or assumed within the dose analysis. Clearly describe the approach used to identify sensitive parameters. Clarify any discrepancies between parameters listed as sensitive and those not used in the analysis. Justify the assumed parameter value or range of parameter values for all sensitive parameters through either site-specific data or demonstration (not simply a statement) that the selection provides a conservative estimate of dose. Justification for key parameter values or ranges of values cannot be based upon unsupported assumptions. In general, generic and default parameter values should not be used for sensitive parameters unless the value can be shown to be either appropriate for the site or shown to be conservative based on what is known about the site. Specifically, provide a basis for the amount of time that a person is assumed to spend outside at the site, for each scenario considered. Provide a basis for the assumed fraction of the dose that an industrial worker in the planned unrestricted area will receive from the pile. Further, provide a basis for the assumed mass loading for inhalation or appropriately demonstrate that this is not a sensitive parameter.

**SMC Response**: Parameters considered to be key to the radiation dose assessment for hypothetical receptors were identified in Chapter 5 of the DP as each exposure scenario was presented. In addition, the tables in Chapter 17 list the significant parameters (i.e., those that contribute significantly to the resulting dose).

The basis for the amount of time a hypothetical receptor spends in a specific location or area of the SMC site was also given as each scenario was presented. As the assumptions for each scenario were different, so were the exposure times.

The basis for the assumed fraction of the dose that an industrial worker in the unrestricted portion of the property will receive from the Storage Yard is designed into the derivation of the derived concentration guideline level (DCGL) for the unrestricted area. Industrial workers were assumed to be present on the property during each work day, but at no time was any worker assumed to enter the restricted portion of the property.[10] To ensure conservatism, it was assumed the industrial worker would spend all of his work time immediately adjacent to the Storage Yard. It was also assumed that the industrial worker would be present at the site eight (8) hours per day, five (5) days per week for fifty (50) weeks per year, which is a typical working year for full-time employees (i.e., 2,000 hours). During each work day, a fraction of the hypothetical worker's time was assumed to be spent outdoors, although the external exposure rate from proximity to the engineered barrier is less than one (1) millirem per year. Therefore, the exposure potential from radionuclides in surface soil in the

[10] To do so would relegate that hypothetical receptor to the "trespasser" category.

unrestricted area of the property by far outweighs the potential exposure from the Storage Yard when all controls are in place.

In regard to the mass loading issue, it was assumed that the industrial worker is located indoors most of the time, and thus not exposed to the airborne dust from surface soil. The average value used for the analysis (i.e., $3x10^{-5}$ grams per cubic meter) represents average concentrations of dust found in urban locations by the USEPA after five years of measurements collected from approximately 1,800 air monitoring stations across the United States.[11] The cumulative distribution function in the RESRAD analysis was based upon the data provided by the USEPA However, it is important to note that when all controls are in place, no activities are envisioned whereby surface soils would be disturbed or intruded upon.

**Action to be Taken**: Additional discussion on the basis for exposure times used in the dose modeling will be included in the documentation to be provided in response to RAI No. 11.

**RAI No. 10:** Address issues with the treatment of parameter uncertainty within the dose analysis.
**RAI No. 10a:** Clarify the statistical distribution used to represent the area of contamination for the unrestricted release analysis. Included with this clarification, clearly state the range of values (i.e., minimum and maximum) and statistical parameters used (e.g., mean, mode, minimum, and maximum). Further, SMC needs to explain its rationale for assuming the particular distribution used in the analysis.

**SMC Response**: The area of contamination in the unrestricted portion of the property was defined in Chapter 5 of the DP as being the entirety of the property with the exception of the area that currently holds the Storage Yard. The area of the unrestricted portion was represented by a triangular distribution with a minimum value of 244,000 square meters and a maximum value of 295,000 square meters. The maximum area was established by the property boundary and includes the Storage Yard as it is currently configured. The minimum value is considered to be the most likely value, which is the area that will be designated as restricted when decommissioning is complete.

The use of the log-uniform distribution is appropriate because it provides a realistic-yet-conservative description of the lateral variability in the size of the source term. That is because it assigns the most likely size of 244,000 square meters as the minimum size and allows for the possibility (albeit with lower probability of occurrence) of larger sizes up to and including the entirety of the property. The log-uniform distribution is a variation on the uniform distribution wherein all points within an interval with a uniform distribution are equally likely. However, the loguniform distribution is useful when little is known about the distribution between the minimum and maximum values, as is the case for the Newfield site.

**Action to be Taken**: Additional clarification on statistical distribution determinations will be included in the materials submitted in response to RAI No. 11.

**RAI No. 10b:** Clarify the range of values assumed for the area of the contamination zone in the assessment for the restricted release case. Provide a basis for the selected values. Provide a rationale for the use of a loguniform distribution. Provide clarification for the need to treat the area of the contaminated zone as an uncertain parameter. Further, justify the assumed statistical distribution used in the uncertainty assessment.

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[11] NUREG-6697, "Development of Probabilistic RESRAD 6.0 and RESRAD-BUILD Computer Codes: User Guide", Appendix C, Section 4.6.

**SMC Response**: The area (size) of the consolidated contaminated zone parameter should be represented by a loguniform distribution with a minimum value of 14,535 square meters and a maximum value of 28,767 square meters. The minimum size is equal to the footprint of the engineered barrier as proposed in the DP. The use of the loguniform distribution for this parameter provides a realistic-yet-conservative description of the lateral variability in the size of the source term in that it assigns the most likely size (14,535 square meters) as the minimum. The footprint of the Storage Yard will change if the final design of the cover changes. The proposed footprint of the pile after placement of the engineered barrier (Figure 18.7 in Rev. 1a of the DP) is 246 feet by 636 feet, or 156,456 square feet (14,535 square meters).

**Action to be Taken**: The response to RAI No. 11 will include a modified RESRAD dose modeling that includes the groundwater pathway in all applicable scenarios. As part of that effort, the relevant tables in Chapter 17 of the DP will be modified, to include the current area (size) of the consolidated zone, and consistency between all modeling efforts will be confirmed. These materials will be submitted on the same schedule as that for the response to RAI No. 11.

**RAI No. 10c:** Provide an explanation as to why a contamination zone thickness of 0.15 meter (m) for the unrestricted release case is considered to be conservative. Further, provide a discussion on how the assumed maximum contamination thickness of 0.3 m compares with the depth of contamination existing at the site or expected at the site following decommissioning.

**SMC Response**: At SMC, residual contamination currently in the unrestricted area is due to surface deposition over time stemming from operations at the site, airborne emissions and laydown areas for materials handling. No underground operations took place and there is no evidence of licensable activity below the ground surface. Once decommissioning is complete, the residual activity above the applicable DCGL will be removed such that any that remains will be confined to a small surface layer of soil.

Surface soil is the only contributor to exposure pathways such as dust inhalation, ingestion and intake of resuspended particulates. The USEPA defines surface soil as the top two centimeters in the Urban Soil Lead Abatement Project (EPA-600/AP-93/001/A).[12] In addition, the USEPA in a document that references EPA-600/AP-93/001/A, states "additional sampling beyond this depth may be appropriate for surface soils under a future residential use scenario in areas where major soil disturbances can reasonably be expected as a result of landscaping, gardening, or construction activities." (EPA/540/R-95/128).[13] Furthermore, the USEPA in 40 CFR 192 set remedial action standards for

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[12] United States Environmental Protection Agency, *The Urban Soil Lead Abatement Demonstration Project. Vol I: Integrated Report Review*, EPA-600/AP93001/A, 1993.

[13] United States Environmental Protection Agency, *Soil Screening Guidance: Technical Background Document*, EPA/540/R-95/128, Office of Solid Waste and Emergency Response, Washington, DC., July 1996, Part 4.

surface soil to a depth of 15 centimeters.[14] Finally, the USNRC also acknowledges a 15-centimeter depth to distinguish surface soil from subsurface soil in NUREG-1757.[15]

From the characterization data acquired to date at the SMC site, it is likely that the thickness of the residual contamination layer will be far less than 15 centimeters. However, to ensure the conservatism of the analysis, the top 15-centimeters of soil was selected as the depth of surface soil for dose modeling purposes. It is also the surface soil sample collection depth proposed for the site-wide final status survey.

As stated in Chapter 17 of the DP, for purposes of providing the uncertainty of this parameter, a maximum depth of 0.3 meters was assumed, with the minimum depth of zero (0) centimeters about the 15-centimeter mean value described above. A triangular distribution about the mean value was assumed because in the absence of supporting distribution information, the most likely value is the apex of a triangle.[16]

**Action to be Taken**: The last paragraph of Section 8.3.2 of the DP will be modified to include the following statement: "Once decommissioning is complete and all residual activity above the applicable DCGL removed, any that remains will be confined to a small surface layer of soil."

**RAI No. 10d:** Clarify the minimum, maximum and central tendency values for the thickness of the contaminated zone for the restricted release analysis. In addition, provide an explanation as to why SMC's chosen value for the thickness of the contaminated zone is considered to be appropriate or conservative.

**SMC Response**: In Rev. 1a of the DP, the thickness of the contaminated zone was represented by a triangular distribution, with the central tendency (CT) value that was conservatively set to reflect the range of the physical measurements of the material as consolidated under the cap. However, when the cap design was modified to incorporate a rock cover, the contaminated zone thickness and area dimensions changed but the RESRAD input parameters for these values were not updated to reflect the change.

**Action to be Taken**: The response to RAI No. 11 will include a modified RESRAD dose modeling that includes the groundwater pathway in all applicable scenarios. As part of that effort, the relevant tables in Chapter 17 of the DP will be modified to capture the appropriate cap design and min/max/central tendency values for the contaminated zone. Only then will the dose modeling for all scenarios selected by the USNRC will be completed. In addition, consistency between all modeling efforts will be confirmed. These materials will be submitted on the same schedule as that for the response to RAI No. 11.

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[14] U. S. Environmental Protection Agency, Title 40, Code of Federal Regulations, Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings", Subpart B, Section 192.12.

[15] Schmidt, D. W. et al, "Consolidated Decommissioning Guidance; characterization, Survey and Determination of Radiological Criteria", NUREG-1757, Vol. 2, Rev. 1, Appendix A (pg. A-2 to A-3) and Appendix G (sect. G.2.1), September, 2006.

[16] NUREG-6697, Appendix C on parametric distribution types.

**RAI No. 10e:** Provide a discussion on how parameter correlations were handled in the uncertainty analysis. If no correlations were considered, provide a demonstration that this does not affect the results. Note that this demonstration should be made in light of how issues relate to the use of the groundwater (RAI # 11) and selection of appropriate distribution coefficients (RAI #12) are addressed. Address uncertainty with the meat-transfer factor for the recreational hunter scenario.

**SMC Response**: The migration of a radioisotope from feed to a meat product is commonly modeled through the use of a transfer coefficient. This transfer coefficient is defined as that amount of an animal's daily intake of the radionuclide(s) in question that is transferred to one kilogram of the animal meat product at equilibrium. For many elements and radionuclides, the transfer coefficient is often derived from a combination of stable element concentrations in feed and animal tissues, extrapolations from single-dose tracer experiments, and comparisons to elemental concentrations in associated or unassociated meat, or milk and feed. It does not appear feasible to develop a site-specific transfer coefficient for the Newfield site.

For the purposes of the dose modeling in Chapter 5 of the DP, the transfer coefficient was instead selected from NCRP Report No. 129, "Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site-Specific Issues," published in 1999. This internationally-recognized guidance document offers transfer coefficients that have a technical basis. For sensitivity analysis, a lognormal probability distribution was assumed, with the distribution parameters selected from NUREG-6697, with the transfer coefficient for "beef" assumed to be equivalent to that for "cattle".[17]

**Action to be Taken**: The response to RAI No. 11 will include a modified RESRAD dose modeling that includes the groundwater pathway in all applicable scenarios. As part of that effort, the relevant tables in Chapter 17 of the DP will be modified and consistency between all modeling efforts will be confirmed.

**RAI No. 11:** Provide justification for excluding the groundwater as a potential exposure pathway. Provide an acceptable basis for excluding the groundwater exposure pathway or include the groundwater pathway in a reassessment of doses.

**SMC Response**: The following justification for excluding the groundwater pathway from the dose assessments was given in Section 5.3 of the DP:

- TCLP results and distribution coefficients determined for the residual radioactivity in SMC's slag show that there is marked resistance to leaching;

- The groundwater at the SMC site contains hexavalent chromium, trichloroethylene and other constituents which, when compared to the National Primary Drinking Water standards defined at 40 CFR 141 and as referenced in Table M.12 of NUREG-1757, Vol. 2, shows that it is not a potable water supply;[18] and

[17] NUREG-6697, Appendix C, Table 6.3-1.

[18] TRC Environmental Corporation, "Groundwater Potability Analysis - Shieldalloy Metallurgical Corporation, Newfield, New Jersey", TRC Project No. 26770-0100-00000, June, 2006.

- It is unreasonable to assume that future industrial operations on the Newfield site would drill and maintain their own on-site drinking water well when a source of municipal water is readily available.

An additional basis for excluding the groundwater pathway from the dose assessments is that nitrate, a contaminant associated with local agricultural land use and not attributable to the SMC facility, has also been detected at levels that are above primary drinking water standards in ground water samples collected from both the shallow and deep Cohansey Sands. As shown in Table 2 of Attachment C to the Supplement to the DP, nitrate was detected at levels as high as 24.3 parts per million (ppm) in the Upper Cohansey sands and 12.8 ppm in the Lower Cohansey sand in December 1990/April 1991 ground water sampling, at levels as high as 17 ppm in the Upper Cohansey sands in July 2002 and at levels as high as 34.7 ppm in the Upper Cohansey sands and 10.2 ppm in the Lower Cohansey sands in April 2004. The federal Maximum Contaminant Level (MCL) for nitrate is 10 ppm.

The U. S. Geological Survey (USGS) has acknowledged the presence of elevated levels of nitrate within agricultural areas of the surficial Kirkwood-Cohansey aquifer.[19] While the impacts documented by the USGS at this time are mainly to recently recharged (i.e., shallow) ground water, the USGS also notes that the nitrate may migrate deeper into the aquifer system and affect the deeper ground water currently used for public water supply systems in the area.

For purposes of potential shallow ground water use by a hypothetical resident that wishes to consume water from a well located adjacent to the SMC Storage Yard, the current presence of nitrate at levels exceeding its associated MCL in the ground water would render that water source non-potable. The anticipated continued agricultural use of the surrounding area will likely result in increasing nitrate levels at greater depths in the future, which could also prohibit the use of deeper groundwater as a source of potable water.

It is important to note that SMC presented the impacts of including the groundwater pathway for the most restrictive exposure scenario in the groundwater modeling memo shown in Appendix D of the Supplement to the DP. In that analysis, the dispersivity values utilized in the analysis were estimated by assuming a 300-foot long plume length and following accepted guidelines for dispersivity estimates. Accordingly, the longitudinal dispersivity is 10% of the plume length pursuant to Pickens and Grisak, and the horizontal transverse and vertical transverse dispersivities are 10% and 1%, respectively, of the longitudinal dispersivity as shown in Gelhar, 1991.[20,21] With respect to the footnoted concern in the RAI regarding the impact of the assumed longitudinal dispersivity value on estimating peak concentration, the sensitivity analysis summarized in Table 3 of the groundwater modeling memo included an evaluation of variations in the dispersivity value on the calculated maximum dose by increases of 100% and decreases of 50% in the sensitivity analysis. In general, the dispersivity values did not have as significant an impact on the resulting radiation dose as those

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[19] Paul E. Stackelberg, Jessica A. Hopple, and Leon J. Kauffman, USGS Water-Resources Investigations Report 97-4241, *Occurrences of Nitrate, Pesticides, and Volatile Organic Compounds in the Kirkwood-Cohansey Aquifer System, Southern New Jersey*, 1997.

[20] Pickens, J. F., and G. E. Grisak, 1981, *Modeling of scale-dependent dispersion in hydrogeologic systems*, Water Resources Res., Vol. 17(6): 1701-1711.

[21] Gelhar, L.W., C. Welty, and K.R. Rehfeldt, 1992. A critical review of data on field-scale dispersion in aquifers. Water Resources Research, v. 28, p. 1995-1974.

of other parameters.[22] Furthermore, the contribution of the groundwater pathway to the total dose was trivial, and the total dose remained below 10% of the applicable decommissioning criteria.

For these reasons, the shallow ground water should not be considered a potential potable source of water. Furthermore, even if the potability issue is ignored and residential ingestion of shallow ground water is considered, the analysis presented in Appendix D of the Supplement to the DP, shows that the resulting doses are well below the allowable limits.

With respect to the distribution coefficients used in the ground water analysis, these are discussed further in the response to RAI No. 12.

**Action to be Taken**: Even though there is adequate justification for excluding the groundwater pathway from the dose assessments, SMC will reassess the dose potential for all applicable scenarios with the groundwater pathway enabled. For this effort, the RESRAD computer code, with reasonably conservative input parameters, will be used to predict the transport of radioactivity from the contaminated zone to the point where it intercepts groundwater. From there, the computer code MODFLOW will be used to predict the transport to the hypothetical receptor point (i.e., a well located 100 feet downgradient or to the southwest of the Storage Yard). In addition, the relevant tables in Chapter 17 of the DP will be modified to include the additional new input parameters, the text in Chapter 5 of the DP will be revised to incorporate additional justifications and information, as necessary, consistency between all modeling efforts will be confirmed, and a cross-walk will be prepared.

SMC estimates that the analysis using the above described methodology can be completed and provided to the USNRC within 10 weeks after initiation. However, because the level of effort and time commitment associated with performing the analyses are significant, SMC proposes a conference call with applicable USNRC and contractor personnel to discuss the approach outlined above and any additional dose modeling-related RAIs that may be forthcoming before initiating the analyses.

**RAI No. 12:** Provide justification for the application of derived distribution coefficients ($K_d$s). Provide justification for extrapolating $K_d$ values derived for the slag to other materials within the slag pile. Alternatively, establish a range of $K_d$ values more appropriate for these materials. Further, if the ground-water exposure pathway cannot be appropriately eliminated (see RAI #11), provide justification for the range of $K_d$ values assumed for the unsaturated and saturated zones for both the unrestricted and restricted use cases. For sensitive parameters, generic or default parameter values should not be used unless they can be shown to be either appropriate or shown to be conservative based upon what is known about the site.

**SMC Response**: SMC will provide at a later date an analysis that utilizes a range of $K_d$ values.

**Action to be Taken**: The site-specific $K_d$ values acquired to date will be used for the contaminated zone only. The $K_d$'s for the unsaturated and saturated zones will be selected from published data that are representative of the native subsurface soils. The findings from the repeat dose modeling will be provided as described in the response to RAI No. 11.

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[22] A 100% increase in the assumed dispersivity values resulted in a maximum dose of 5.23 millirem per year, as compared to the 3.40 millirem per year estimated in the original analysis.

**RAI No. 13:** Provide additional support for assumptions made with respect to the maintenance worker scenario. SMC needs to discuss the amount (if any) of maintenance activities that have taken place on the cover at the Cambridge, Ohio facility. The assumed outdoor time fraction for the maintenance worker scenario should be based on an appropriate consideration of the worker conducting both routine inspections and non-routine maintenance activities at the site. SMC needs to provide an acceptable basis for the assumed inhalation rate for the worker assuming the individual is involved in both inspection and maintenance activities.

**SMC Response**: The slag pile caps in place at SMC's Cambridge, Ohio site are of a slightly different design than that proposed for Newfield. They are solid waste caps with a design that met the criteria of the Ohio EPA. Because these caps are vegetation-covered, they are more aesthetically pleasing but more maintenance-intensive than the rock-covered cap that the USNRC recommended for the Newfield site. The following is a brief description of the maintenance/surveillance activities that have taken place at Cambridge for both of the caps. Other than these, no other activities take place at these locations.

- East Slag Pile - The East Slag Pile at Cambridge, capped in June of 2006, has undergone no maintenance to date. Quarterly inspections of the 2.5-acre cap consume 10 minutes of a single person's time to traverse the cap surface, for a total of 40 minutes per year. It is envisaged the cap will be mown annually, which is estimated to consume two hours of a single person's time using a tractor- towed mower.

- West Slag Pile - The West Slag Pile at Cambridge, capped in the summer of 2004, covers almost 10 acres. Erosion repairs were made between capping and vegetation growth to address the result of poor weather at that time. In addition, the cap has been mown annually and inspected quarterly. Erosion repairs and mowing consumed two (2) eight-hour days for two people in 2005 and 2006. No further erosion repairs are envisaged for 2007. Annual mowing requires four hours for a single person on a tractor-towed mower. Quarterly inspections consume 30 minutes for one person, for a total of two hours per year.

Mowing and erosion repairs should not be an issue at the Newfield site once decommissioning is complete due to the presence of the rock cover. Most of the maintenance effort will be dedicated to inspection, with fewer (if any) erosion repairs as compared to that for the Cambridge site to date. Currently inspections/mowing of the East Slag Pile (2.5 acres) are estimated to consume less than three (3) hours per year while inspections/mowing of the West Slag Pile (approximately 10 acres) are estimated to consume approximately 16 hours per year. Table 17.3.6 of the DP assumes 32 hours per year for surveillance/maintenance of the rock-covered Newfield cap, which is significantly smaller in size (approximately 3.5 acres) than the West Slag Pile cap. Therefore, the exposure assumptions for the Maintenance Worker Scenario in Chapter 5 of the DP are conservative.

**Action to be Taken**: None required.

**RAI No. 14:** Provide justification for the assumption of very limited excavation into the pile. Evaluate the potential doses to hypothetical receptors assuming excavation into the pile by more mechanized excavation methods. Describe how the final disposition of material within the pile will compare against the piles at the Cambridge, Ohio site. For example, describe where the soil, baghouse dust, and demolition concrete will be placed within the pile in relationship to the slag. Further, discuss why this placement is expected to minimize future excavation within the pile.

**SMC Response**: In Section 5.3.3.3 of the DP, SMC stated that slag excavation scenarios are unrealistic because the material under the engineered barrier has no monetary value, removing the barrier material using hand excavating equipment would be difficult, and if such a removal were to occur, the excavator would be likely to excavate a top rather than a side wall of the engineered barrier so that the exposure potential for hypothetical occupants/residents next to the restricted area would not change.

Section 5.3.3.3 of the DP also states that a hypothetical excavator would remove only one (1) square meter of the cover, including all its layers, using manual excavation methods. Realistically, a footprint of those dimensions would provide enough space for the excavator to climb down from the surface of the cover and onto the layer of exposed slag and confirm that further excavation with hand-held tools would be fruitless.

These same justifications and more would apply to excavation by mechanized means. It is not realistic to think anyone would go to the effort and expense of bringing an excavator to the site without first determining whether there was something within the engineered barrier that was worthy of excavation. However, even if such an activity were to take place, it is reasonable to assume that an excavator shovel has a diameter of less than one (1) meter. Therefore, after removing cover material with a footprint of about one (1) meter, the excavator operator would quickly discover that further penetration into the pile would be fruitless, meaning the excavation diameter would be on the order of one (1) meter.

The final disposition of the contents of the Storage Yard is described in Section 8.3 of the DP. As stated therein, the final design and specifications for the engineered barrier, along with the placement of the contents of the Storage Yard, will be developed in accordance with USNRC requirements, as summarized in Title 10 Code of Federal Regulations, Section 61.52, and submitted to the USNRC for approval along with the other final plans and specifications called for in the DP once the DP has been approved. As described in Section 8.3.1 of the DP, the contents of the Storage Yard will be consolidated into a smaller footprint. Due to the large size and rough texture of the slag buttons, the finer-grained slag, soils and baghouse dust will be used to fill the larger void spaces they produce. The final decisions as to the location of the various materials currently in the Storage Yard will be made by SMC's decommissioning contractor based upon field conditions and final engineered barrier design considerations, as approved by the USNRC.

**Action to be Taken**: An excavation scenario that includes mechanical removal of the engineered barrier as described above will be included in the dose modeling for the DP, the result of which will be submitted on the same schedule as that for the response to RAI No. 11.

# LIST OF ATTACHMENTS

ATTACHMENT 4f

- 1991 Emissions Testing Report
- 1997 Stack Testing and Emissions Modeling Reports
- Atmospheric Modeling Report

ATTACHMENT 4g

- Groundwater Focused Feasibility Study

ATTACHMENT 4h

- TRC/SMC/NJDEP Administrative Consent Order

ATTACHMENT 4i

- 2006 Annual Groundwater Monitoring Report

ATTACHMENT 4k

- Lagoon Closure Report
- Radiological Analysis of Former Lagoon Area
- WRS Test Results for Former Lagoon Area

ATTACHMENT 4l

- CANAL Paper

ATTACHMENT 5

- Listing of AUTOCAD Drawings to be Provided

ATTACHMENT 6c

- 1994 Safety Analysis Report on Slag Transport