May 16, 2013

Mr. Lance Hauer
Remedial Project Manager
Corporate Environmental Programs
General Electric Company
640 Freedom Business Center
King of Prussia, PA 19406

SUBJECT: REVIEW OF UNITED NUCLEAR CORPORATION/GENERAL ELECTRIC DOCUMENTS SUBMITTED IN NOVEMBER AND DECEMBER 2012 RELATED TO THE UNC CHURCH ROCK – NORTHEAST CHURCH ROCK NON-TIME CRITICAL REMOVAL ACTION

Dear Mr. Hauer:

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of documents submitted in November and December 2012, by United Nuclear Corporation (UNC), a subsidiary of General Electric (GE), in support of the UNC Church Rock Northeast Church Rock Non Time Critical Removal Action. The documents reviewed included: (1) Memorandum prepared by Dr. Stephen Dwyer dated December 14, 2012, entitled "Reply to NRC Comments on report - Evaluation of Consolidation and Water Storage Capacity Related to Placement of Mine Material on the Existing UNC Mill Site Tailings Impoundment"; (2) Memorandum prepared by Dr. Stephen Dwyer dated December 14, 2012, entitled "Reply to DOE Comments on report - Evaluation of Consolidation and Water Storage Capacity Related to Placement of Mine Material on the Existing UNC Mill Site Tailings Impoundment"; (3) Memorandum prepared by Dr. Stephen Dwyer dated December 14, 2012, entitled "Proposed Additional Sensitivity Analysis: Evaluation of Consolidation and Water Storage Capacity Related to Placement of Mine Material on the Existing United Nuclear Corporation (UNC) Mill Site Tailings Impoundment; and (4) "Supplemental Data Needs Evaluation and Work Plans for Removal Design Northeast Church Rock Mine Site Removal Action, November 9, 2012" [Agencywide Document Access and Management System (ADAMs) Accession Numbers ML12349A112; ML12349A111; ML13018A099; ML13018A108, ML13018A114, and ML13018A115].

Based on the NRC staff review, concerns were identified that require the submittal of additional information. Please note that the NRC did not proffer any comments on the UNC/GE reply to U.S. Department of Energy (DOE) comments on the Consolidation report. In addition, please take note that the NRC is potentially deferring many of its comments related to the Consolidation report until after the site evaluation and characterization activities are completed and until the next revision of this report. The NRC's concerns for all other aforementioned documents are outlined in Enclosures 1, 2 and 3 of this letter.

Given that UNC/GE has expressed an interest in expediting the schedule for the submittal of the license amendment request to transfer mine waste from the Northeast Church Rock Mine to the UNC Church Rock Mill Site, it is strongly recommended that an in-situ sampling plan for the

existing tailings impoundment, accompanied by a health and safety plan is developed for review. This approach the NRC believes would address most of our concerns and guide the proposed additional sensitivity analyses.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of the NRC's ADAMS. ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have comments or questions regarding this letter, please contact me at 301-415-7741 or via email at Yolande.Norman@nrc.gov.

Sincerely,

/RA/

Yolande Norman, Project Manager
Special Projects Branch
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Docket No.: 40-8907
License No.: SUA-1475

Enclosures:
1. NRC Staff Replies to May 2011 Report
2. NRC Staff Comments to December 2012 Report
3. NRC Staff Comments to November 2012 Report

cc: UNC Church Rock Distribution List

existing tailings impoundment, accompanied by a health and safety plan is developed for review. This approach the NRC believes would address most of our concerns and guide the proposed additional sensitivity analyses.

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/RA/
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U.S. Nuclear Regulatory Commission Staff Replies to United Nuclear Corporation Responses to Concerns on the report entitled "Evaluation of Consolidation and Water Storage Capacity Related to Placement of Mine Material on the Existing UNC Mill Site Tailings Impoundment, May 2011"

NRC Overall Comment :

No response was provided to the U.S. Nuclear Regulatory Commission (NRC) original comment. Since this is not adequate, the NRC staff has expanded on the original comment by providing further detailed information.

Given that the original design of the existing tailings impoundment did not contemplate the transfer of mine waste and its placement above it, consider conducting in-situ sampling of current conditions existing within the tailings impoundment. The NRC staff considers the existing tailings impoundment as the foundation for the mine waste. Therefore, it is important to verify current field conditions and geotechnical properties of the underlying material.

The following provides a summary of potentially applicable regulations, criteria, and guidance used during the NRC review process to determine if adequate characterization has been performed for the foundation and subsurface materials of the tailings disposal area. The following is not intended to be exhaustive. An in-depth review of the regulations and guidance should be performed to determine appropriate sampling, characterization, and design requirements. Due to the large uncertainty, which currently exists within the tailings impoundment regarding geotechnical properties and current conditions, the NRC staff is concerned that any future license amendment request will not provide adequate characterization to ensure compliance with the regulations contained in Appendix A to 10 CFR Part 40.

The NRC staff understands the unique design challenge that the mine waste presents if it is incorporated into the existing tailings impoundment at the United Nuclear Corporation (UNC) Church Rock Mill site. Of concern to the NRC staff is the placement of a liner below the mine waste or the low permeability material (i.e., radon barrier) remaining in place over the existing tailings impoundment. The NRC staff believes that this scenario could allow excess moisture to accumulate and may cause gradient controlled flow toward the side slopes. The gradient controlled flow has the potential to discharge at seeps on the side slopes. Saturated conditions at the side slopes may affect the integrity of the disposal impoundment and impact the long-term performance objective. Therefore, it is incumbent on UNC/GE to demonstrate that the proposed disposal will not compromise the reclamation of the tailings impoundment by demonstrating compliance with the reclamation and closure criteria of Appendix A of 10 CFR Part 40 while contemplating environmental and safety considerations.

In accordance with Criterion 5G(2) of Appendix A to 10 CFR Part 40, the licensee shall supply information to support the proposed design of the disposal system concerning the following: The characteristics of the *underlying soil* and geologic formations particularly as they will control transport of contaminants and solutions. This includes detailed information concerning the

extent, thickness, uniformity, shape, and orientation of underlying strata. Hydraulic gradient and conductivities of the various formations must be determined. This information must be gathered from borings and field survey methods taken within the proposed impoundment area and in surrounding areas where contaminants might migrate to groundwater. The information gathered on boreholes must include both geologic and geophysical logs in sufficient number and degree of sophistication to allow determining significant discontinuities, fractures, and channeled deposits of high hydraulic conductivity. If field survey methods are used, they should be in addition to and calibrated with borehole logging. Hydrologic parameters, such as permeability, may not be determined on the basis of laboratory analysis of samples alone; a sufficient amount of field testing (e.g., pump tests) must be conducted to assure actual field properties are adequately understood. Testing must be conducted to allow estimating chemi-sorption attenuation properties of underlying soil and rock.

In the Standard Review Plan for the Review of Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act of 1978, NUREG 1620, Rev. 1 provides further guidance in Chapter 2.0, Geotechnical Stability. Chapter 2.0 establishes procedures for NRC staff to conduct and document the review of geotechnical stability aspects of reclamation plans for mill tailings impoundments, amendments to the approved reclamation plans, or license termination.

Section 2.1.2 directs the reviewer to examine the site stratigraphy and evaluation of *engineering properties of the underlying materials* to determine if appropriate methods were properly used to characterize the materials. Specific descriptive information is listed within Chapter 2.0 of NUREG 1620 to determine the adequacy of the subsurface characterization and for evaluating the performance of the disposal system. All eight of the items listed in this section are of importance and pertain to characterizing the underlying materials: (i) Site stratigraphy based on borings and other investigations; (ii) Seismologic information to determine geotechnical stability; (iii) Stratigraphy of material designated for stabilization in the tailings disposal cell; (iv) In-situ testing programs of underlying material for determination of engineering properties; (v) Sampling programs to obtain laboratory samples to determine engineering properties; (vi) Laboratory testing to determine engineering properties; (vii) Physical and engineering properties of the underlying materials; and (viii) Records of historical groundwater fluctuation. .

Given the complexity of the existing UNC Church Rock Mill tailings impoundment and the proposed action to collocate the mine waste within this existing impoundment, it is incumbent upon the licensee to describe, in sufficient details, the information on the geotechnical characteristics that will be part of the input data needed for the analysis and design of the enhanced tailings impoundment. Therefore, during the development of the in-situ sampling program, the licensee should be aware that part of the NRC's requirement for acceptance of the information presented on the geotechnical characteristics of the underlying material is a detailed and quantitative discussion on the aforementioned eight items. This information presented should be sufficient to demonstrate compliance with the regulatory criteria in Appendix A to 10 CFR Part 40 such as site features that contribute to waste isolation – Criterion 1; the primary option for disposal to avoid the proliferation of small waste disposal sites – Criterion 3; facility location with respect to an active fault to ensure that the impoundment could withstand a credible earthquake event – Criterion 4(e); permeability characteristics of the site – Criterion

5(G)2; and reasonable assurances of control of radiological hazards effective for 1000 years to the extent reasonably achievable, for at least 200 years –Criterion 6(1) .

The NRC staff will use professional judgment when evaluating the geotechnical characteristics to determine compliance with the regulatory criteria, in addition to, verifying that samples were properly taken and tested in sufficient number to define the critical soil parameters for the underlying material. In the case of tailings material for license amendment reviews, the evaluations of the materials strength and settlement characteristics should be presented in detail. Parameter values should be presented to allow NRC staff the ability to evaluate the underlying materials and should include the following: (i) compressibility and rate of consolidation, (ii) shear strength and loss of shear strength resulting from strain-softening for sensitive soils, (iii) liquefaction potential, (iv) permeability, (v) dispersion characterization, (vi) swelling and shrinkage, and (vii) long-term moisture content and cover cracking.

Please note that field investigations and laboratory testing procedures should be conducted using appropriate standards published by the American Society for Testing and Materials (ASTM). Applicable references to ASTM standards for geotechnical sampling and characterization are provided in NUREG 1620. Review of Regulatory Guide (RG) 1.132 may provide guidance for performing site investigations for foundations and RG 1.138 provides guidance laboratory investigations of soils for engineering analysis.

Section 2.2.3 of NUREG 1620 provides a list of slope stability criteria that include further detail of uncertainties and variability, the boundaries and parameters within and *beneath* the slope (2.2.3(2)(b)), and an analysis that takes into account the failure surfaces within the slopes, including through the *foundation* (2.2.3(2)(c)).

Section 2.3 discusses settlement criteria used to estimate deformation of subsurface materials and uranium mill tailings. The NRC review will give particular attention to the identification and thickness of compressible soil layers within the tailings and in the foundation. Additional criteria in this section should be considered since a majority of the cover related problems may be influenced by inadequate characterization and analysis of the subsurface and/or foundation.

NRC Comment 1:

Response to comment is adequate. Additional information pertaining to this comment is as follows:

- No specific data was presented on how the three processes are specifically responsible for having removed the excess free water within the existing tailings. A general hypothesis was discussed, but no specific data demonstrating their effectiveness.

NRC Comment 2:

Response to comment is not adequate due to the following:

2a) The response did not state how the Terzaghi assumptions are being fulfilled, or why it is not significant if one or more of these assumptions are not being fulfilled. However, the response did state that: "…the assumptions have been shown to be valid in similar applications…" in reference to Terzaghi's theory of consolidation. NRC staff has long expressed interest in such documents and is interested in reviewing documentations pertaining to these similar applications which demonstrate that Terzaghi's theory (for saturated soils) has been successfully applied to partially saturated, heterogeneous/ anisotropic soils to predict consolidation. This information is necessary to demonstrate the conservatism of the simulations.

2b) Section 3.1 in the 2011 Consolidation report stated that the first stage of consolidation is the "Immediate" stage. No further discussion was presented in the report on this stage. Bowles (1996)[1] states that immediate settlement analyses are used for all fine-grained soils including silts and clays with a degree of saturation of 90% or less, and for all coarse-grained soils, while consolidation settlement analyses are used for all saturated, or nearly saturated, fine-grained soils. Is the impact from immediate settle not significant in comparison to the Terzaghi's primary and secondary consolidation?

2c) In addition, the documents referenced in this report and other relevant reports should be placed into your SharePoint site so that it is accessible to the reviewer to determine if the documents referenced, supports the applicability of the current UNSAT-H model to simulate processes related to a future mill site repository.

<u>References from the report entitled "Evaluation of Consolidation and Water Storage Capacity Related to Placement of Mine Material on the Existing UNC Mill Site Tailings Impoundment, May 2011" [ADAMs Accession No. ML1222A159] [pp.16-17]:</u>

- Canonie Environmental. 1987. Geohydrology Report, Church Rock Site, UNC Mining and Milling, Gallup, NM. May 1987.
- Canonie Environmental. 1987. North Cell Final Reclamation, As-Built Report. November 1987.
- Canonie Environmental. 1987. Reclamation Plan for Alluvium, table 4.
- Dwyer, SF. 2003. Water Balance Measurements and Computer Simulations of Landfill Covers. PhD Dissertation, Department of Civil Engineering, University of New Mexico.
- Fayer, M. J., and T. L. Jones. 1990. UNSAT-H version 2.0: Unsaturated soil water and heat flow model. PNL-6779, Pacific Northwest Laboratory, Richland, WA.
- Fayer, M.J. 2000. UNSAT-H Version 3.0: Unsaturated Soil Water and Heat Flow Model, Theory, User Manual, and Examples. Pacific Northwest Laboratory, Richland, WA.
- Rawls, W. J., D. L. Brakensiek, and K. E. Saxton. 1982. Estimating soil water properties. Transactions, ASAE, 25(5): 1316-1320 and 1328.
- Ritchie, J.T., and E. Burnett . 1971. Dryland evaporative flux in a semihumid climate, 2, plant influences. Agron. J. 63: 56-62.
- Samani, Z. A. and M.Pessarakli, 1986: Estimating Potential Crop Evapotranspiration with Minimum Data in Arizona, Transactions of the ASAE Vol. 29, No. 2, pp. 522-524.

[1] Reference: Bowles, J.E. 1996 (5th ed.), Foundation Analysis and Design. McGraw-Hill Companies, Inc., New York, NY.

- Sergeant, Hauskins , and Beckwith. 1976. Geotechnical Investigation Report, Tailings Dam and Ponds. Church Rock Uranium Mill, United Nuclear Corporation, Church Rock, NM. May 1976.

References from the January 2004 US Filter report entitled "Rationale Field Investigation Work Plan to Evaluate Recharge and Potential Cell Sourcing to the Zone 3 Plume, Church Rock, Gallup NM [ADAMs Accession No. ML0403004040] [pp.15-17]:

- Sergent, Hauskins & Beckwith, October 1974, Preliminary Geotechnical Investigation Report, Tailings Dam, Church Rock Uranium Mill, United Nuclear Corporation, Church Rock, New Mexico. (amended by frontice piece letter in January 1975)
- Sergent, Hauskins & Beckwith, July 1976, Seismic Refraction Investigations Report, Tailings Dam and Ponds, Church Rock Uranium Mill, United Nuclear Corporation, Church Rock, New Mexico.
- Sergent, Hauskins & Beckwith, July 1978, Geotechnical and Design Development Investigation Report, Tailings Dam and Ponds, Church Rock Uranium Mill, United Nuclear Corporation, Church Rock, New Mexico.
- Sergent, Hauskins & Beckwith, October 1978, Engineering Analysis Report, Tailings Disposal Systems Analysis, Church Rock Uranium Mill, United Nuclear Corporation, Church Rock, New Mexico.
- Sergent, Hauskins & Beckwith, July 1979, Geotechnical Investigation Report, Stability and Integrity Assessment, Church Rock Uranium Mill, United Nuclear

NRC Comment 3:

Response to comment is adequate.

NRC Comment 4:

Response to comment is adequate.

NRC Comment 5:

Response to comment is not adequate due to the following:

- In the response, Dr. Dwyer describes why the Van Genuchten model is applicable to define the moisture characteristic curve and described why the Brooks and Corey method is not adequate. Another model commonly used is the Fredlund-Xing Model. Was this model considered for this project? In addition, NRC staff prefers moisture content data to be obtained during the site evaluation and work plan that is expanded to include an in-situ sampling program.

NRC Comment 6:

Response to comment is adequate.

NRC Comment 7:

Response to comment is adequate.

NRC Comment 8:

Response to comment is adequate.

NRC Comment 9:

Response to comment is adequate. Additional information pertaining to this comment is as follows:

- During calibration, parameter values are found that enable the numerical model to simulate field-measured conditions. The purpose of calibration is to establish that the model can reproduce the field-measured data.

- The calibration exercise for this model should be documented in detail in the next report.

NRC Comment 10:

Response to comment is adequate. Additional information pertaining to this comment is as follows:

- Sources of uncertainty inherent to waste disposal in the near surface include, but are not limited to, incomplete knowledge of the natural system, its evolution, and interactions with the engineered system. An uncertainty analysis is a method of formally assessing, reducing or managing, and documenting the inherent uncertainties of a system. The uncertainties can include model uncertainty (which spans conceptual model uncertainty and mathematical model uncertainty) and parameter uncertainty (i.e., uncertainty in values used in the numerical model). In addition, it should be demonstrated that the chosen code or software is appropriate for the conceptual and mathematical models selected/needed and can solve the associated mathematical equations. This differs from a sensitivity analysis which examines how the behavior of a system varies with changes to the values of the governing parameters.

NRC Comment 11:

Response to comment is adequate. Additional information pertaining to this comment is as follows:

- Please note that the NRC's original comment was referring to a water budget for the current UNSAT-H model. What are the flow rates for lateral drainage, deeper

drainage, water storage change, infiltration, surface runoff, etc. for the current model runs?

NRC Comment 12:

Response to comment is adequate.

NRC Comment 13:

Response to comment is adequate.

NRC Comment 14:

Response to comment is adequate. Additional information pertaining to this comment is as follows:

- NRC staff prefers that hydraulic conductivity data is obtained during the site evaluation and work plan which should be expanded to include an in-situ sampling program.

NRC Comment 15:

Response to comment is adequate.

NRC Comment 16:

Response to comment is adequate.

NRC Comment 17:

Response to comment is adequate.

NRC Comment 18:

Response to comment is adequate.

NRC Comment 19:

Response to comment is not adequate due to the following:

- Staff was not able to find the information in the referenced document. Please provide the documents and page numbers where the referenced values can be found.

NRC Comment 20:

Response to comment is adequate.

NRC Comment 21:

Response to comment is not adequate due to the following:

- Please provide the documents and page numbers where the referenced values can be found.

NRC Comment 22:

Response to comment is adequate.

NRC Comment 23:

Response to comment is adequate.

NRC Comment 24:

Response to comment is adequate.

NRC Comment 25:

Response to comment is adequate.

NRC Comment 26:

Response to comment is adequate.

NRC Comment 27:

Response to comment is adequate.

NRC Comment 28:

Response to comment is adequate.

U.S. Nuclear Regulatory Commission Comments on the Report entitled "Proposed Additional Sensitivity Analysis: Evaluation of Consolidation and Water Storage Capacity Related to Placement of Mine Material on the Existing UNC Mill Site Tailings Impoundment, Northeast Church Rock Mine, Gallup, NM, December 14, 2012"

General Comment

The U.S. Nuclear Regulatory Commission (NRC) staff opinion is that sensitivity analyses should not be performed until site evaluation and characterization activities are completed and the responses to the NRC Overall Comment and NRC Comment 2 in Enclosure 1 are addressed adequately.

U.S. Nuclear Regulatory Commission Comments on the report entitled "Supplemental Data Needs Evaluation and Work Plans for Removal Design, Northeast Church Rock Mine Site Removal Action, November 9, 2012"

Areas of Potential Concern:

The U.S. Nuclear Regulatory Commission (NRC) staff prefers the collection of sufficient data to reduce uncertainty and to obtain information associated with the following potential concerns:

NRC Comment 1:

Differential settlement

Differential settlement could cause damage to components of the repository and the new and old covers. The foundation of the to-be-built repository will be the existing tailings impoundment. One of the current expectations includes the assumption that the tailings are homogenous. If, however, that assumption is not true, differential settlement may occur.

NRC Comment 2:

Damage due to seismic activity

Seismic activity could cause damage to components of the repository and the new and old covers. The damage may be visible to inspection or hidden. Due to the height of the planned repository with mine waste collocated above the tailings impoundment, strong seismic activity could cause partial collapse of a hypothetical repository (i.e. tailings disposal area) with a poorly thought-out design above an unstable foundation.

NRC Comment 3:

Breaks/cracks outside repository perimeter

Weight from the addition of mine waste within the tailings impoundment may cause future breaks and cracks in components (e.g., compacted clay liner) of the existing impoundment around the perimeter of the repository (i.e. tailings disposal area).

NRC Comment 4:

Repository loading discharges contaminated water

Tailings are compressed, and pore water from the tailings seep out.

Additional discharging of contaminated water would require further corrective actions if concentrations were to exceed applicable groundwater protection standards. Environmental

impacts to the groundwater could be problematic if consolidation of the existing tailing created significant discharge conditions due to inadequate knowledge of the moisture conditions.

NRC Comment 5:

The occurrence of drainage, if a liner or low permeability layer is placed beneath the mine waste, may potentially create a perched condition within the mine waste, above the existing tailings impoundment. Failure of the side-slopes or slope instability could result due to pore water pressure increase. The transport and placement of the mine waste prior to final cover completion may allow a significant amount of water to enter into the impoundment (Note this may also include the application of water for dust suppression).

Additional "Design Elements" to be Included in Table 3-1:

NRC Comment 6:

Design element labeled "Characterization of Coarse Tailings"

Geotechnical testing to obtain in-situ properties such as density, porosity, field capacity, hydraulic conductivity, moisture content, standard Proctor compaction, moisture retention characteristics, particle size, and specific gravity should be considered as part of an in-situ sampling program. NUREG-1620 may need to be added to the "Performance Criterion Reference or Guidance." More detailed information is presented in NRC staff's reply to the response to "NRC Overall Comment" in Enclosure 1.

NRC Comment 7:

Design element labeled "Characterization of Fine Tailings."

Geotechnical testing to obtain in-situ properties such as density, porosity, field capacity, hydraulic conductivity, moisture content, standard Proctor compaction, moisture retention characteristics, particle size, and specific gravity should be considered as part of an in-situ sampling program. NUREG-1620 may need to be added to the "Performance Criterion Reference or Guidance." More detailed information is presented in NRC staff's reply to the response to "NRC Overall Comment" in Enclosure 1.

NRC Comment 8:

Design element labeled "Characterization of the Alluvium Under the Tailing."

Geotechnical testing to obtain in-situ properties such as density, porosity, field capacity, hydraulic conductivity, moisture content, moisture retention characteristics, and particle size should be considered as part of an in-situ sampling program. NUREG-1620 may need to be added to the "Performance Criterion Reference or Guidance." More detailed information is presented in NRC staff's reply to the response to "NRC Overall Comment" in Enclosure 1.

NRC Comment 9:

Design element labeled "Characterization of the Zone 3 sandstone under the tailing."

Geotechnical testing to obtain in-situ properties such as density, porosity, field capacity, hydraulic conductivity, moisture content, moisture retention characteristics, and particle size should be considered as part of an in-situ sampling program. NUREG-1620 may need to be added to the "Performance Criterion Reference or Guidance." More detailed information is presented in NRC staff's reply to the response to "NRC Overall Comment" in Enclosure 1.

NRC Comment 10:

Design element dealing with discovering various types and quantities of unexpected material.

Since no documentation exists as to what was disposed within the mine spoils, it is possible, despite the assumption of uranium being co-located and proportional to with radium, that unexpected hazardous materials may be discovered during the excavation of the mine spoils.

NRC Comment 11:

Design element labeled "Requirement for dose criteria."

Criterion 6(6) of Appendix A to 10 CFR Part 40 requires that byproduct material containing concentrations of radionuclides other than radium in soil must not result in a total effective dose equivalent (TEDE) exceeding the dose from cleanup of radium contaminated soil to the above standard (benchmark dose), and must be at levels which are as low as is reasonably achievable. A calculation of the potential peak annual TEDE within 1000 years to the average member of the critical group that would result from applying the radium standard (not including radon) on the site should be provided.

Specific Comments on Table 3.1

NRC Comment 12:

Design element labeled "Maintenance of cover over tailings and construction of new cover over mine spoils."

Please provide additional information about this design element. NUREG-1620 and NUREG-1623 may need to be added to the "Performance Criterion Guidance." This is one of the most critical elements of the design.

NRC Comment 13:

Four design elements in Table 3-1 include:

- Consolidation of mine spoils onto tailings facility
- Placement of contaminated soils

- Placement of comingled TPH and Ra-226 soils, and
- Placement of mine debris/filling of void spaces

13a) What is the difference between “consolidation” and “placement” and between “mine spoils” and "contaminated soils?”

13b) Will these four actions results in four distinct separate repository layers, or will the soils be mixed together?

13c) If these actions result in four distinct separate layers, would geotechnical testing be appropriate for each soil type? Currently, contaminated soils are the only soil type that will have geotechnical testing results (includes moisture content, saturated hydraulic conductivity, standard Proctor compaction, moisture retention characteristics, particle size, and specific gravity).

NRC Comment 14:

Design element labeled “Cover (general).”

Please provide additional details explaining what this element is about since no description is provided. Include NUREG-1623 as one of the guidance documents in the “Performance Criterion Reference or Guidance” column.

NRC Comment 15:

Four design elements in Table 3-1 include:

- Cover (general)
- Cover permeability
- Cover infiltration, and
- Freeze/thaw, slope stability, and biointrusion

The potential data gaps for the design elements state that the design element properties will be obtained by characterization of the borrow areas. Obtaining the particle size of the borrow area soil is useful. However, most of these activities will be capturing the in-situ hydro-geotechnical parameters of the borrow soil only and not the properties of in-situ repository cover. Many of the properties will change after the material is transported to the site, larger places broken apart, and compacted after placement.

15a) How will the following in-situ properties of the various repository layers be obtained or determined?

- Density
- Porosity
- Field capacity
- Hydraulic conductivity
- Moisture content

NRC Comment 16:

Design element labeled "Tie into existing site features."

Please provide additional details on what site features this design element refers to (e.g. diversion channels, swales, etc…?). Details are necessary since the remedial action's intention is to utilize existing erosion protection features if possible.

NRC Comment 17:

Design element labeled "Design life for evaluation of facility components."

Add NUREG-1623 and NUREG-1757, Volume 2, Revision 1, Appendix P as part of the "Performance Criterion Reference or Guidance." Although NUREG-1757 is written for decommissioning sites, Appendix P contains information about the use of natural analogs to demonstrate indirect evidence of resistance to weathering of a selected rock source.

NRC Comment 18:

Due to the potential significance on future performance, sufficient information should be available, or should be gathered during the upcoming site evaluation and characterization activities that is expanded to include an in-situ sampling program, so as to construct a cross-section of a typical branch swale or diversion channel as it exists on the current cover. All its components/layers should be included, and the significant property values of these components should be labeled.

NRC Comment 19:

Section 3.1.2, first bullet states: "The repository will be designed to hold the contaminated mine material excavated from the NECR Mine Site. The design specifications will comply with CERCLA requirements, and specifically all Applicable or Relevant and Appropriate Requirements (ARARs)." This statement does not reference NRC requirements. Please include NRC requirements as part of the design specifications.