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Responses to NRC Comments on Northeast Church Rock Mine Site Removal Action Pre-Design Studies Work Plans (dated August 16, 2013) and Supplemental Data Needs Evaluation and Work Plans for Removal Design, Northeast Church Rock Mine Site Removal Action (dated November 9, 2012)

“Volume 1 Northeast Church Rock Mine Site Removal Action – Pre-Design Studies Work Plan Church Rock Mill Site” dated August 16, 2013, (ENCLOSURE 1)

1. *Section 1.5, second bullet states that “The repository will include a cap designed and constructed to isolate the mine waste, reduce the potential for leachate development, and prevent contaminated runoff by minimizing flux of precipitation through the cap while minimizing erosion protection.”*

Please clarify if this should perhaps state “maintaining” instead on “minimizing”?

Response: The text has been changed to: “...*optimizing erosion protection.*”

2. *Section 2.2.3 states that “Two types of erosion protection materials are available on site for use in the proposed repository, the rock from the existing cover, and the 1.5-in and 3-in diameter rock stockpiled at the Mill Site that were previously used during construction of the existing cover.” It is unclear if the two types of erosion protection materials available have been evaluated and determined to be suitable for each of the proposed alternative cover designs due to potentially steeper side-slopes required to accommodate the estimated volumes of mine waste. Updated D_{50} calculations should be included for NRC review when a final design is submitted for NRC approval.*

Response: The purpose of the sampling and testing described in the Work Plan is to characterize the available materials. Sizing of the erosion protection materials will be performed during design.

3. *Section 2.2.1.2 described the details on CPT and boreholes for Borrow Pit No. 2, Borrow Pit No.1, Central Cell, and North Cell. In addition this section states that samples will be tested for index, consolidation, strength and hydraulic properties, if “suitable” or “qualify” samples are retrieved.*

Please explain how these properties will be determined if “non-suitable or “non-qualify” samples are retrieved.

In addition, Figure 3-5 indicates that locations for CPT will be adjusted to further characterize the extent of subsurface saturation if encountered. The flow chart should include provisions for additional characterization for both CPT and auger sampling if unexpected subsurface conditions are encountered based on existing geotechnical data for the tailings provided in Appendix A. For example, if the thickness of the slimes or coarse tailings is not as expected additional sampling locations should be included to further characterize the stratigraphy of the tailings.



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Response: The word “quality” (sic) has been changed to “undisturbed” in the text and the following sentence has been added to Section 2.2.1.2: *“If undisturbed samples of the tailings cannot be retrieved laboratory testing will be conducted on remolded samples.”*

Figure 3-5 has been updated to include decision branches for encountering thicker than expected tailings deposits.

4. *Please explain the basis for selecting proposed sampling locations on the UNC Church Rock Mill site, since it is not explained in the corresponding Pre-Design Studies Work Plan. For example, sample locations No. 1 and No. 3 are located outside of the tailings impoundment. It is unclear how these locations will provide supporting information for establishing current tailings conditions. Consideration should be given to either relocating these proposed sample locations or including additional sample locations at the North and Central cells within areas of maximum thickness.*

Figure 4 from Appendix B.1 illustrates the depth to the base of tailings in the disposal area. This figure illustrates that in the vicinity of the North and Central Cells are five areas with tailings thicker than 35 ft. and two locations greater than 50 ft. NRC staff believes that collecting sampling data in areas of the North and Central cells where the tailings is thickest could provide more useful data and potentially reduce parameter uncertainties.

Consideration should also be given to sampling in locations where the tailings are in direct contact with other hydrogeologic subsurface units besides the Southwest Alluvium. This is important due to the sensitivity of hydraulic conductivity values for underlying units observed in 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”, prepared by Dwyer Engineering [ML1222A159]. For example, if sample location No. 11 is relocated closer to the historic geotechnical boring SHB78b-07, this would allow a comparison of historic and current conditions. This location is also where Zone 1 is in direct communication with the tailings allowing geotechnical information to be gathered on this unit.

Response: Sample locations 1 and 3 have been included to address previous NRC comments regarding the geotechnical review of the proposed repository design and meeting the stability requirements of NUREG 1620 Chapter 2. The primary purpose of these two locations is to obtain strength parameters of the existing embankment soils. However, to obtain additional tailings data, sample location 1 will be moved to the north cell (See revised Figures 3-1 and 3-2).

While we agree that sampling in the areas estimated to have the thickest impoundment may provide the most information on the tailings, the primary objective of the investigation is to evaluate the foundation conditions for the placement of additional material. The investigation was designed to assess the areas of greatest proposed fill in conjunction with the areas of thickest tailings.



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Figure 4 Appendix B.1 shows five areas where the depth from the cover to the bottom of tailings is estimated to be greater than 35 feet and two areas where the depth is estimated to be greater than 45 feet. One of the areas estimated to be greater than 45 feet thick is in Borrow Pit No. 2. The material in Borrow Pit No. 2 consists of compacted demolition debris and random fill, and may have limited amounts of tailings. The other area is located near the outer edge of the footprint of the conceptual 1.5 million cubic yard repository, where the repository thickness will be minimal. Based on the available information for debris placement in Borrow Pit No. 2, debris was placed over the location identified as the deepest portion of the pit. Therefore, sample location 11 was located to avoid the debris, but also target a deep impoundment profile. Location 11 has been moved to the east, near the edge of the debris outline (See revised Figures 3-1 and 3-2) to target the contact between the tailings and the Zone 1 Sandstone.

Locations 8 and 9 have been adjusted to explore the areas of probable thick tailings. Location 8 has been moved to the southeast side of Borrow Pit No. 1. Location 9 has been moved to the northeast. Location 7 has been moved to the east to optimize spacing of the soundings within the repository footprint and still contact the Zone 3 sandstone (See revised Figures 3-1 and 3-2). Text summarizing the sampling locations and basis for selecting each location has been included in Section 2.2.1.2. This information has been added as text in the report.

5. *Previous 'Steering Committee Meetings' to discuss the pre-design indicated that the estimated volume of metallic and wood mill site debris was under development. Does this Pre-Design Studies Work Plan for the Church Rock Mill Site contribute to narrowing the range of volume estimates for mill site debris?*

Response: The PDS Work Plan has been updated to include an inventory of the location, nature and quantity of surface debris at the Mill Site. The debris inventory is described in Sections 2.2.10 and 3.1.10.

6. *One of the original 'Repository Alternative' designs for the enhanced tailings disposal area, i.e., Repository Alternative 4, proposed to cover the South Cell and a portion of the Central Cell. Due to historical information about the South Cell tailings containing a significant amount of slime, and the evaporations ponds currently being located in the South Cell, "Repository Alternative 4" was eliminated as an alternative. However, if the evaporation ponds will no longer be needed as part of the ongoing groundwater remediation effort for the UNC Church Rock Mill Site and it is available at the time of construction of the enhanced tailings cover, conceivably the South Cell would be a viable option for the disposal of mine spoils.*

Consideration should be given obtaining more information about the South Cell as part of this current characterization effort to inform the technical decision as to the viability of utilizing the South Cell as the base for the enhanced tailing disposal area, and to confirm if the tailings material in this area is different than what previous historical information



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suggested. If there is a possibility that the evaporation ponds will not be needed in the near future, and if UNC/GE is interested in having the South Cell as an additional area for disposing of the mine spoils, NRC staff believes that a technical basis should be used to exclude, or justify the use of, the South Cell.

Response: At this time, UNC/GE is not considering the existing south cell for the location of the repository.

“Volume 2 Northeast Church Rock Mine Site Removal Action – Pre-Design Studies Work Plan Church Rock Mine Site, August 16, 2013” (Enclosure 2)

1. *The mine site sampling plan is unclear whether or not the total estimated volume of contaminated material proposed to be transferred to the UNC Church rock Mill site accounted for soil removed from Step-Out Area Number 2 [a.k.a. the east drainage area, 30,000 yd³], Unnamed Arroyo, and Step-Out Area Number 1[a.k.a. the 2009 IRA area, (100,000 yd³)] during interim removal actions, which were stockpiled at the Northeast Church Rock Mine site.*

Response: Material volume estimates (e.g., soil with Ra-226 above 2.24 pCi/g and solid mine waste) will be updated based on the results of the PDS. The updated volume estimates will be included in the PDS Report, and will include a table of volumes by mine facility, including all areas containing soil above the RAL. The boundaries of each area that were used to estimate the volumes will be clearly referenced and labeled on a site map.

2. *NRC staff is interested in reviewing data including particle sizes, moisture contents, and volumes of “primary threat waste” (PTW), contaminated soil, clean soil, and debris waste on each of the twelve survey areas. During preparation of future documents it would be helpful to consistently reference the below-referenced twelve survey areas, identified in the report entitled “Removal Site Evaluation Report” OF 2007:*
 - i. *Boneyard*
 - ii. *Non-Economical Material Storage Area (NEMSA)*
 - iii. *NECR-1 (including soils transported from the East Drainage, Red Water Pond Rd., and 2009 IRA areas)*
 - iv. *NECR-3*
 - v. *Ponds 1&2*
 - vi. *Pond 3/3a*
 - vii. *Sandfill 1*
 - viii. *Sandfill 2*
 - ix. *Sandfill 3 and adjacent areas*
 - x. *Sediment Pad*
 - xi. *Trailer Park*
 - xii. *Vents 3 & 8*

Response: Acknowledged.



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3. *NRC staff would be interested in a demonstration of volume estimate calculations for PTW, contaminated soil, clean soils, and debris waste of a survey area that has been sufficiently characterized (no further sampling is planned). Sandfill No. 1 is not included in the current work plan, and NRC staff has been told that Sandfill 1 has been sufficiently characterized due to past sampling and surveying efforts.*

Would it be possible present volume estimates, and the methodology to obtain those estimates, for Sandfill 1 during the Sep. 10-11 meeting in Albuquerque?

Response: This information was provided during the Design Team meeting on September 11, 2013. The PDS report will provide updated volume estimates for the various material types at the mine site (PTW, contaminated soil, clean soil, debris, etc.) and will clearly describe the methods that were used to estimate the volumes.

U.S. Nuclear Regulatory Commission Replies to General Electric/United Nuclear Corporation Responses on the report entitled "Supplemental Data Needs Evaluation and Work Plans for Removal Design, Northeast Church Rock Mine Site Removal Action, November 9, 2012"(Enclosure 3):

Areas of Potential Concern: Comments 1 - 5

1. *NRC Comment 1: Differential settlement*
NRC Reply to Response: NRC staff will review those sections of the mine waste disposal facility design document pertaining to differential settlement when it is issued.

Response: Acknowledged.

2. *NRC Comment 2: Damage due to seismic activity*
NRC Reply to Response: NRC staff will review updated seismic hazards evaluations and those sections of the mine waste disposal facility design document pertaining to seismic activity including ground acceleration and liquefaction when it is issued.

Response: Acknowledged.

3. *NRC Comment 3: Breaks/cracks outside repository perimeter*
NRC Reply to Response: NRC staff will review those sections of the mine waste disposal facility design document pertaining to potential tension cracking, including the plasticity index, when it is issued.

Response: Acknowledged.

4. *NRC Comment 4: Mine waste loading discharges contaminated water*



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NRC Reply to Response: NRC staff will review the updated 2011 report by Dwyer Engineering pertaining to potential discharge of pore water from existing tailings due to loading when it is issued.

Response: Acknowledged.

5. *NRC Comment 5: Perched condition within the mine waste*

NRC Reply to Response: NRC staff will evaluate the potential for perched conditions to exist when the final repository design is submitted as a license amendment request for NRC review and approval.

Response: Acknowledged.

Additional “Design Elements”

1. *NRC Comment 6: Design element labeled “Characterization of Coarse Tailings”*
NRC Reply to Response: Response to comment is adequate.

Response: Acknowledged.

2. *NRC Comment 7: Design element labeled “Characterization of Fine Tailings.”*
NRC Reply to Response: Response to comment is adequate.

Response: Acknowledged.

3. *NRC Comment 8: Design element labeled “Characterization of the Alluvium Under the Tailing.”*
NRC Reply to Response: Response to comment is adequate.

Response: Acknowledged.

4. *NRC Comment 9: Design element labeled “Characterization of the Zone 3 sandstone under the tailing.”*
NRC Reply to Response: Response to comment is adequate. [The ‘2013 Pre-Design Studies Work Plan Church Rock Mill Site’ report stated that the Zone 3 unit will be sampled (see Tables 3-1 and 3-2) for geotechnical characterization.]

Response: Acknowledged.

5. *NRC Comment 10: Design element on discovering unexpected material.*

NRC Reply to Response: NRC staff will review the sections of the ‘Mine Site Removal Action Construction Plan’ pertaining to identifying the nature and potential hazardous



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characteristics of any unexpected material found during the removal action when it is issued.

Response: Acknowledged.

6. NRC Comment 11: Design element labeled "Requirement for dose criteria."
NRC Reply to Response: *Response to comment is adequate.*

Response: Acknowledged.

7. NRC Comment 12: Design element labeled "Maintenance of cover over tailings and construction of new cover over mine spoils."
NRC Reply to Response: *Response to comment is adequate.*
NRC Staff will review the proposed design details on maintenance of the subject design element when available.

Response: Acknowledged.

8. NRC Comment 13a: What is the difference between "consolidation" and "placement" and between "mine spoils" and "contaminated soils?"
NRC Reply to Response: *Response to comment is adequate.*

Response: Acknowledged.

9. NRC Comment 13b: Will these four actions results in four distinct separate repository layers, or will the soils be mixed together?
NRC Reply to Response: *NRC staff will review those sections of the mine waste disposal facility design document pertaining to specifications for placement of the different material types when it is issued.*

Response: Acknowledged.

10. NRC Comment 13c: If these actions result in four distinct separate layers, would geotechnical testing be appropriate for each soil type?
NRC Reply to Response: *Response to comment is adequate.*

Response: Acknowledged.

11. NRC Comment 14: Design element labeled "Cover (general)."
NRC Reply to Response: *Response to comment is adequate.*

Response: Acknowledged.



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12. NRC Comment 15: How will the following in-situ properties of the various repository layers be obtained or determined?

NRC Reply to Response: Response to comment is adequate; however, the information and procedures documented in Response 15 is not documented in the '2013 Pre-Design Studies Work Plan Church Rock Mill Site' report. A revision of this report should incorporate this material.

Response: Section 3.1.2 has been modified to include a description of the laboratory testing.

13. NRC Comment 16: Design element labeled "Tie into existing site features."

*NRC Reply to Response: Response to comment is adequate.
NRC staff will review the qualitative evaluation of existing site features when available.*

Response: Acknowledged.

14. NRC Comment 17: Design element labeled "Design life for evaluation of facility components."

*NRC Reply to Response: Response to comment is adequate.
Specified NRC documents will be included in the "Performance Criterion Reference Guidance."*

Response: Acknowledged.

15. NRC Comment 18: Typical branch swale or diversion channel components/layers and the significant property values of these components.

NRC Reply to Response: Response to comment is adequate.

Response: Acknowledged.

16. NRC Comment 19: Include NRC requirements as part of the design specifications.

*NRC Reply to Response: Response to comment is adequate.
NRC requirements have been references as part of the design specification.*

Response: Acknowledged.