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September 5, 2019

Ms. Cinthya Román
Chief, Environmental Review Branch
Division of Fuel Cycle Safety, Safeguards, and Environmental Review
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

RE: Response to August 6, 2019 Environmental Request for Additional Information (RAI), United Nuclear Corporation (UNC) License Amendment Request to Move Mine Waste from the Northeast Church Rock Mine to the Church Rock Mill Site, McKinley County, NM (Docket No. 040-8907)

Dear Ms. Román,

On behalf of my client, United Nuclear Corporation/General Electric (UNC/GE), please let this letter and its attachments serve as a response to the subject request for additional information. The responses were compiled by INTERA Incorporated (INTERA) on behalf of the multidisciplinary team that prepared the Supplemental Environmental Report (SER). Per your request, we are submitting these responses within 30 days of receipt of your request letter.

If you have any questions, please contact me at the number above or Mr. Roy Blickwedel of UNC/GE by telephone at 1-610-529-6323 or via email at Roy.Blickwedel@ge.com.

Sincerely,

INTERA Incorporated

Peter Castiglia, P.G.
VP, Mining and Water Resources Group

Enclosures

CC: Ashley Waldron, NRC
Roy Blickwedel, UNC/GE
Melanie Davis, Stantec

RAI PA-1. Clarify whether the evaluation in the Environmental Report (ER) is based upon the initial or revised locations of proposed stockpiles SP2, SP3, and SP4 to assess the proposed action's impacts and, if needed, revise the impact analyses in the ER accordingly.

For air quality, as described in ER Section 4.6.4.2, "Proposed Action," air dispersion modeling was conducted for two different locations of stockpiles SP2, SP3, and SP4: the initial locations and revised locations. ER Sections 4.6.4.2 and 5.6.1.2, "Proposed Action Stockpiles, " describe the revised locations as a proposed mitigation strategy where the stockpiles are moved further away from receptors to reduce the impacts. However, ER Section 5.6.1.2 does not indicate if the licensee will implement this mitigation. Therefore, it is unclear which stockpile locations should be used to describe the United Nuclear Corporation (UNC) proposal and assess its impacts — the air dispersion modeling results shown in Table 4.6-9 for the initial locations, or the air dispersion modeling results in Table 5.6-1 for the revised locations.

For resource areas other than air quality, it is also unclear if the impact analyses in ER Chapter 4 are based on the initial or revised stockpile locations. ER Section 5.6.1.2 states that relocating stockpiles SP2 and SP3 impacts other resource areas However, the description in ER Section 5.6.1.2 concerning the impacts on other resources areas for relocating these stockpiles does not appear to be comprehensive.

This information is needed in accordance with Title 10 of the Code of Federal Regulations (10 CFR) Part 51.45(b) and (b) 1, which require that the ER describe the proposed action and its potential impacts on the environment.

RAI-PA1 Response

The environmental consequences of Alternatives B through D presented in Section 4 of the Supplemental Environmental Report (SER) are based on the locations of the Principal Threat Waste (PTW) Stockpile (SP1), Imported Rock (SP2), Screened Rock (SP3), and the Topsoil Stockpile (SP4), as originally defined in the design for the License Amendment Request, which is the basis of the Proposed Action described in Chapter 2 (i.e., the original SP locations). The air dispersion modeling results shown in Table 4.6-9 of the ER are for the original locations of all stockpiles. These results show that the Total Suspended Particulate (TSP; Annual and 24-hour) and PM2.5 (24-hour) standards are above the National Ambient Air Quality Standards (NAAQS)/New Mexico Ambient Air Quality Standards (NMAAQS). This was the driving factor in identifying a mitigation strategy. However, TSP standards have been revoked, so are no longer a consideration. SER Section 5.6.1.2 (Proposed Action Stockpiles) presents an analysis of a mitigation measure that changes the locations of SP2, SP3, and SP4 (i.e., the revised SP locations). Table 5.6-1 in the SER shows the impacts post-mitigation (moving the stockpiles). The revised stockpile locations show that the Proposed Action with this mitigation is passing the ambient standards.

UNC/GE's Proposed Action is Alternative B. However, we imagine that the Nuclear Regulatory Commission (NRC) would wish to select an alternative in its Environmental Impact Statement (EIS) that would comply with New Mexico Air Quality Standards. As such, UNC/GE has identified a reasonable mitigation measure that could improve the Proposed Action by modifying the location of the stockpiles to achieve state air quality compliance. In introducing this measure, UNC/GE is willing to introduce this mitigation, should the NRC wish to adopt this mitigation measure as part of the agency-selected alternative in its EIS.

The level of analysis for resource areas other than air quality would depend on the approach that the NRC takes in developing its EIS. If there are deficiencies in the analysis of impacts, then UNC/GE would appreciate more specific information on the resources and scope of the analysis required.

RAI PA-2. Clarify actions and activities related to the cessation of the UNC Mill Site groundwater corrective action program (CAP) and closure of evaporation ponds.

The License Amendment application (Stantec, 2018), last paragraph of Section 12, "License Condition Changes, " states, "Cessation of the groundwater (CAP) is necessary to complete EPA 's [U.S. Environmental Protection Agency] removal action" and that "UNC has filed permits to install several monitoring and sentinel wells to help support any desired administrative and/or institutional controls to enable the final closure of the groundwater CAP. Equipment and resources will be available onsite to complete closure of the evaporation ponds during construction of the Repository. "

UNC should clarify which actions and activities are part of this license amendment request and which are other [sic] ongoing or future actions associated with the cessation of the groundwater CAP or closure of the evaporation ponds. This information will assist the U.S. Nuclear Regulatory Commission (NRC) staff in accurately describing the proposed action in the Environmental Impact Statement.

RAI PA-2 Response

Closure of the evaporation ponds, which is not within the scope of the License Amendment Request (LAR) or SER, would be completed based on the previously approved reclamation plan for the tailings area. The license requirement to close the evaporation ponds is covered in the current license and by condition, cannot be completed until the CAP has been completed. At the appropriate time in the future, UNC would request NRC termination of the CAP. As a result, the environmental consequences of evaporation pond closure are not considered in this LAR or SER.

The text *"Equipment and resources will be available onsite to complete closure of the evaporation ponds during construction of the Repository."* was included in the LAR because it would be UNC/GE's preference to complete these additional closure components at approximately the same time as construction of the Repository. This is based on the construction resources that would be onsite to construct the Repository and could be used to close the ponds. However, UNC/GE recognizes that cessation of the CAP and subsequently closure of the ponds requires agency approval to initiate and the schedule defined in the license condition for these activities is currently separate from cover construction.

RAI TR-I. Clarify estimated average annual daily traffic counts for local roads.

ER Table 3.2-1 provides estimated traffic counts for routes that would be associated with proposed transportation. A footnote to the table indicates that all traffic counts in the table were estimated from information on the New Mexico Department of Transportation website without providing information about how the traffic counts were estimated or supporting reference information. UNC should clarify who estimated the traffic counts reported in ER Table 3.2-1. If available, UNC should also briefly explain how the traffic counts were estimated and what underlying data were used in these estimates. If values were estimated by the New Mexico Department of Transportation, then explain how they estimated the traffic counts, if known.

Explain why estimates were used instead of actual counts. Also, clarify if the traffic count for State Route 566 (NM 566) at the haul road crossing was estimated or based on monitoring as described in the text. Provide full reference information for citations (Note that the 2016 reference to the New Mexico Department of Transportation was not located in the ER Chapter 9 List of References).

This additional information is needed in accordance with 10 CFR 51.45(b)(1), which requires that the ER contain sufficient data to aid the NRC in its development of an independent analysis.

RAI TR-I Response

Table 3.2-1 was developed by Stantec to provide general information on the affected road network, and to provide an illustration of the relative magnitude of traffic volumes on the routes listed. This information is not used in calculations. As the data available are for highly variable lengths of road segments, as well as intermittent road segments, a qualitative representation of the annual average daily traffic (AADT) was chosen for each route by the engineer reviewing the data (Jeff Coleman, PE, Stantec). The underlying traffic data from the New Mexico Department of Transportation is available from the website link below:

https://dot.state.nm.us/content/dam/nmdot/Data_Management/NM_AADT_Listing.pdf

Current New Mexico Department of Transportation (NMDOT) standards for traffic monitoring can be found at the following reference:

1. *State Traffic Monitoring Standards,* Prepared for New Mexico Department of Transportation, Lee Engineering, June 2018. Available online at:

https://www.dot.state.nm.us/content/dam/nmdot/Data_Management/2017_State_Traffic_Monitoring_Standards.pdf

The traffic data from the Colorado and Utah DOTs are available from the interactive GIS website links below:

2. http://dtdapps.coloradodot.info/otis/TrafficData
3. https://www.udot.utah.gov/main/f?p=100:pg::::1:T,V:5053

Methodologies used by CDOT and UTDOT are not readily noted on the websites, but they are expected to be similar to the standards used by New Mexico.

The AADT NM 566 (118 vehicles per day) was estimated based on the site-specific monitoring described in the text.

RAI TR-2. Provide the full reference information for reported traffic accident rates.

The traffic accident rates provided in ER Table 3.2-2 do not include full reference information. The source for New Mexico accident rates is listed only as "2016 Traffic Crash Annual Report." Clarify the sources of the documents either by providing the full reference for the sources of this information (e.g., author, title, year) or an electronic copy thereof, as well as any appropriate additional information as to the provenance and accuracy of the underlying data.

This additional information is needed in accordance with 10 CFR 51.45(b)(1), which requires that the ER contain sufficient data to aid the NRC in its development of an independent analysis.

RAI TR-2 Response

Crash report references are noted below:

1. *New Mexico Traffic Crash Annual Report 2016*, New Mexico Department of Transportation, Traffic Safety Division, Traffic Records Bureau, Published May 2018. Available online at:

http://www.dgr.unm.edu/reports_annual_report.html

Notes from New Mexico Traffic Crash Annual Report title page: Produced for the New Mexico Department of Transportation, Traffic Safety Division, Traffic Records Bureau, under Contract 5801 Produced by the University of New Mexico Geospatial and Population Studies, Traffic Research Unit. Distributed in compliance with New Mexico Statute 66-7-214 as a reference source regarding New Mexico traffic crashes. For the purposes of this report, data are compiled by the University of New Mexico, Geospatial and Population Studies, Traffic Research Unit (TRU), on behalf of the New Mexico Department of Transportation (NMDOT).

2. *2012 Statewide Crash Book,* Colorado Department of Transportation, Traffic and Safety Data Management Unit. Available online at:

https://www.codot.gov/library/traffic/safety-crash-data/accident-rates-books-coding/crash-rate-books-accident-rates-books

Notes from 2012 Statewide Crash Book Introduction: Statistical data on fatal crashes was compiled and supplied by the Colorado Fatality Analysis Reporting System (FARS). FARS is a nationwide, federally mandated program that tracks, analyses, and stores data on fatal crashes. The criteria used in maintaining the FARS database can differ slightly from the criteria used in maintaining the CDOT summary database. Therefore, there may be slight differences in the data derived from the two databases. It is clearly notated where these differences can be seen within this document.

3. *Utah Crash Summary 2016*, Utah Department of Public Safety, Highway Safety Office, 2017. Available online at:

https://highwaysafety.utah.gov/wp-content/uploads/sites/22/2015/02/UtahCrashSummary2016-2.pdf

Notes from Utah Crash Summary 2016 Introduction: *Crash Data*: Crash data comes from traffic crash reports completed by law enforcement officers throughout Utah who investigate crash scenes on public roadways. Information is collected when a crash involves an injury, death, or at least $1,500 total property damage. *Fatal Crashes*: Additional detailed information is collected on fatal crashes and compiled into the Fatality Analysis Reporting System (FARS). FARS is a national data system collecting data on all fatal traffic crashes in the U.S. FARS was used for the data on fatal crashes.

RAI WR-1. Provide a detailed explanation for the determination that although scouring might continue to widen and deepen the Pipeline Arroyo, that minimal lateral migration is expected.

ER Section 3.4.2.2.2, "Features," states that "scour may continue to deepen and widen the arroyo with minimal lateral migration. " However, this statement is in contrast with the stated outcomes of the No-Action alternative as described in ER Table 2.4-1, "Comparison of Predicted Environmental Impacts," and ER Section 4.4.1.2.1, "No Action Alternative," which indicate that in the absence of any intervention to stabilize the arroyo "damage to the jetty and continued head cutting toward the jetty could pose a risk of controlled erosion with the potential for tailings exposure and downstream migration." Clarify the apparent inconsistency in these statements in the ER and describe the methodology used to determine that there would be minimal additional migration of the arroyo. Additionally, clarify the reference to "NRC, 2003" in ER Section 4.4.1.2.1. The referenced report appears to be unrelated to the sentence in which it appears.

This additional information is needed in accordance with 10 CFR 51.45(b) and (b)(l), which require that the ER include a description of the affected environment and discuss the impacts of the proposed action.

RAI WR-1 Response

The bank-ward and headward channel erosion that would continue to occur in Pipeline Arroyo in the absence of any intervention to stabilize the arroyo is presented consistently in both SER Table 2.4-1 (Predicted Environmental Impacts) and Section 4.4.1.2.1 (Potential Surface Water Impacts for No Action Alternative). In contrast, SER Section 3.4.2.2.2 describes the channel pattern within the context of the width of the drainage basin and not with respect to the facility. As a result, the statement that scour *may continue to deepen and widen the arroyo with minimal lateral migration* is intended to describe the absence of evidence of the channel meandering back and forth across the width of the drainage basin. Although the image analysis shows lateral migration is minimal compared to the width of the drainage basin, the widening is nevertheless significant with respect to the risks to the jetty and the tailings facility.

Regarding the methodology for determining the minimal lateral migration across the width of the drainage basin, Stantec reviewed 10, high-altitude, orthorectified aerial images from the University of New Mexico, Earth Data Analysis Center. The images dated back to 1954 (1954, 1962, 1978, 1981, 1991, 1997, 2005, 2009, 2011, 2014) with images from 1954 to 1981 being in black and white and images after 1981 being in color. The images were opened in ArcGIS, and the position of the Pipeline Arroyo was delineated for each of the 10 images. The images show deepening and widening of the arroyo below the knickpoint, but no appreciable lateral movement of the arroyo with respect to the entire width of the drainage basin. This channel geometry and position within the drainage basin makes sense because the channel downstream of the knickpoint is in a state of continual sediment deficit, the result being downcutting and widening, but no driving mechanism to cause the formation of meanders. The aerial image from 1954, taken prior to installing grade control at the rock outcrop, shows that the early channel position upstream of the knickpoint did extend up into the current Tailings Disposal Area.

The full reference for NRC (2003) cited in SER Section 4.4.1.2.1 is:

US Nuclear Regulatory Commission (NRC), 2003. *Erosion Protection Design Concerns Identified at Recent Site Visit* (TAC No. L52459)

RAI WR-2. Provide a detailed explanation for the determination that although scouring might continue to widen and deepen the Pipeline Arroyo, that minimal lateral migration is expected.

ER Section 3.4.2.2.3, "Water Quality," cites historical surface water quality data from a 1986 Gallaher and Cary study. The NRC staff has not been able to locate this reference. A publicly available reference should be provided. Additionally, more recent surface water quality data are necessary to determine whether the findings presented in ER Section 3.4.2.2.3, which are over 30 years old, are representative of current water quality conditions and applicable requirements [e.g., requirements could be administered through the National Pollutant Discharge Elimination System, or separate requirements could be established by the EPA or New Mexico Environment Department]. The data should include total suspended solids, total dissolved solids, radionuclides, uranium concentrations, and all constituents with regulatory limits.

This additional information is needed in accordance with 10 CFR 51.45(b) and (b)(l), which require that the ER include a description of the affected environment and discuss the impacts of the proposed action.

RAI WR-2 Response

Per your request, a copy of the publicly available document produced by the New Mexico Environmental Improvement Division, referred to in the SER as Gallaher and Cary (1986), is provided as **Attachment 1.**

The reason that surface water flow and quality data are not presently available but were during the 1980s is easily explained by examining the operational history of mines within the watershed. The drainages of the Upper Puerco River watershed are naturally ephemeral drainages, as described by Gallaher and Cary (1986) and more recently by NMOSE (2017). However, uranium mine dewatering, including operations at NECR, transformed ephemeral drainages into artificially perennial reaches (Gallaher and Cary, 1986). When stream flow is managed or governed by artificial conditions, sampling conditions are safe and predictable, making it conducive for sample collection. Alternatively, when flow is ephemeral and only in response to precipitation, sampling opportunities are both relatively limited and often unsafe. Therefore, it is understandable that the available data are dated and that stream gauges within the Upper Puerco River once monitored by the USGS in the 1980s were discontinued close in time when mine-water discharge, the source of artificial perennial flow, was terminated.

Given the difficulty of safely collecting samples from ephemeral flows, Delemos et al. (2008) sampled and analyzed sediment samples within the Pipeline Arroyo drainage basin, including locations immediately downstream of the NECR Mine Site and upstream of the UNC Mill Site. These published results represent the most recent, available information for uranium concentrations in both sediment and in suspended sediment from aqueous samples. As described in section 3.4.2.1.3 of the SER, Delemos et al. (2008) conclude that uranium levels in the majority of >100 sediment and suspended sediment samples were not elevated above background levels.

We believe that the NRC correctly ascertained that there was no gap in the regional and project-specific data for surface water resources during its review (NRC, 2015) of the *Environmental Data Gap Report for the United Nuclear Corporation Superfund Site and Northeast Church Rock Mine Site* (INTERA, 2015), which described the findings of Delemos et al. (2008). Nevertheless, we would be most grateful if the NRC would please clarify for UNC/GE whether this peer-reviewed study provides information that is sufficient for describing these ephemeral drainage systems and for evaluating the potential impacts of the Proposed Action and the Alternatives.

RAI WR-3. Clarify the peak flow rates presented in the ER.

The discussion of sediment transportation and erosion in ER Section 3.4.2.2.4, "Sediment Transportation and Erosion," mentions peak flow rates that conflict with the peak flow rates in the "Northeast Church Rock 95% Design Report" (referred to as the 95% Design report) (MWH, 2018).

- *The peak flows for existing conditions presented in the ER are higher than those listed in Table 10, "Simulated Peak Flows at Locations of Interest for the Remedial Design, " of the 95% Design Report's Attachment I. 1, "Estimation of Flood Flows for Design of Interim and Final Surface Water Controls for the Removal Action at the NECR Mine Site and Church Rock Mill Site."*
- *Clarify the source data for the baseline peak flow rates as well as a table with pre- and post-proposed action peak flows for the 10-year, 100-year, and Probable Maximum Flood (PMF). This additional information is needed in accordance with 10 CFR 51.45(b)(1), which requires that the ER contain sufficient data to aid the NRC in its development of an independent analysis.*

RAI WR-3 Response

The values reported in the SER were defined in Table 1 of a May 14, 2018 memo by Stantec (2018a), the firm that completed the hydrological assessment for the Project. Review of Table I.1 of the 95% Design Report (MWH, 2018) shows that the peak flow rates listed in the SER are equivalent to the post-remedial action (post-RA) flow rates estimated by Stantec (2018a). Flow rates for existing conditions are also listed in Table I.1 for the Probable Maximum Flood and from floods with return frequencies of 100 and 2 years. Table I.1 does not list the estimated flow rate for the 10-year flood under existing conditions or post-RA conditions; however, the hydrology model described in Attachment I.1 of the 95% Design Report can simulate the 10-year flood under existing conditions and post-RA conditions.

Table 1 below provides the simulated peak flows at the Pipeline Arroyo outlet for the PMF, 100-year flood, and 10-year flood under existing conditions and post RA conditions. Because the development of the 10-year flood is not described in the 95% Design Report, the model parameters (time of concentration and storage coefficient values) for the existing condition simulation of the 10-year flood are provided in Table 2. The model parameters for the 10-year storm simulation for the post-RA conditions are provided in Table D2 of Attachment I.1.

Table 1. Pipeline Arroyo Outlet Peak Flows for Select Frequencies and 1-hr PMF

Flood Frequency	Existing Conditions Peak Flow (cfs)	Post-RA Conditions Peak Flow (cfs)
10-year	1,216	1,137
100-year	4,766	4,932
1-hour PMF	26,764	27,502

Table 2. Existing Conditions - Unit Hydrograph Parameters for the 10-year Storm Event
(see Table D1 in Attachment I.1 of the 95% Design Report)

Sub-basin	Tc (hours)	R (hours)
0	1.08	1.19
1	0.27	0.20
2	0.69	0.57
3	0.48	0.54
4	0.60	0.72
5	0.61	0.58
9	0.49	0.27
10	0.67	0.43
16	0.38	0.33
17	0.77	0.61
18	1.15	0.98
19	0.84	0.57
20	0.74	0.46
21	0.68	0.49
22	1.40	0.74
23	1.09	0.56
24	1.46	0.98
25	1.61	0.94
26	1.36	0.78
27	1.32	1.50
31	0.69	0.59
32	0.39	0.31
33	0.13	0.09
34	0.11	0.10
35	0.10	0.05
36	0.14	0.15
37	0.39	0.51
38	0.23	0.25
39	0.80	0.80
42	0.71	0.61
43	0.98	0.61
44	0.41	0.33

RAI WR-4. Clarify the methodology used to determine the floodplain for the proposed project area.

ER Section 4.4.1.1, "Surface Water Impacts Analysis," states, "No federally delineated floodplains (Flood Hazard Zone A as identified by FEMA) occur within or adjacent to the Project Area. However, the NRC staff has identified through ArcGIS a Federal Emergency Management Agency (FEMA) Special Flood Hazard Area Zone A along Pipeline Arroyo within the UNC Mill Site (FEMA, 2019). Provide an explanation for the discrepancy between floodplain determinations included in the ER and that of FEMA and/or update the ER as appropriate.

This additional information is needed in accordance with 10 CFR 51.45(b) and (b)(l), which require that the ER include a description of the affected environment and discuss the impacts of the proposed action.
AIR QUALITY (AQ)

RAI WR-4 Response

INTERA confirms the presence of the Special Flood Hazard Area Zone A, as designated by FEMA and observed by the NRC in May 2019. It appears that INTERA mis-interpreted information presented in Stantec (2018a) specifically regarding the floodplain, as defined by FEMA, which led to the incorrect statement in the SER. The requested information regarding affected environment and potential impacts could be addressed in an Addendum to the SER. If required by the NRC, this SER Addendum could be delivered within 60 days of receiving confirmation to proceed.

RAI AQ-1. Revise the emission inventory and associated impact analyses for the UNC proposal (alternatives A to D) to include combustion emissions from mobile sources and construction equipment or provide a basis for not doing so.

ER Section 4.6.2.1, "Description of Effluents, " states that the main activities for the UNC proposal are excavating and transporting material. However, criteria [National Ambient Air Quality Standards (NAAQS)] pollutants associated with combustion emissions from mobile sources and construction equipment were not included in the project emission inventory that served as input to the air dispersion modeling that was used for the impact analyses (ER Table 4. 6-2, "Release Point Parameters, " and ER Table 4.6-6, "Proposed Action and Alternative Modeling Source Groups"). The analysis in ER Section 4.6.2.1 for hazardous air pollutants and volatile organic compounds did not consider the combustion emissions from mobile sources and construction equipment. Revise the emission inventory and the associated impact analysis to include volatile organic compounds and hazardous air pollutants from mobile sources and construction equipment or otherwise explain why these sources were not included. An appropriate accounting for the proposed project's emissions is needed to accurately assess the potential impacts. UNC should revise the emission inventory, revise the initial screening described in ER Section 4 6.23.7, "Significant Impacts Analysis, " and update the associated impact analyses to include combustion emissions from mobile sources and construction equipment, or provide a basis for not doing so. The impact analysis in the ER includes emissions sources from the entire area within the emission source footprint (i.e., everything within the Boundary Line shown in ER Figure 4.6-1, "Receptor Grid for Air Dispersion Modeling"). If the emission inventory and associated impact analysis is revised in response to this RAI, UNC should include emissions from all sources within this emission source footprint expect for those sources exclusively associated with the principal waste threat. In addition, UNC should, to the extent possible, clarify the proposed activities within the following areas contribute to emissions and associated impacts: (i) within the UNC Mill Site boundary shown in ER Figure 4.1-1, "Restricted Use Areas, Proposed Action, " and (ii) within the emission source footprint, minus the Northeast Church Rock (NECR) Mine Site boundary shown in ER Figure 4.1-1).

Responses to requests for additional information (RAIs) AQ-I through AQ-6 and CC-I should also consider revisions to the emission inventory. When responding to these RAIs, UNC should consider a similar break down or grouping of the emission sources for the analysis as described for this RAI in the preceding paragraph (i.e., the entire emission source footprint, the UNC Mill Site, and the entire emission source

footprint minus the NECR Mine Site). This information is needed in accordance with 10 CFR 51.45(b), which require that the ER describe the proposed action and its potential impacts on the environment.

RAI AQ-1 Response

The method for analyzing impacts of the Proposed Action on air quality was originally defined in the Draft Environmental Data Collection Work Plan (INTERA, 2016). Concern for the exclusion of mobile sources was not included in agency comments during review (US EPA, 2016) of the Draft Environmental Data Collection Work Plan (INTERA, 2016) or final approval of the Final Environmental Data Collection Work Plan (INTERA, 2017).

To ensure that the methodology used for including mobile sources is agreeable to the NRC, UNC/GE proposes to (1) schedule a teleconference between the NRC, UNC/GE, and the INTERA Team within 20 calendar days of the date of this letter to discuss the RAI and options for addressing the concern, (2) develop a written methodology for the approach and an implementation schedule for NRC review within 60 calendar days of the teleconference, (3) gain written NRC approval of the methodology and schedule prior to commencing with the additional analysis, and (4) commence with the analysis according to the approved methodology and schedule. Given the need to identify an agreeable methodology prior to forecasting a completion schedule for this an several additional RAIs, these four steps would also apply to the responses for RAIs AQ-2, AQ-5, AQ-7, and CC-1 (See below).

RAI AQ-2. Revise the air quality analysis for the UNC proposal (Alternatives A to D) to include emissions from construction activities (i.e., the construction phase) or provide a basis for not doing so.

The air dispersion analysis in ER Section 4.6.2, "Air Dispersion Modeling," excludes emissions from the following construction activities: road construction (source DA5), facility construction (source DA6), and the imported rock stockpile (source SP2). Such activities could generate both fugitive dust and combustion emissions (refer to RAI AQ-I). An appropriate accounting for the proposed project emission levels associated with the construction phase is needed to accurately assess the potential impacts.

This information is needed in accordance with 10 CFR 51.45(b), which requires that the ER describe the proposed action's impacts.

RAI AQ-2 Response

We struggle to understand the distinct “construction phase” of the Proposed Action or Alternatives, as described in this RAI. Instead, we view the remedy envisioned for cleanup as the “actual operations” represented in the emissions inventory. These operations would commence immediately and would encompass any startup operations. If there is a separate construction period and associated unique activities, the INTERA Team would need to compare those activities to currently modeled operations to determine the following: (1) If the current modeled and quantified operations are worst case enough to cover impacts from “construction”; (2) If not, then an emissions quantification and modeling effort would be required to determine air quality impacts. As such, we propose to follow the steps and schedule presented in AQ-1 to resolve this RAI.

RAI AQ-3. Explain why the air dispersion modeling for the UNC proposal adequately addresses the potential impacts since modeling was not conducted for a scenario that includes all of the emission sources. Otherwise, update the air dispersion modeling based on an emission inventory that includes all of the emission sources.

ER Section 4.6.23.4, "Proposed Action Versus Alternative Source Groups," describes that Alternative A emission sources for the UNC proposal were split into five source analysis groups to isolate material being transported from the NECR Mine Site and the borrow areas. Air dispersion modeling "scenarios" were conducted for each of these five groups. Alternative C was similarly divided into two source analysis groups, which were modelled as separate scenarios. ER Table 4.6-6, "Proposed Action and Alternative Modeling Source Groups, " identifies which emission sources were included in each scenario. ER Figure 4.6-1, "Receptor Grid for Air Dispersion Modeling, " shows the modeling domain or area of analysis that was used for each of the scenarios. A single emission source footprint was established that encompassed each of the emission sources (see ER Figure 4.6-1); however, a modeling scenario was not conducted that includes all of these emission sources within this footprint. As a result, the NRC staff needs additional information to verify the adequacy of the current analyses to evaluate the air quality impacts of the potential emissions from the UNC proposal

This information is needed in accordance with 10 CFR 51.45(b) 1, which requires that the ER describes the proposed action's impacts.

RAI AQ-3 Response

The facility operations were broken out into the Proposed Action (Years 1 through 5) and four Alternative Actions (B through D) as discussed in SER Section 4.6.2.3.4. For air dispersion modeling purposes, these scenarios were separated into distinct and mutually exclusive source groups based on operating scenarios that could occur. Each scenario was independent of the other scenarios and contains differing equipment and operational conditions. Under each of these scenarios, air emissions would only occur for sources in operation at that time. Table 4.6-6 in the SER shows the equipment/processes in operation under each scenario.

RAI AQ-4. Clarify whether the air dispersion modeling results represent peak emission levels. If the results do not represent peak emission levels, provide a basis for this omission or provide such data.

According to the proposed project schedule as described in the 95% Design Report (MWH, 2018, Removal Action Schedule, Appendix K, Figure K-1), the project is estimated to last about 4 years. The number of activities that generate air emissions varies over this 4-year period. ER Section 4.6.2.3.3, "Modeled Emission Rates," states that short-term emission rates were used in the air dispersion modeling with variable emission rates to account for the hours of operation per day. ER Section 4.6.2.3.5, "Hours of Operation," discusses how hours of operations for anthropogenic activities were incorporated into the air dispersion modeling, but it is not clear from this discussion whether the air dispersion modeling results represent the peak emission levels (i.e., a bounding analyses).

This information is needed in accordance with 10 CFR 51.45(b) and 10 CFR 51.45(c), which require that the ER describe the proposed action's impacts and contain sufficient data to aid the NRC staff in its development of an independent analysis.

RAI AQ-4 Response

The modeled emission rates represent the short-term peak emissions for each emission unit under each operational scenario. The peak short-term emission rate is applied for any hours that a process is active (i.e., 9am to 5pm or the appropriate shift length). Outside of the normal operational hours when no work will be occurring, there are no emissions from the sources. This allows for a representative analysis of daily and annual facility-wide operations.

RAI AQ-5. Provide air dispersion modeling results for the UNC proposal (alternatives A to D) appropriate for comparison to Prevention of Significant Deterioration (PSD) thresholds for the UNC proposal and alternatives or provide a basis for not doing so.

The air quality description in ER Section 3.6.8, "Baseline Air Quality, " discusses PSD thresholds as well as Federal and State ambient air quality standards; however, ER Table 4.6-9, "Air Dispersion Modeling Impact Results, " only compares the air dispersion modeling results for the UNC proposal and alternatives to Federal and State ambient air quality standards. PSD thresholds are only compared to project-level emissions alone. This differs from ambient air quality standards that are compared to the combined project level emissions along with background pollution levels (as shown in ER Table 4.6-9). Another difference between PSD thresholds and ambient air quality standards is that they are based on different statistical values. Thus, modeling results specific for NAAQS are not comparable to PSD thresholds.

This information is needed in accordance with 10 CFR 51.45(b) and 10 CFR 51.45(c), which require that the ER describe the proposed action's impacts and contain sufficient data to aid the NRC staff in its development of an independent analysis.

RAI AQ-5 Response

It is not clear which PSD thresholds are being referred to for this RAI item. PSD thresholds include a major source threshold (250 tons per year [tpy] of site-wide non-fugitive potential criteria pollutant emissions) and significant emission rate thresholds by pollutant (applicable only to major sources). As shown in Table 4.6-5 in the SER, maximum annual emissions are less than the PSD major source threshold of 250 tpy.

If this item is referring to PSD Increment, then UNC/GE requests that this RAI item be withdrawn. The proposed operation is short-term in nature and will therefore not permanently consume PSD increment for air quality planning purposes.

If NRC is referring to PSD Increment and require that this analysis be completed, then we propose to follow the steps and schedule presented in AQ-1 to resolve this RAI. The complexity of the analysis will depend on NRC allowing GE/UNC to model worst-case increment rather than increment for each project phase and scenario.

RAI AQ-6. Revise ER Figures 4.6-3 to 4.6-6, 4.6-9 to 4.6-12, 5.6-1 to 5.6-4, and 5.6-7 to 5.6-10, or provide NRC with the vector data (or shapefiles) for these figures.

ER Figures 4.6-3 to 4.6-6, 4.6-9 to 4.6-12, 5.6-1 to 5.6-4, and 5.6-7 to 5.6.10 display the air dispersion modeling results (i.e., concentration ranges for PM2.5 and PMIO) for the UNC proposal and alternatives.

However, these figures do not include the location of the nearest residences (e.g., as shown in ER Figure 4.12-1) or other potential receptors. This data is needed to assess impacts by comparing the location of receptors to the air dispersion modeling results. These figures are listed below. Also, the NRC staff cannot decipher the modeling results information provided in these figures due to the poor quality and resolution of the figures. The NRC staff notes that the Total Suspended Particles (TSP) standard has been revoked, and thus updated TSP data are not [sic].

This information is needed in accordance with 10 CFR 51.45(b) and 10 CFR 51.45(c), which require that the ER describe the proposed action's impacts and contain sufficient data to aid the NRC staff in its development of an independent analysis.

RAI AQ-6 Response

Shapefiles will be developed to assist with the legibility of predicted concentrations on the model output plots. These plots will also include the locations of the sensitive receptors identified for the noise analysis (Table 4.7-3 in the SER). For the existing modeling results, these files will be developed and delivered within 20 calendar days of obtaining approval to proceed. If NRC determines that modeling must be updated, then enhanced plots will be provided as part of the revised modeling.

RAI AQ-7. Provide an analysis of air quality impacts by proposed project stages for the UNC proposal (alternatives A to D).

ER Section 4.6, "Meteorology, Climatology, and Air Quality Impacts," does not provide an analysis of air quality impacts for the various project stages, including construction, transferring mine waste, and closure of the proposed disposal area. The impact analysis should address the impacts by project stage (e.g., categorizing the emission sources in ER Table 4.6-6, "Proposed Action and Alternative Modeling Source Groups, " by the various activities associated with that emission source). Impact analyses for each project stage should address the impacts from the applicable activities being conducted during that project stage and for all of the emissions sources (i.e., the UNC Mill Site, the NECR Mine Site, and the haul roads area; as well as these sources combined.

This information is needed in accordance with 10 CFR 51.45(b), which requires that the ER describe the proposed action's impacts

RAI AQ-7 Response

The stages/scenarios modeled represent the Proposed Action over 5 years (A1 through A5), where each year has a different location of borrow material. The Alternate Scenarios (B1, C1, C2 and D1) represent differing operational processes based on using conveyors to reduce noise (B1); spoils material transported from mine site to the repository while excavating the Jetty (C1); clean fill being sourced from the Jetty rather than the borrow areas and transporting it to the repository (C2); and D1 which is similar to A1 except that the PTW would be screened at the PTW stockpile and transported offsite, whereas spoils would be taken to the Repository. This is discussed in SER Section 4.6.2.3.4. All "on" sources for each scenario are shown in Table 4.6-6. These scenarios are the basis of the air dispersion modeling source groups. As such, each scenario was modeled (SER Table 4.6-8) as a separate source group and the worst case from all scenarios were shown as the final results in SER Table 4.6-9 and under the mitigation scenario in SER Table 5.6-1. As a result, we suggest that the stages of the Proposed Action have been adequately represented in the impact assessment.

This item overlaps with other line items, including AQ-2 and AQ-5. As such, we propose to follow the steps and schedule presented in AQ-1 to resolve this RAI.

RAI AQ-8. Clarify how Navajo Nation air quality requirements were considered.

The License Application Report (Stantec, 2018) references the 95% Design Report (MWH, 2018). The 95% Design Report, Appendix N, contains the Permitting Requirements and Compliance Plan, and it states that regulations set forth in the Navajo Nation Air Pollution Prevention and Control Act will be considered and the means of conformance are addressed in the 95% Design Report, Appendices J and Q. However, neither these appendices nor SER Table 4.6-1; "National Ambient Air Quality Standards and New Mexico Ambient Air Quality Standards, " specify what regulations were considered, or whether there are any Navajo Nation Air Pollution Prevention and Control Act standards or regulations, and their interaction (supplemental, more restrictive than) with Federal and State standards. This information is needed in accordance with 10 CFR 51.45(d), which requires that the ER describe the compliance with applicable environmental quality standards and requirements.

RAI AQ-8 Response

The Navajo Nation has its own Title V Operating Permit Program but does not have a minor source permitting program. The Northeast Church Rock operation is minor for Title V permitting purposes; as such, a Title V application is not required to be submitted to the Navajo Nation.

Minor source permitting requirements are addressed by US EPA Region IX with input from the Navajo Nation EPA. This would entail developing a permit application and possibly performing an air quality impacts assessment as part of the permitting effort, if required by US EPA. An air quality permit application must be submitted to US EPA Region IX and approved prior to commencing operations at the site.

RAI AQ-9. Clarify non-radiological air monitoring and related corrective actions. Clarify when monitoring occurs over the lifespan of the project. Provide clarification on the UNC response to monitoring results above action levels.

UNC committed to non-radiological dust monitoring; however, it is unclear when nonradiological monitoring would occur during the project. The License Application Report (Stantec, 2018) contains portions of the 95% Design Report including the Removal Action Schedule (Appendix K of the license application document). Appendix K, Figure K. I-Iz "Preliminary Removal Action Schedule, " contains the project schedule, which identifies the 600 days when air monitoring would occur (Figure K. 1-1, line item 19); however, it is unclear if this schedule applies to only radiological monitoring or both radiological and non-radiological monitoring. The License Application Report, Appendix Q, contains the Dust Control and Air Monitoring Plan. Appendix Q, Table Q.4-1, "Summary of Perimeter Air Monitoring Plan, " describes the frequency of non-radiological airborne dust monitoring. This table states that non-radiological air monitoring for particulate matter PM2.5 and PMT starts 2 days prior to construction, occurs 24 hours per day for the first 3 days of significant earthmoving activities, and then occurs continuously during working hours thereafter. However, it is unclear exactly how this description of the non-radiological monitoring would be incorporated into the overall project schedule as presented in Appendix K, Figure K. 1-1. Please clarify if non-radiological airborne dust monitoring occurs continuously during working hours over the

600 days specified in Appendix K, Figure K. 1-1, or describe when non-radiological airborne dust monitoring occurs within the context of the project duration.

The Dust Control and Air Monitoring Plan, Section Q. 4.2, "Nuisance Dust Monitoring, " identifies the non-radiological airborne dust action levels and states that the monitoring results will be reviewed and assessed to determine potential health hazards or risks. UNC should clarify what, if any, actions will be taken if the non-radiological monitoring results exceed the action levels.

This information is needed in accordance with 10 CFDR 51.45(b), which requires that the ER describe the proposed action and its potential impacts on the environment.

RAI AQ-9 Response

This RAI concerns information presented in the LAR, which would be best addressed by the authors of the LAR. As such, Stantec, the authors of the LAR, will provide a response to this RAI on behalf of UNC/GE within 30 days of this letter.

RAI AQ-1O. Identify any mitigation incorporated into the emission inventory used for the air dispersion modeling and specify the mitigation efficiency as well as the basis for this efficiency.

It is unclear what specific mitigation methods were incorporated into the emission inventory in ER Tables 4.6-5, "Proposed Potential to Emit Emission Rates, " and 4.6-6, "Proposed Action and Alternative Modeling Source Groups, " used as input for the air dispersion modeling for the UNC proposal and alternatives. Text in ER Section 4.6.1, "Meteorology, Climatology, and Air Quality Impacts Analysis, " states that the impact analyses assumed that all mitigation methods, best management practices, and environmental protection measures would be followed as recommended. Similarly, ER Section 4.6.2.3.3, "Modeled Emission Rates, " states that the emission inventory in ER Table 4.6-5, "Proposed Potential to Emit Emission Rates, " includes reductions due to control practices. However, in both cases, identification of specific mitigation, the mitigation efficiency, and the basis for this efficiency was missing. ER Section 5.6.1.1, "General Emission Control Techniques, " states that "emission control efficiencies" applied to the haul roads and screening operations are shown in ER Table 4.6-2, "Release Point Parameters." However, the NRC staff was unable to locate that information.

This information is needed in accordance with 10 CFR 51.45(b) and 10 CFR 51.45(c), which require that the ER describe the proposed action's impacts and alternatives available for reducing and avoiding adverse environmental impacts.

RAI AQ-1O Response

The emission calculations were completed using methods initially outlined in the Final Environmental Data Collection Work Plan (INTERA, 2017). The mitigation methods used to control emissions were not explicitly identified in SER Table 4.6-5. This table will be amended to include the associated control efficiencies and a description of the methods.

An updated SER Table 4.6-5 could be provided to the NRC within 30 calendar days of receiving approval to proceed. It is our recommendation that this updated table be provided even if NRC requires additional modeling per the above items. Providing this updated table would give NRC the opportunity to approve or comment on the control levels utilized in the calculations.

RAI CC-I. Characterize or estimate project level emissions of greenhouse gases for the UNC proposed action and alternatives.

ER Sections 3.6, "Air Quality," 4.6, "Meteorology, Climatology, and Air Quality Impacts," and 5.6, "Air Quality," do not provide any information concerning project level greenhouse gas emissions. UNC should characterize or provide estimated greenhouse gas emission levels for the proposed action and alternatives. These estimates should include emissions from the sources included in the air dispersion modeling (see ER Table 4.6-6) as well as mobile sources and construction equipment discussed in RAI AQ-I and construction activities discussed in RAI AQ-2.

This information is needed in accordance with 10 CFR 51.45(b), which requires that the ER describe the proposed action and its potential impacts on the environment.

RAI CC-1 Response

Because the RAI does not define the methodology for quantifying emissions, we would be able to develop a schedule for providing the information once UNC/GE and the NRC agree upon the accounting tools, methodologies, and data available for quantifying the emissions. Our understanding of the Council on Environmental Quality Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gases (Docket No. CEQ-2019-0002) is that federal agencies are to quantify those emissions that are substantial enough for quantification using available data and greenhouse gas accounting tools that the Council on Environmental Quality has identified for agencies to use in their National Environmental Policy Act reviews. As such, we propose to follow the steps and schedule presented in AQ-1 to resolve this RAI.

RAI VS-I. Provide a recent visual resource management (VRM) classification map for the proposed project area.

ER Section 3.9, "Visual/Scenic Resources," states that, according to a previous NRC study (NRC, 2009), the NRC staff determined that there are no Class I or Class II VRM areas near the NECR Mine Site. Provide a more recent VRM classification map for the proposed project area or justify why the reference in the ER is sufficient. Also provide the distance from the UNC offices to the Church Rock Outlier Area of Critical Environmental Concern.

This additional information is needed in accordance with 10 CFR 51.45(b), which requires that the ER include a description of the affected environment and discuss the impacts of the proposed action.

RAI VS-I Response

A more recent map of visual resources management classifications does not exist. Map 3-9 on Page 3-61 of the Farmington Proposed Resource Management Plan and Final Environmental Impact Statement Volume 1: Chapters 1-5 (BLM, 2003) classifies the land at and surrounding the proposed project area as a Class IV VRM classification. The BLM Farmington Field Office confirmed that this document represents the most up-to-date resource for visual resource management classification (R. Joyner, Personal Communication, August 26, 2019).

Table 3 below provides straight-line distances from the UNC offices to Church Rock Areas of Critical Environmental Concern.

Table 3. Distances of UNC Offices to Church Rock Areas of Critical Environmental Concern

Area of Critical Environmental Concern	Straight-Line Distance (miles)
Chaco Culture Center National Historic Park	42
Red Rock State Park	10
Bisti Wilderness	49
El Morro National Monument	43
El Malpais National Monument	59

RAI VS-2. Clarify whether the key viewpoints depicted in ER Figure 3.9-3 are all constructed features in the vicinity of the NECR Mine Site,

ER Section 3.9 states that the key viewpoints are not representative of individual structures but rather of a portion of sorted, grouped, and ranked structures. In addition, Figure 3.9-3, "Final Key Viewpoints, " is described as a map of the constructed features in the vicinity of the NECR Mine Site. However, it is unclear if Figure 3.9-3 is a map of all constructed features. Clarify how a key viewpoint is defined, what features were included, and what is displayed in Figure 3.9-3. If Figure 3.9-3 does not depict all of the constructed features in the vicinity of the proposed project area, provide a map (or shapefiles) of all constructed features in the area.

This additional information is needed in accordance with 10 CFR 51.45(b), which requires that the ER include a description of the affected environment and discuss the impacts of the proposed action.

RAI VS-2 Response

A key viewpoint is defined in the SER as a location where people are present or frequently travel or visit.

INTERA determined key viewpoints following the methodology described in Section 2.6.2 of the agency-approved *Environmental Data Report for the Northeast Church Rock Site Removal Action and the United Nuclear Corporation Site Remedial Action* (INTERA, 2017a). A summary of the steps is as follows:

1. A point shapefile from TerraSpectra Geomatics was obtained by INTERA to identify the locations of constructed features (structures or buildings) in the vicinity of the NECR Mine and UNC Mill Sites. A total of 4045 points were included in this shapefile. The map and shapefiles included as **Attachment 2** show locations of all constructed features in the area. This TerraSpectra dataset gave us structures, regardless of whether they would be in the line of sight of the proposed disturbance. Using GIS methods, a new dataset (Viewshed dataset) was created to identify areas from which the proposed disturbance would be visible. This Viewshed dataset gave us the areas from which the proposed disturbance would be visible.
2. Intersecting the TerraSpectra dataset with the Viewshed dataset returned the number of constructed features from which the Proposed Action would be viewable. This new dataset of constructed features in view of the proposed disturbance was further refined by utilizing National Agricultural Imagery Program imagery and Google Earth imagery to evaluate if the

features still existed. If a structure was found to no longer exist, then it was removed from the dataset. In addition, features related to the mine/mill facility were also removed. Once all the necessary features were removed from the selected dataset, 111 features remained.

3. Using GIS tools, these 111 features were divided into 12 groups and one feature from each group was selected as a key viewpoint. These 12 locations are presented in SER Figure 3.9-2 Initial Key Viewpoints. SER Figure 3.9-3 shows these initial key viewpoints as well as several additional locations that were identified while in the field.
4. Final key viewpoints presented in SER Figure 3.9-3 include features such as homes and roads.

RAI SOC-I. Provide a copy of the "UNC, 2011" document referenced in ER Sections 4.10.1 and 4.11-2.2.

The licensee refers to a document in ER Sections 4.10.1, "Socioeconomics Impacts Analysis, and 4.11.2.2, "Alternative A — Proposed Action, " as "UNC, 2011." No reference is provided in the ER references section for this document. Please provide the full reference to the document (e.g., full title, author, and year of publication) if publicly available, or provide an electronic copy of the document to the NRC staff that can be made publicly available.

This additional information is needed in accordance with 10 CFR 51.45(b)(1), which requires that the ER contain sufficient data to aid the NRC in its development of an independent analysis.

RAI SOC-I Response

A copy of UNC (2011) is included as **Attachment 3.**

RAI POH-I. Provide an analysis of expected non-radiological worker injuries and fatalities from the proposed project.

Non-radiological public and occupational health impact information that includes estimates of potential worker injuries or fatalities from the proposed project based on the best available information could not be located in the ER. ER Section 3.11.5, "Occupational Injury Rates and Occupational Fatality Rates, " states that no site-specific occupational health information is available but mentions the availability of general data from the Bureau of Labor Statistics. This section does not provide or summarize any of the data from this or other sources. The ER should provide separate estimates and a discussion of non-radiological worker injuries and fatalities for the activities occurring at each site (i.e., the NECR Mine Site and the UNC Mill Site inclusive of NECR mine waste haul road between the two sites) during each phase (construction, NECR mine waste transfer, and closure of the proposed disposal area) and provide a basis for those estimates.

This information is needed in accordance with 10 CFR 51.45(c), which requires analyses in ERs to be quantitative to the fullest extent practicable and contain sufficient data to aid the NRC in its development of an independent analysis.

RAI POH-I Response

The following text will replace the last paragraph of Section 3.11.5.

Due to the current inactive facility status, there are currently no existing measurements associated with non-radioactive constituents of concern for the Proposed Action relative to occupational health standards. Accordingly, the only available data for evaluation of worker risk is for miners (i.e., not remedial workers). Though not directly relevant to Proposed Action activities evaluated herein, the data do provide a level of understanding of non-radiological constituent risks (health, mortality) posed to workers exposed from uranium mining and processing activities, as well as for exposures to equipment fumes (e.g., diesel) during the Proposed Action.

Under the Proposed Action, workers would be exposed to non-radiological contaminants and physical hazards present at the Mine and Mill Site as follows:

- Exposure associated with residual non-radiological metals, such as uranium and arsenic
- Exposure associated with the fugitive dust
- Exposure associated with diesel gaseous emissions and associated particulate matter
- Hazards associated with material transport

Information on the outcomes of these exposures to workers undertaking the Proposed Action are discussed below in the context of occupational risk and mortality data identified for non-remedial workers.

Due to uranium's low specific activity, health effects from uranium exposure are mostly attributed to the chemical properties of uranium (ATSDR, 2011). Uranium metal's main target is the kidneys. Kidney damage has been observed in both humans and animals following the inhalation or ingestion of uranium compounds. Kidney damage has not been consistently found in soldiers with uranium metal fragments in their bodies for several years. Epidemiological studies have been conducted to assess the potential health effects of occupational exposure to uranium. The Royal Society performed an extensive meta-analysis of 14 studies (11 from the United States and 3 from the United Kingdom) to examine the adverse health effects associated with work in the wider uranium industry—including uranium processing, uranium enrichment, uranium fuel fabrication, phosphate fertilizer production, and employment at other uranium-contaminated sites (Royal Society, 2001). The review included approximately 120,000 workers with 33,000 observed fatalities associated with multiple causes. Health outcomes included all-cause mortality, deaths from 13 specific cancer types, and from genitourinary disease as a primary cause of death. The meta-analysis did not observe statistically significant increases in all-cause mortality, all cancer mortality, or mortality due to specific cancers, or genitourinary disease for uranium workers. Identified limitations with the meta-analysis included a lack of specific uranium exposure data, potential double counting of workers that were common to more than one study, inclusion of subjects with little or no uranium exposure, lack of co-exposure data for toxicants other than uranium, and a tendency for workers to be healthier than the general reference population. These limitations notwithstanding, the report authors concluded that it would not be justified to infer that adverse health effects associated with occupational uranium exposures do not exist.

The National Research Council performed a review of uranium worker epidemiological studies that overlapped somewhat with the Royal Society's earlier review (National Resource Council, 2008). The National Resource Council report also noted many of the same limitations of these studies. The report

similarly concluded that there were no statistically significant excess mortality outcomes observed among nearly 110,000 uranium workers from cancer or renal (kidney) disease in the combined study population. It should be noted that without controlling for the concurrent exposure of uranium workers to radon and thoron progeny within the uranium mine areas, the results of epidemiological studies of uranium worker populations are likely inadequate for assessing the carcinogenic potential of uranium.

A study by Taeger et al. (2008) identifies the contributing effects of co-exposure to multiple carcinogens (including non-radiological constituents) in establishing mortality rates from lung cancer among uranium mine workers. Taegar et al. (2008) evaluated the proportional lung cancer risk of uranium miners from co-exposures to radon and the non-radiological constituents quartz (silica) and arsenic. The researchers reported that the proportional lung cancer mortality of uranium workers was approximately three times higher than that observed in the general population. The risk factors for lung cancer among these uranium workers were cumulative radon, quartz (silica) and arsenic exposure.

Even though a dust-control system will be implemented under the Proposed Action, another potential occupational exposure for the remedial worker under the proposed plan is inhalation of fugitive dust including silica. During the actual operational period of the site, the Mine Safety and Health Administration (MSHA) monitored airborne dust in the mill complex twice annually (D'Appolonia, 1981). Five samples were taken and analyzed for silica content. As is typical practice, notice of violations are transmitted to the mine operators only when either a violation of standards or of any identified worker health risks are found. The MSHA has not identified any violations at the Mill (D'Appolonia, 1981). Under the Proposed Action, a dust control plan included in Appendix Q of the 95% Design Report (MWH, 2018) will be implemented prior to initiation of any earthwork activities at the Mine and Mill Sites (including borrow areas). The dust control plan will mitigate the generation of dusts containing toxic and carcinogenic non-radiological constituents and hence, will reduce occupational exposure and health risk from fugitive dusts to remedial workers.

Exposure to diesel emission may also result in potential health effects to workers. Diesel engine exhaust consists of respirable carbonaceous particulates that absorb organic chemicals, including polycyclic hydrocarbons. The health effects of diesel exhaust have been well studied in numerous epidemiological studies of occupational groups exposed to diesel emission. Evidence of lung cancer has been identified, reviewed, and summarized by numerous agencies, including the National Research Council (National Research Council, 1981) and the International Agency for Research for Cancer (IARC, 1989). Although the 1981 National Resource Council study found no evidence for the carcinogenic effect of diesel exhaust, the 1989 IARC study concluded that the diesel exhaust was "probably carcinogenic to humans." As a part of the Proposed Action for the site, green remediation best management practices (BMPs) will be implemented throughout the remedial action process to reduce the emission of diesel and other greenhouse gases. Emission reduction requirements are included in the Technical Specifications (Appendix J of MWH, 2018). In addition, an air monitoring program will be implemented to measure the concentration and the size of the particulates (i.e., present in the air).

During 2014, a standalone transportation study, *Risk Assessment for the Transport of Radioactive Materials for the Proposed URENCO USA Facility Capacity Expansion Lea County, New Mexico* was conducted to identify the potential for impacts from accidents during the increased frequency of transport of radiological materials (LPES, 2014). The study was conducted in accordance with the NRC NUREG- 0170 and NUREG/CR 4829 Guidance. Table 5-1 of the study presents the results of potential non-radiological impacts in terms of fatalities resulting from traffic accidents during the shipment of

radioactive material. Fatalities from traffic accidents were estimated to be 0.0942 individuals per year in the peak year, or one fatality every 10.5 years due to trucking accidents involving transport of non-radiological materials along all combined routes and shipments. These accident and fatality rates are identical to the national averages for the same activities accounting for approximately 5.5 million kilometers (3.4 million miles) of truck travel each year. These data suggest that there is not likely to be an increased risk of traffic fatalities from non-radiological materials transport during the Proposed Action above national average rates.

RAI CB-I. Provide additional details concerning the calculations and assumptions made for the cost comparison calculations for Alternative B and Alternative C, as discussed in ER Table 7.0-1.

Details on the cost comparison calculations for Alternatives B (i.e., using the conveyor system) and C (i.e., using the Jetty Area for material sourcing) are provided in Sections D. 1 and D2, respectively, of ER Appendix D, "Cost Comparison Calculations." However, ER Appendix D does not provide sufficient information for the NRC staff to (i) independently follow how the cost estimate for Alternative C in ER Table 7.0-1, "Summary of Estimated Costs for Alternatives, " was calculated, and (ii) understand the rationale for how the values for some of the input parameters {i.e., values for any cost per loose cubic yard, cost per ton, and cost per square meter [or square foot], and cost per meter [or foot] were determined. UNC should provide additional information specifying how the costs in ER Table 7.0-1 were calculated and provide a justification for the sources of information used to establish input parameters used for these cost estimations (e.g., unit costs).

This information is needed in accordance with 10 CFR 51.45(c), which requires that the ER include consideration of the benefits and costs of the proposed action as well as contain sufficient data to aid the NRC in its development of an independent analysis.

RAI CB-I Response

Heavy industry benchmarking from RS Means (https://www.rsmeans.com/) for the 2nd Quarter of 2017 for Gallup NM, were used in accordance with the American Association of Cost Engineers (AACE) Class 4 (-) 20% to (+) 30% estimate guidelines. Detailed activities used in the cost buildup are shown below.

RSMeans Cost Book

Data Release: Year 2017 Quarter 2
Data Type: Unit Cost
Cost Book: Heavy

City Cost Index (CCI)

Country: United States
State/Region: NM
City: GALLUP, 873

	Case 2 - Haulage & Revegetation		Labor	Equipment	Materials	O&P	Total		
1	**Haulage from Jetty - 3,550 ft**	**1**						**$ 1,840,750**	**Each**
1.1	Haulage from Jetty - 3,550 ft	497,500						$ 1,840,750	L.C.Y.
1.11	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 22 C.Y. truck, cycle 3300 ft, 15 MPH, excludes loading equipment		$ 0.64	$ 2.69		$ 0.37	$ 3.70		
2	**North Burrow**	**1**						**$ 681,252**	**Each**
2.1	Haulage from North Burrow - 4,421 ft	71,000						$ 265,453	L.C.Y.
2.1.1	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 22 C.Y. truck, cycle 4400 ft, 15 MPH, excludes loading equipment		$ 0.65	$ 2.71		$ 0.38	$ 3.74		
2.2	Revegetation of North Burrow - 384,636 SF	384,636						$ 415,798	S.F.
2.2.1	Seeding rye, fine textured, with mulch and fertilizer, 10 lb. per M.S.F., hydro or air seeding	385	$ 21.08	$ 9.02	$ 31.90	$ 0.56	$ 62.56	$ 24,063.82	M.S.F.
2.2.2	Soil preparation, structural soil mixing, spread soil conditioners, manure, 18#/S.Y., tractor spreader	385	$ 3.94	$ 1.06	$ 957.33	$ 0.22	$ 962.55	$ 370,231.42	M.S.F.
2.2.3	Rough grading sites, open, per 100000 S.F., grader	4	$ 3,137.50	$ 2,062.50		$ 390.49	$ 5,590.49	$ 21,503.25	Ea.
3	**South Burrow**	**1**						**$ 1,123,145**	**Each**
3.1	Haulage from South Burrow - 2,800 ft	160,000						$ 558,283	L.C.Y.
3.1.1	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 22 C.Y. truck, cycle 2800 ft, 15 MPH, excludes loading equipment		$ 0.60	$ 2.53		$ 0.36	$ 3.49		
3.2	Revegetation of South Burrow - 522,528 SF	522,528						$ 564,862	S.F.
3.2.1	Seeding rye, fine textured, with mulch and fertilizer, 10 lb. per M.S.F., hydro or air seeding	523	$ 21.08	$ 9.02	$ 31.90	$ 0.56	$ 62.56	$ 32,690.70	M.S.F.
3.2.2	Soil preparation, structural soil mixing, spread soil conditioners, manure, 18#/S.Y., tractor spreader	523	$ 3.94	$ 1.06	$ 957.33	$ 0.22	$ 962.55	$ 502,959.38	M.S.F.
3.2.3	Rough grading sites, open, per 100000 S.F., grader	5	3137.5	2062.5		$ 390.49	$ 5,590.49	$ 29,211.86	Ea.
4	East Burrow	1						**$ 559,116**	**Each**
4.1	Haulage from East Burrow - 2,129 ft	55,000						$ 181,832	L.C.Y.
4.1.1	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 22 C.Y. truck, cycle 2000 ft, 15 MPH, excludes loading equipment		$ 0.57	$ 2.40		$ 0.34	$ 3.31		
4.2	Revegetation of East Burrow - 349,008 SF	349,008						$ 377,284	S.F.
4.2.1	Seeding rye, fine textured, with mulch and fertilizer, 10 lb. per M.S.F., hydro or air seeding	349	$ 21.08	$ 9.02	$ 31.90	$ 0.56	$ 62.56	$ 21,834.84	M.S.F.
4.2.2	Soil preparation, structural soil mixing, spread soil conditioners, manure, 18#/S.Y., tractor spreader	349	$ 3.94	$ 1.06	$ 957.33	$ 0.22	$ 962.55	$ 335,937.69	M.S.F.
4.2.3	Rough grading sites, open, per 100000 S.F., grader	3	3137.5	2062.5		$ 390.49	$ 5,590.49	$ 19,511.25	Ea.
5	West Burrow	1						**$ 675,617**	**Each**
5.1	Haulage from West Burrow - 3,476 ft	89,000						$ 322,194	L.C.Y.
5.1.1	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 22 C.Y. truck, cycle 3500 ft, 15 MPH, excludes loading equipment		$ 0.62	$ 2.63		$ 0.37	$ 3.62		
5.2	Revegetation of West Burrow - 326,935 SF	326,935						$ 353,422	S.F.
5.2.1	Seeding rye, fine textured, with mulch and fertilizer, 10 lb. per M.S.F., hydro or air seeding	327	$ 21.08	$ 9.02	$ 31.90	$ 0.56	$ 62.56	$ 20,453.90	M.S.F.
5.2.2	Soil preparation, structural soil mixing, spread soil conditioners, manure, 18#/S.Y., tractor spreader	327	$ 3.94	$ 1.06	$ 957.33	$ 0.22	$ 962.55	$ 314,691.32	M.S.F.
5.2.3	Rough grading sites, open, per 100000 S.F., grader	3	3137.5	2062.5		$ 390.49	$ 5,590.49	$ 18,277.26	Ea.

Figure 1. RAI CB-I Response

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