APPENDIX H
AIR MONITORING PLAN

Prepared for:

United Nuclear Corporation
P.O. Box 3077
Gallup, NM 87305

General Electric Company
640 Freedom Business Center
King of Prussia, PA 19406

DRAFT

PERIMETER AIR MONITORING PLAN

EAST DRAINAGE REMOVAL ACTION CONSTRUCTION WORK PLAN
NORTHEAST CHURCH ROCK MINE SITE

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Prepared by:

MWH
1475 Pine Grove Road, Suite 109
P.O. Box 774018
Steamboat Springs, Colorado 80487
(970) 879-6260

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1.0 INTRODUCTION

This Perimeter Air Monitoring Plan (PAMP) has been prepared for construction activities that will be conducted for the East Drainage Removal Action (RA) at the Northeast Church Rock (NECR) Mine site, as described in the *East Drainage Removal Action Construction Work Plan* (MWH, 2012). The radiation protection program that will be followed during the RA includes, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve doses to members of the public that are as low as is reasonably achievable (ALARA), in accordance with the Code of Federal Regulations, Title 10, Part 20, Subpart D, *Radiation Dose Limits for Members of the Public*. The purpose of this PAMP is to establish air monitoring, sampling and analysis protocol for construction activities to demonstrate protection of individual members of the public that meets the dose limits defined in 10 CFR 20, Appendix B, Table 2. In order to achieve this, air monitoring will be conducted at upwind and downwind locations for internal and external radiation.

The methods that will be used to monitor internal and external radiation exposure are described in the *Standard Operating Procedure for Perimeter Airborne Particulate Monitoring*, which is included in Attachment A and are discussed below.

The perimeter air monitoring program will also include monitoring for respirable dust according to EPA's Primary National Ambient Air Quality Standard during. Respirable dust will be monitored during the beginning stages of construction to determine any long-term measures that may need to be taken to protect employee health during construction activities.

Records of environmental monitoring implemented during the RA at the NECR will be maintained and will be provided with the RA Final Construction Report. The records shall include surveys and calibrations, individual monitoring results, prior occupational doses, special exposures, dose to public, notifications of incidents, and reports to individuals.

2.0 RADIATION MONITORING

2.1 INTRODUCTION

Perimeter air monitoring for internal and external radiation exposure to individual members of the public will be conducted using the methods descried here, and as summarized on Table 1, *Summary of Perimeter Air Monitoring Program*.

To evaluate the potential internal radiation exposure, air particulates will be collected on a 47-mm Type A/E glass fiber air filters using air samplers (e.g., RAS-2). The loaded filter will be counted on-site for gross alpha activity. Individual airborne concentrations will be determined for U-234, U-238, Ra-226, and Th-230 from their activity fraction of the gross alpha activity of dust material, which has the potential for becoming airborne. Since these radionuclides are in secular equilibrium in uranium ore dust, their airborne concentrations will be determined by multiplying the airborne gross alpha activity by 0.25. These concentrations will be compared to the air concentration values specified in Table 2 of Appendix B to 10 CFR Part 20 for evaluation. These calculations can be conducted daily, as needed.

To evaluate potential internal airborne radon and radon progeny concentrations, track etch radon monitors will be submitted for laboratory analysis. The track etch monitors will be analyzed by the manufacturer Landauer quarterly or at the end of project.

To evaluate potential external radiation exposure, environmental thermoluminescent dosimeters (TLDs) will be submitted for laboratory analysis on a quarterly basis. Until the TLD results have been received from the laboratory, external exposure to gamma radiation will be estimated based on weekly area exposure rate field measurements using a calibrated micro-R-meter.

The results and measurements will be compared against the limits presented in Section 2.3. If any exceedances of the limits are observed, construction will stop, USEPA will be notified, and construction will not resume until the cause(s) for the exceedances can be identified and rectified. The results of these monitoring activities will be transmitted to the USEPA with the monthly status reports.

Records of environmental monitoring implemented during the RA at the NECR will be maintained and will be included in the East Drainage RA Final Construction Report required by the AOC. The records shall include surveys and calibrations, individual monitoring results, prior occupational doses, special exposures, dose to public, notifications of incidents, reports to individuals and any planned special exposures.

2.3 RADIATION CRITERIA

2.3.1 Internal Radiation Criteria

The individual airborne concentrations obtained from the gross alpha activity counts and estimates from the track etch monitors will be reviewed to assess compliance with the following internal radiation dose limits for individual members of the public as specified in 10 CFR § 20.1302(b) and NMAC 20.3.4.414:

U-234:	3.0E-12 μCi/ml
U-238:	3.0E-12 μCi/ml

Ra-226: 9.0E-13 μCi/ml
Th-230: 2.0E-14 μCi/ml
Rn-222: 1.0E-08 μCi/ml

The Rn-222 limit for the class "with daughters removed" is used because the track etch radon monitor is equipped with a filter that removes the daughters prior to the measurement.

2.3.2 External Radiation Criteria

The quarterly TLD laboratory results and weekly field gamma results will be reviewed to assess compliance with the following external radiation dose limits for individual members of the public as specified in 10CFR20.1301 and NMAC 20.3.4.413 (see Table 1):

- Total effective dose equivalent of 0.1 rem (100 mrem) per year to individual members of the public; and

- Maximum dose rate of 0.002 rem/hour and 0.05 rem per/year in the unrestricted area from external radiation sources.

If any member of the public enters any controlled area which is located outside the restricted area, the above dose limits will apply.

2.2 MONITORING METHODS

2.2.1 Internal Radiation

In order to demonstrate compliance with the dose limits MWH will monitor:

(1) airborne gross alpha activity from particulates; and
(2) airborne radon and radon progeny concentrations.

Airborne gross alpha activity will be monitored by collecting approximately 8-hour air particulate samples (the potential maximum time of exposure based on the construction activities) for field analysis at locations both downwind and upwind of the construction activities using an Eberline RAS-2 air sampler (see Table 1). Consistent with the prior IRA, air samples will be collected on day one, three and five from the start of excavation activities. After the first five days, samples will be collected weekly or if excessive wind prevents adequate dust control. If sampling data indicates that gross alpha activity is greater than 0.25 times the airborne concentration limits, air sampling will be increased to three days per week. Gross alpha activity measurements will be measured at one location upwind of the construction activities to establish background and generally two downwind locations: one downwind of the Soil Consolidation Area to monitor soil placement activities, and one downwind of excavation activities. The location of the monitoring station downwind of the excavation activities will be adjusted based on the where excavation is taking place.

To evaluate potential internal radiation exposure, the RAS-2 air filters will be counted on-site for gross alpha activity from uranium, Ra-226 and Th-230 after radon progeny from the particulate sample has decayed, generally 72 hours, using an Alpha Radiation Counting Instrument such as Eberline SAC R-5.

Airborne radon and radon progeny concentrations will be monitored continuously for the duration of excavation and soil placement activities with track etch radon monitors at one upwind and two downwind locations: one at the edge of the NECR-1 pad and a second downwind of excavation

activities; these locations will be fixed for the duration of construction activities. Track etch monitors will be replaced quarterly or at the end of the RA, and analyzed by the manufacturer (Landauer, Inc.). The turnaround time for analysis is about 7 to 10 days-

2.2.2 External Radiation

To evaluate external radiation exposure, both TLDs and direct gamma radiation exposure rate field measurement will be used. Exposure rate measurements will be made using a μR gamma survey meter. Exposure rate measurements will be performed weekly at the location of the environmental TLDs and at additional perimeter locations based on construction activities and environmental conditions.

TLDs will be used continuously for the duration of excavation and soil placement activities at one upwind and two downwind locations: one at the edge of the NECR-1 pad and a second downwind of excavation activities (i.e., the same locations as the track etch monitors); these locations will be fixed for the duration of construction activities. The TLDs will be analyzed by the manufacturer Landauer on a quarterly basis.

3.0 NUISANCE DUST MONITORING

The dust on-site has the potential to travel downwind during construction or affect workers and/or the public by means of inhalation during construction. Surficial contamination of sediments is of concern to MWH employees and subcontractors involved in excavation activities in the RA areas. To avoid creating dust during operations, construction will be subject to a dust control program, which will include spraying water over the working areas and constructed haul roads during operations, as described in the *Dust Control Plan* included with the *IRA Construction Work Plan*.

The perimeter air monitoring program will include monitoring for respirable dust (PM10 and PM 2.5, as per EPA's Primary National Ambient Air Quality Standard (40 CFR 50) during this project, especially during the beginning stages of construction to determine any long-term measures that may need to be taken to protect employee health. Monitoring will be conducted at an upwind location and two downwind locations: one at the edge of NECR-1 and one downwind of excavation activities. The location of the monitoring station downwind of excavation activities will move based on the location of the excavation activities. Dust monitoring will be conducted using a Model 8520 Dustrack Aerosol Monitor and will be conducted continuously during working hours (see Table 1).

The results of the dust monitoring will be reviewed and assessed to determine any potential health hazards or risks. Respirable dust standards shall be EPA's Primary National Ambient Air Quality Standards at 24 hour Time Weighted Average (TWA) of:

PM_{10}: 50 micrograms/cubic meter ($\mu g/m^3$)
$PM_{2.5}$: 35 $\mu g/m^3$

Personal air space monitoring necessary for MWH employees and the construction Contractor's employees will be performed in accordance with their respective Health and Safety Plans.

Table 1
Summary of Perimeter Air Monitoring Plan

Type	Instrumentation	Location[1]	Frequency	Action Level	Analysis
Radiation Monitoring					
Internal Radiation	RAS-2 Sampling pump with 47-mm Type A/E glass fiber filter	Upwind and 2 Downwind	Week 1 - Three days per week during working hours Thereafter - weekly (based on results)	U-234, U-238, Ra-226, and Th-230, air concentration values as specified in 10 CFR 20, Appendix B, Table 2.	Analyzed by RSO using an Alpha Radiation Counting Instrument
Internal Radiation	Landauer Radtrak Alpha-track detector	Upwind and 2 Downwind	Continuously for duration of project	Rn-222 dose limits as specified in 10 CFR 20, Appendix B, Table 2.	Analyzed by manufacturer Landauer quarterly or at end of project.
External Radiation	Landauner InLight Dosimeter	Upwind and 2 Downwind	Continuously for duration of project	Dose limits as specified in 10 CFR 20.1302(b)	Analyzed by manufacturer Landauer on a quarterly basis.
External Radiation	Ludlum Model 19 Micro R Meter.	Upwind and 2 Downwind	Estimate exposure rate weekly	Dose limits as specified in 10 CFR 20.1302(b)	Estimated by RSO
Airborne Dust Monitoring					
Airborne Dust	Model 8520 Dustrack Aerosol Monitor	Upwind and 2 Downwind	Continuously during working hours	24-hr TWAs for PM10 = 150 $\mu g/m^3$ & PM 2.5 = 35 $\mu g/m^3$ (40 CFR 50).	Direct read

Notes:

1. The downwind perimeter air monitoring location may be adjusted based on wind conditions and daily activities. The radtrak and dosimeter will be placed at fixed locations for the duration of construction.

ATTACHMENTS

AIRBORNE PARTICULATE MONITORING
STANDARD OPERATING PROCEDURE

1.0 SCOPE

1.1 Purpose

This procedure describes the method for determining the concentration of airborne radioactive particulate at the upwind and downwind boundary areas during the East Drainage Area IRA activities. The procedure is intended to:

1.1.1 Demonstrate compliance with the intake limits for general public specified in the Radiation Protection Program.

1.1.2 Determine whether exposures to radioactive materials are being maintained As Low As Reasonably Achievable (ALARA) as stated in the Radiation Protection Program.

1.2 Applicability

This procedure applies to all personnel under Radiation Safety Officer (RSO) supervision performing airborne particulate monitoring during IRA at NECR.

2.0 REFERENCES

2.2 Portable Instrument/Survey Record Procedure for Field Projects.

2.3 10 CFR 20, "Standards for Radiation Protection"

2.4 NRC Regulatory Guide 8.30, Health Physics Surveys in Uranium Mills

2.5 NRC Regulatory Guide 8.25, Calibration and Error Limits of Air Sampling Instruments for Total Volume of Air Sampled.

3.0 EQUIPMENT AND MATERIALS

3.1 Air Sampler: Eberline RAS-II Low Vol Air Sampler (40 – 60 liters per minute).

3.2 0.45 micron particulate GF filter media. Envelopes for Filter Storage or Petri dishes.

3.4 Alpha radiation Counting Instrument (Ludlum 2929 or similar)

3.5 Air Particulate Sampling Survey Report/Form (Appendix A or equivalent).

4.0 AIR SAMPLE COLLECTION INSTRUCTIONS

4.1 Select a suitable upwind or downwind location for sampling. The filter head should be situated at approximately three to five feet from the ground surface.

4.2 Select a calibrated Regulated Air Sampler (RAS-II). Install a 0.45 micron glass fiber filter in the filter head.

4.3 Determine the time and flow rate necessary to sample a volume sufficient to ensure that a

required Lower Limit of Detection (LLD) will be met.

4.4 Turn on the air sampling unit, adjust the flow rate to a the desired calibrated flow rate, and record the starting time, flow rate, vacuum, totalizer flow meter reading and initials of the technician in the Field Data Sheet. Record any other pertinent comments.

4.6 Periodically check air sampler unit for proper operation.

4.7 After the minimum collection time to meet the LLD requirement in Step 4.3, record ending flow rate, vacuum and time, and turn off the air sampling unit. Remove the air filter and place in sample envelope or petry dish and label it.

5.0 FILTER COUNTING INSTRUCTIONS

5.1 An initial 24 hour decayed count may be performed for informational purposes. Allow a minimum of 72 hours from the end of sample collection before counting sample (to allow for decay of interfering short-lived radon daughters) as appropriate. The LLD should be at least 10% of MPC (i.e. 8×10^{-13} μCi/ml for gross alpha based on Th-230 limit) for the final counting of the sample.

5.2 Count the samples per Reference 2.1

5.3 Record the results per Reference 2.1

6.0 RECORDS

All forms generated as a result of this procedure shall be maintained throughout the duration of the project and then retained in the permanent project file.

AIR PARTICULATE SAMPLING FIELD DATA SHEETS

Sample #/Dish #_____ Date:_____

SOP:_____ Field Tech:_____

Area/Location/Assigned to:_____

_____

Sampler Used:_____ Filter Used:_____
Sampler Serial #:_____ Vac./Roto. Rdg(start)_____
Sampling Rate(SR):_____LPM Vac./Roto. Rdg(stop)_____

Time Start:_____Stop:_____Break Time:_____Elapsed(E):_____(min)
Volume of Air Sampled_____(ml)
(SR x E x 1000)

Initial Count

Alpha Counter_____, Efficiency_____ Bkg._____

Count Date and Time_____
Alpha Counts_____, Count Time_____
Bkg. Counts_____, Count Time_____
Gross Alpha_____ µCi/mL
LLD_____µCi/mL
% MPC_____

Final Count

Alpha Counter_____, Efficiency_____ Bkg._____

Count Date and Time_____
Alpha Counts_____, Count Time_____
Bkg. Counts_____, Count Time_____
Gross Alpha_____ µCi/mL
LLD_____µCi/mL
% MPC_____

Gross Alpha Activity, µCi/ml = $\frac{\text{(Gross cpm –Bkg cpm)(FA)}}{\text{2.22E+6 (dpm/µCi) x Eff (cpm/dpm) x Sample Volume (ml)}}$

Estimated Error (uncertainty 95%), µCi/ml = $\frac{\text{1.96 x (FA) x \{(Gross cpm/t min,Gorss)+(Bkg cpm/t, min Bkg)\}\^0.5}}{\text{2.22E+6 (dpm/µCi) x Eff (cpm/dpm) x Sample Volume (ml)}}$

LLD, µCi/ml = $\frac{\text{4.66 x (FA) x [(Bkg counts)\^0.5]/t min, Bkg count time}}{\text{2.22E+6 (dpm/µCi) x Eff (cpm/dpm) x Sample Volume (ml)}}$

*Filter Absorption (FA) = 1.25 for glass fiber filters; 1.0 for Cellulose nitrate filters