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NORTHEAST CHURCH ROCK MINE
INTERIM REMOVAL ACTION

COMPLETION REPORT

June 29, 2010

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CERTIFICATION

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Lance Hader
GE, Corporate Environmental Programs
Designated Project Coordinator

1.0 INTRODUCTION

This Interim Removal Action (IRA) Completion Report provides information on removal action and results of sampling and testing completed as part of IRA activities at and adjacent to the Northeast Church Rock (NECR) Mine (the mine site). The Site is located approximately 16 miles northeast of Gallup, McKinley County, New Mexico, as shown on Drawing 1, *Cover and Index Sheet*. The original ground conditions that were present prior to the IRA construction are shown on Drawing 2, *Original Conditions*.

Removal activities were performed per the *Administrative Settlement Agreement and Order on Consent for Removal Site Evaluation* (AOC), dated July 24, 2009, the *Interim Removal Action Work Plan, Northeast Church Rock Mine Site*, dated July 24,2009, and the *Northeast Church Rock Mine, Interim Removal Action Construction Plan*, dated August 3, 2009. Major activities completed during the IRA include:

- Removal of soils from the NECR-1 Step-Out area with mean Radium 226 (Ra-226) concentrations above the Site Screening Level of 2.24 pCi/g (subsequently adopted and hereafter referred to as the IRA Action Level) that were potentially attributable to historic activities at the NECR mine site.

- Regrade of the side-slopes and top surface of the NECR-1 pad and consolidation of excavated materials from the NECR-1 Step-Out area on the pad. Soil cover placement on the pad and establishment of drainage controls to manage stormwater runoff from the pad.

- Temporary housing for residents of three nearby home sites.

- Investigation of Red Water Pond Road and the adjacent right-of-ways to determine which portions of this area may require removal actions.

- Seeding and fencing of areas disturbed by removal activities.

This report describes the activities performed to comply with the AOC and has been prepared to meet the requirements of the Section 33 of the AOC and referenced regulations and guidance documents. This report is organized into five Sections.

- Section 1 provides a brief introduction to the project and the activities performed.
- Section 2 describes removal activities performed in the Step-out Area and in the mine permit area.
- Section 3 presents the results of the Post-IRA Status Survey of the Step-out Area and the final status survey of the Unnamed Arroyo excavation.
- Section 4 presents the results of the Red Water Pond Road investigation.
- Section 5 provides an estimate of the total costs incurred implementing the AOC.

2.0 IRA REMOVAL ACTIVITIES

2.1 REMOVAL SCHEDULE

Removal activities were implemented between August 17, 2009 and May 21, 2010. Major earthworks were conducted between August 2009 and January 2010. Removal activities were suspended through February and March 2010 due to poor weather. Final removal activities including seeding and fencing were completed in May 2010.

2.2 RESIDENT HOUSING

Temporary housing was provided to residents of three households located in or adjacent to the Step-out Area as a convenience to nearby residents in consideration of potential noise and similar inconveniences associated with nearby construction activity. Temporary housing was provided from August 29, 2009 through January 18, 2010. Southwest Indian Foundation assisted GE and UNC with the temporary housing effort and provided support to the families during the removal period. Temporary housing was provided in accordance with the Temporary Housing Plan as approved with modifications by EPA on August 15, 2009 and EPA's temporary housing agreements with the residents.

2.3 NECR-1 STEP-OUT AREA

In August 2009, prior to removal, removal areas were delineated by AVM, Inc. Delineation of the removal boundaries was performed in accordance with the methods and procedures presented in Attachment C of the AOC. The removal boundary was recorded with a differentially corrected GPS. The final removal boundary is shown on Drawing 3, *Final Conditions* and more details of the final conditions are shown in Drawing 4, *Detailed Final Conditions Step-out Area*. Photos showing removal activities are included in Appendix A.

Prior to the start of removal activities, sediment control measures were installed as presented in the IRA Work Plan (MWH, 2009). Sediment control measures were maintained throughout removal activities and were removed following completion of seeding. Temporary access roads were established within the Step-out Area to allow transport of all impacted soils to the mine.

Access to removal areas was controlled using orange temporary snow fencing strung between t-posts. All personnel and equipment leaving the controlled area were screened, commonly referred to as frisked, for the presence of radioactive material on the hands, face and feet of personnel and tires and floorboards of equipment and vehicles. No elevated radioactive measurements were identified during the frisking process.

A total of approximately 109,800 cubic yards of soils were removed from the Step-out Area which was calculated from the pre- and post-work topographic survey of the NECR-1 Pile (see Drawings 2 and 7).

2.3.1 Traditional Cultural Properties

Prior to implementing the removal action, Dinetahdoo Cultural Resource Management conducted a cultural survey of the work area. On May 15, 2009 Dinetahdoo submitted a report on the findings to Navajo Nation Historic Preservation Department (NNHPD). On June 6, 2009, the NNHPD issued a Cultural Resources Compliance Form providing notice to proceed.

One traditional cultural property (TCP) was identified during the cultural resources survey. Materials exceeding the IRA action level located adjacent to the outside of the limits of the TCP were removed on September 22, 2009. Consistent with the compliance form, an archaeologist from Dinetahdoo Cultural Resource Management (Dinetahdoo) was on site to supervise material removal within 50 feet of the TCP. An existing fence surrounding the TCP was left in place and materials within the fence were not disturbed.

A second potential TCP was identified on the top of the hillside in Zone 2 by local resident Teddy Nez during removal activities. This second TCP was located outside the removal boundary. The site was recorded by Dinetahdoo and its location was discretely marked and materials within the marked area were not disturbed.

2.3.2 Step-out Area Excavation and Backfill

Excavation of materials in the Step-out Area that exceeded the IRA action level was conducted from north to south, including the access road through the Step-out Area from RWPR to the unnamed arroyo crossing. A number of methods were used to remove the material depending on the depth of removal and ground conditions in the area. Open areas with few obstacles (roads, utilities, fences, etc.) were excavated by stockpiling surface materials with dozers, loaders, or motor grader. Other areas including excavations to greater depth and/or around obstacles were excavated with an excavator. Depth of excavation varied from six inches to about eight feet in discrete areas. Areas of deeper excavation are shown on Drawing 4. Following gamma surveying and sampling, deep excavations were backfilled to the elevation of surrounding grade with material from the borrow area. Excavated materials were hauled to the NECR-1 pile and used to establish the top grade of the pile.

During work, to facilitate school bus pick-up/drop-off outside the work area, a turnout was constructed on the east side of the unnamed arroyo. Following removal, approximately six inches of road base was applied to the top of reclaimed roads and drainage swales were constructed on both sides of the road. The existing culvert at the east end of the access road near Red Water Pond Road was removed and replaced with a new culvert. Similarly, approximately six inches of road base was placed on portions of the driveways to the Nez residence that were located within the removal area and disturbed by the work.

2.3.3 Hillside Removal

In an effort to preserve trees, removal of materials in the hillside area was initially performed using small skid steer tractors and manually using shovels. Limbs of trees were trimmed to allow access by laborers and skid steers and a small number of trees were removed to allow access by equipment to haul excavated materials from the hillside. Trees and limbs that were removed were moved to the stockpile area located east of Pond 3, as shown on Drawing 3.

Radiological scanning following removal of material by skid steers and hand shoveling indicated that this method was not achieving the removal objective. Additional trees were removed and a small dozer (John Deere 850) was used to remove material between trees. Following removal of approximately six inches of material from around some trees, it was observed the trees were not stable against strong winds and blew down. At EPA's request, additional gamma surveying was performed and GE presented options for achieving an alternative cleanup level in this area (including the unrestricted use standard applied under the Uranium Mill Tailings Radiation Control Act or UMTRCA) that would allow the majority of trees to be preserved.

Following discussions with EPA in consultation Navajo Nation EPA, EPA instructed GE to remove the majority of the trees from the hillside and remove soils to meet the removal objectives. Navajo Nation officials concurred on this decision. All removed trees were stockpiled on the mine site. All removed soils were hauled to the NECR-1 Pile.

2.3.4 Petroleum Impacted Soils

Petroleum impacted soils were encountered in the southern portion of the Step-out Area near the NECR-1 pile at the locations shown on Drawing 4. Approximately 4,000 cubic yards of impacted soils were removed in connection with the effort to remove visibly impacted soil, obtain the proposed 2.5V:1H slope on the face of NECR-1, and identify the limits of the impacts. Excavated materials were placed on the mine in the Stockpile Area east of Pond 3, as shown on Drawing 3. The Stockpile Area was underlain and overlain with six mil plastic liner.

Additional investigation into the extent of petroleum impact and alternatives for remediation are being conducted outside the scope of this AOC, as presented in the November 13, 2009 (amended January 21, 2010) letter to the EPA, titled *Work Plan for Evaluating Petroleum Impacted Soils* (MWH).

2.4 UNNAMED ARROYO

The unnamed arroyo was excavated from the south end, starting at the Navajo Reservation boundary, and working to the north end, just past the culverts, as shown on Drawing 5, *Plan and Profile, Unnamed Arroyo*. A John Deere 460 tracked Excavator was used for the removal. At the south end of the arroyo where the excavation was the deepest, the excavator casted material onto the east bank of the arroyo where it was loaded into trucks and hauled to the NECR-1 pile where it was used to establish the top

grade of the pile. Where the excavation was shallower and trucks were able to safely approach the excavation area, the material was direct loaded into the trucks. To provide safe access for removal and haulage equipment, the east bank of the arroyo was laid back to approximately a 3:1 (horizontal:vertical) slope. The soils removed to slope the excavation were placed on the top of the NECR-1 pile. The approximate volume of material excavated from the arroyo was 33,000 cubic yards. This estimate is based on the estimated excavation dimensions at each sample location.

Once results of onsite sample analysis indicated that remaining soils on the sides and bottom of the excavation were below the field screening level, the arroyo was backfilled with soils from the borrow area. The soils were placed and compacted in accordance with the approved backfill compaction plan included in Appendix B.

Following backfill of the excavation, eight inches of bedding material and 16 inches of riprap were placed in the channel to bring it back to approximate original grade. At the request of EPA, smaller rock and gravel were placed in the arroyo to create a vehicle by-pass road and a foot-path. Results of analytical and gradation testing of the riprap materials are included in Appendix C.

Three, two-foot diameter, 20-foot long culverts were installed to replace the existing single 18 inch, 15 foot long culvert where the access road through the Step-out Area crosses the unnamed arroyo (see Drawing 5). The culverts were installed in accordance with the approved IRA Work Plan (MWH, 2009). The elevation of the downstream side of the culverts was raised and a riprap apron was placed downstream to control future erosion. Approximately two feet of material was placed over the culverts and railroad ties were stacked two high at the sides of the roadway. Finally, reflectors were placed at the approaches to the crossing at both ends.

The final conditions of the unnamed arroyo are shown in plan and profile views on Drawing 5, and cross-sections across the arroyo are shown on Drawing 6, *Unnamed Arroyo Sections*.

2.5 NECR-1 PILE

2.5.1 Demolition of Existing Structures and Concrete Pads

Existing structures and concrete pads were demolished from August 17 through October 8. Building materials and concrete debris were hauled to the Stockpile Area located east of Pond 3, as shown on Drawing 3.

Floor tiles on some of the concrete pads were identified as asbestos containing material. Asbestos containing materials were removed between October 1 and 6, 2009 by Southwest Abatement in accordance with the Asbestos Abatement Workplan submitted to EPA on September 15, 2009 and approved by EPA with modifications on September 29, 2009. Asbestos containing material was disposed of at the EPA-approved Butterfield Station Landfill in Mobile, AZ. Asbestos removal permits and disposal manifests, providing material quantities, are included in Appendix D.

2.5.2 Grading of NECR-1 Pile

Grading of the NECR-1 pile occurred from August 24 through January 8, 2010. Grading included cutting of the slopes to a grade no steeper than 2.5V:1H and placing fill materials excavated from the Step-out Area and unnamed arroyo on the top surface to establish drainage from the east side of the pile to Pond 3.

Grading of the slope of the pile was accomplished using dozers and excavators. Excavators were used to remove material from the top and bottom of the pile to establish the final crest and toe. Material from the middle of the slope that could not be removed by the excavators and direct loaded into the haulage trucks was pushed to the bottom of the slope by dozers. At the bottom of the slope, this material was loaded into haulage trucks and hauled to the top of the pile. All material excavated from the slopes was placed as fill on the top surface of the pile. Approximately 22,540 cubic yards of material was excavated from the slope.

A channel was constructed with material from the borrow area along the north slope of the pile. This channel conveys runoff from the slope to a sediment pond located within the mine permit area south of the reservation boundary. The channel and sediment pond are shown on Drawing 7, *Detailed Final Conditions NECR-1.*

Materials removed from the slopes of the pile, from the Step-out Area and from the unnamed arroyo were placed on the top surface and east slope of the NECR-1 pile. These materials were used to establish a top surface grade that directs runoff from the top surface of the pile into Pond 3. Approximately 22,800 cubic yards of additional material was placed on the NECR-1 Pile above that estimated in the IRA Work Plan. To accommodate this extra material, the east slope of the pile was extended to the east and the top surface elevation was increased.

The final conditions of the NECR-1 pile, based on topographic survey performed following placement of cover material, are show on Drawing 7. An isopach map of the cut and fill thicknesses are shown on Drawing 8, *Cut-Fill Isopach, NECR-1*, and cross-sections through the pile are shown on Drawing 9, *NECR-1 Pile Sections.*

2.5.3 NECR-1 Pile Cover

Following final grading of the slope and consolidated material on the top surface, the NECR-1 Pile was covered with material from the borrow area. The top surface of the pile was covered with a minimum of six inches of material and the slope was covered with a minimum of 12 inches of material. Grade stakes were used to place the cover to the required thickness. Total estimated cover volume based on the area of the slopes and top surface is 17,600 cubic yards.

2.6 SOIL AMENDMENT, SEEDING AND PLANTING

Following completion of the removal activities, reclamation of the disturbed areas was performed between March 25 and April 2, 2010 in accordance with the February 9, 2010 Vegetation Plan.

Areas to be seeded were first disced to prepare the seed bed. Sterile organic mulch was applied at a rate of approximately 4 tons/acre to approximately 22 acres of the Step-out Area north and west of the limit of mulch line shown on Drawing 3. Mulch was applied using a hydro-seeder. The sterile organic mulch was disced into the surface soil prior to application of seed. The 13 acres between the control berm and the reservation boundary and the top surface of the NECR-1 Pile (11 acres) did not receive mulch.

Following preparation, seed specified for broadcasting was applied using a centrifugal broadcaster attached to a tractor. Drill seed was then applied using a range land drill seeder. Seeding equipment was not able to work on the slopes of the NECR-1 Pile. The slope was seeded by hand broadcasting and then hand raking the seed into the soil. Following seeding, the six acres of the slope of the NECR-1 Pile received 2 tons/acre of hydro-straw mulch with tacifier.

Seed certificates for all seed applied are included in Appendix E. The preferred seed mix called for 0.75 lbs/acre of Alkali Sacaton which was not available at the time of seeding. Sand Dropseed, an approved alternate seed was substituted for Alkali Sacaton. The seed mix used is shown in Table 1, *2010 IRA Seed Mix.*

TABLE 1
2010 IRA SEED MIX

Common Name	Scientific Nomenclature	Rate (PLS lbs/ac)[1]	Preferred Seeding Method
Western Wheatgrass	Agropyron smithii	1.50	Drill
Blue Grama	Bouteloua gracilis	0.50	
Galleta	Hiliaria jamesii	0.50	
Thickspike Wheatgrass	Agropyron dasystachyum	0.75	
Indian Ricegrass	Oryzopsis hymenoides	1.00	
Sideoats Grama	Bouteloua curtipendula	1.00	
Bottlebrush Squirreltail	Sitanion hystrix	0.25	
Fourwing Saltbush	Atriplex canescens	1.00	
Winterfat	Ceratoides lanata	1.00	
Desert Globemallow	Sphaeralcea ambigua	0.75	Broadcast
Sand Dropseed[2]	Sporobolus cryptandrus	0.25	
Palmer Penstemon	Penstemon palmeri	0.50	
Rocky Mtn. Penstemon	Penstemon strictus	0.25	
Lewis Flax	Linum lewisii	1.00	
Wyoming Big Sagebrush	Artemisia tridentata wyo.	0.25	
Cliffrose	Purshia stansburiana	1.00	

Notes:
1 PLS = Pure Live Seed
2 Sand Dropseed was substituted for Alkali Sacaton, which was not available at time of planting

2.7 POST-REMOVAL SITE CONTROL

Following seeding of disturbed areas, fencing was installed around the Step-out Area, and fencing along the mine permit boundary that had previously been removed to accommodate removal activities was replaced. Merrill Fencing Company of Gallup, New Mexico performed fence construction. The purpose of the fencing around the Step-out Area is to restrict access to seeded areas by grazing animals to improve vegetative success. The alignment of the fence is shown on Drawing 3.

The fence consists of metal t-posts driven into the ground at approximately 10 foot centers. Hog wire was placed from ground level to four feet above ground. Two strands of barbed wire were installed above the hog wire. Total fence height is approximately five feet.

Sediment in the existing cattle guard at Red Water Pond Road was cleaned out and a new cattle guard was installed in the access road just east of the unnamed arroyo. The new cattle guard has an HS-20 rating. Gates were installed at the locations shown on Drawing 3. Additional gates were installed adjacent to the cattle guards to allow the cattle guards to be bypassed if required.

2.8 ENVIRONMENTAL MONITORING

Environmental monitoring performed during removal activities included air monitoring of internal and external radiation dose using Eberline RAS air samplers, Track Etch monitors for monitoring of Radon exposure, environmental thermoluminescent dosimeters (TLD) for monitoring of external radiation dose, and Dustrack monitors for respirable dust monitoring. Results of environmental monitoring are included in Appendix F and are summarized below. All radiological monitoring results were below the action levels presented in the IRA Work Plan (MWH, 2009). On two occasions $PM_{2.5}$ respirable dust data were above the actions levels. These data points coincide with the burning of garbage upwind of the monitor at a nearby residence, and as such were unrelated to the IRA activity or to historic mining impacts.

- External radiation dose was monitored continuously throughout the project at one upwind and two downwind locations and the total dose over the entire period was totaled. The dose limit for individual members of the public, as established in the IRA Work Plan, was 100 millirem (mrem). Total dose at the upwind location was 11.3 mrem, at the downwind station located near the residence in the Step-out Area it was 19.2 mrem, and at the downwind station located at the north end of the Step-out Area it was 11.0 mrem.

- Respirable dust was measured during working hours each working day. Respirable dust standards were based on the EPA's Primary National Ambient Air Quality Standards at 24 hour Time Weighted Average (TWA) of 150 micrograms/cubic meter ($\mu g/m^3$) for PM_{10} and 35 $\mu g/m^3$ for $PM_{2.5}$. Summary data are presented in Table 2, *Dust Monitoring Data Summary.*

TABLE 2 DUST MONITORING DATA SUMMARY				
Station	Particle Size	Concentration (µg/m^3)		
		Average	Minimum	Maximum
Down Wind N	PM10	0.012	0.000	0.339
	PM2.5	0.007	0.000	0.134
Down Wind W	PM10	0.014	0.000	0.383
	PM2.5	0.010	0.000	0.225
Up Wind	PM10	0.007	0.000	0.366
	PM2.5	0.004	0.000	0.027

- Internal exposure was monitored three days per week using an Eberline RAS-2 sampler. The action level for internal exposure was established as 25 percent of the Annual Limits of Intake (ALI) established by the Nuclear Regulatory Commission (NRC) in 10 CFR 20. Summary data of internal exposure monitoring are presented in Table 3.

TABLE 3 INTERNAL RADIOLOGICAL EXPOSURE DATA SUMMARY					
	Airborne Particulate Activity (uCi/ml)				
	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210
ALI (Limit)	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13
Action Level, 25% of ALI	4.5E-13	2.3E-13	2.3E-13	5.0E-15	1.5E-13
Mean, Downwind	1.9E-14	9.4E-15	4.7E-15	4.7E-15	3.7E-15
Mean, Upwind	1.5E-14	7.6E-15	3.8E-15	3.8E-15	3.0E-15
Mean, Net (Downwind minus upwind)	3.5E-15	1.8E-15	8.9E-16	8.9E-16	7.1E-16
Mean % of ALI, Net	0.20%	0.20%	0.10%	4.43%	0.12%
Max (Net)	2.3E-14	1.1E-14	5.7E-15	5.7E-15	4.6E-15
Max, % of ALI, Net	1.3%	1.3%	0.6%	28.5%	0.8%

Additional monitoring was provided to on-site workers to evaluate potential health and safety concerns specific to construction activities. Monitoring results are summarized below and indicate that criteria established within the EPA-approved safety plans for the project were met.

- Entrance and exit bioassays of uranium in urine were collected from site personnel and analyzed for total uranium. Analysis of results showed dose-producing intakes of uranium did not occur during project work.

- External radiation monitoring using TLD badges was performed for all site workers. The maximum individual exposure over the six months of site work was

8 mrem with a cumulative dose for all site workers of 48 mrem. The individual annual dose limit for a radiation worker is 5,000 mrem per year.

- Breathing zone air monitors were worn by four representative employees from the start of construction through the end of October 2009. Employees wearing the monitors varied from day to day and included laborers, operators and drivers. Filters from the breathing zone monitors were analyzed for alpha and beta emissions at the end of the day. The maximum dose recorded from the breathing zone monitors was 0.23 mrem for the day with an average dose for the group of 0.035 mrem/day. The maximum occupation annual dose for workers is 5,000 mrem per year or (approximately 100 mrem/day) combined from internal and external radiation exposures.

- Radioactive contamination monitoring, also called frisking, of equipment and personnel was performed at all site exits prior to personnel or equipment leaving the controlled work area. No elevated radioactive measurements were identified during the frisking process.

- On-site fugitive dust was monitored throughout removal activities. The dust monitor was setup within the active work area on the top surface of the NECR-1 Pile. The daily average never exceeded 1 mg/m^3 during removal activities, only six readings fell between 1 and 5 mg/m^3, and no readings exceeded 5 mg/m^3, the action level established for suspension of construction activities.

3.0 POST-IRA STATUS SURVEY

This section summarizes the results of the Post-IRA Status Survey of the Step-out Area and Final Status Survey of the Unnamed Arroyo conducted at the conclusion of IRA excavation activities. The surveying activities and the results of the statistical analysis are presented in detail in the report *Post-IRA Status Survey, Interim Removal Action* (MWH, 2010), which is included Appendix G. The status survey consisted of gamma surveying, soil sampling and analysis, and development of a revised and more accurate correlation between gamma measurements and equivalent Ra-226 concentrations. The Post-IRA Status Survey of the Step-out Area was conducted in accordance with the *Interim Removal Action Work Plan* (MWH, 2009), and the Final Status Survey of the arroyo was conducted in accordance with the *Work Plan for Final Status Survey of the Unnamed Arroyo* (MWH, October 2009).

The results of the gamma surveying and the soil analyses from the Step-out Area and unnamed arroyo show that the IRA of the unnamed arroyo meets the MARSSIM release criterion for the IRA action level. They also show that the IRA of the Step-out Area meets the MARSSIM release criterion for the IRA action level. As discussed in Appendix G, consistent with MARSSIM, the results exceeding the $DCGL_{EMC}$ were evaluated to assess if there are potentially any areas of elevated residual radioactivity that might result in a dose or risk exceeding the release criterion. The results of the gamma surveys and soil sampling confirmed that only a few small areas exceed the $DCGL_{EMC}$ and statistical analysis of all the survey and soil sampling results confirm that MARSSIM release criterion has been achieved for the step-out area.

4.0 CHARACTERIZATION OF RED WATER POND ROAD

Characterization of Red Water Pond Road (RWPR) took place from September 8 to 11, 2009. A detailed report including drawings presenting the characterization activities and results was submitted to EPA on January 26, 2010, *Removal Site Evaluation Report, Red Water Pond Road*, and is included in Appendix H. The results of the investigation conducted in the Study Area along RWPR indicated the following:

- Surface static gamma measurements collected during both the Supplemental RSE (SRSE) and the RWPR RSE, reported as equivalent Ra-226 concentrations using the SRSE correlation, exceeded the FSL at 100% of the locations within the 50-ft buffers and the roadway; all but four exceeded 3.0 pCi/g.

- Surface soil Ra-226 concentrations were greater than the FSL at 100% of the locations within the 50-ft buffers.

- Subsurface soil Ra-226 concentrations were less than the FSL at 100% of the locations (1 to 6 ft bgs) within the roadway.

- Subsurface soil Ra-226 concentrations were less than the FSL at all locations within the 50-ft buffers, except four test pits located along the northern portion of RWPR within approximately 600 feet of the east-west arroyo crossing to the Quivira Mine.

These results do not change the conclusions of the February 2009 statistical evaluation of the previous RSE gamma survey and surface soil data sets. The results of the evaluation indicated that the mean/median of the data for both the southern and northern sections of RWPR are statistically higher than adjacent areas immediately to the west in the NECR-1 Step-out Area. Overall, the results offer further indication that RWPR and the immediate buffer areas on either side of the roadway were likely impacted by historic use of the road by the operators of the Quivira Mine and subsequent disturbance of historic material by wind, water or vehicular traffic. Due to the proximity of NECR to the southern portion of RWPR and based on local drainage patterns in this area, past operations at the NECR site could also have caused some impact along the southern portion of the Study Area in addition to impacts from past use of RWPR as a haul road for the Quivira Mine. Impacts from NECR are considered unlikely to extend beyond the small drainage that crosses the central portion of the Study Area. Impacts along the northern portion of the Study Area are likely associated with the Quivira Mine due to the proximity of the mine, past use of RWPR as a haul road, and the potential for ongoing road use and maintenance to transport materials from the north side of the east-west arroyo into the Study Area.

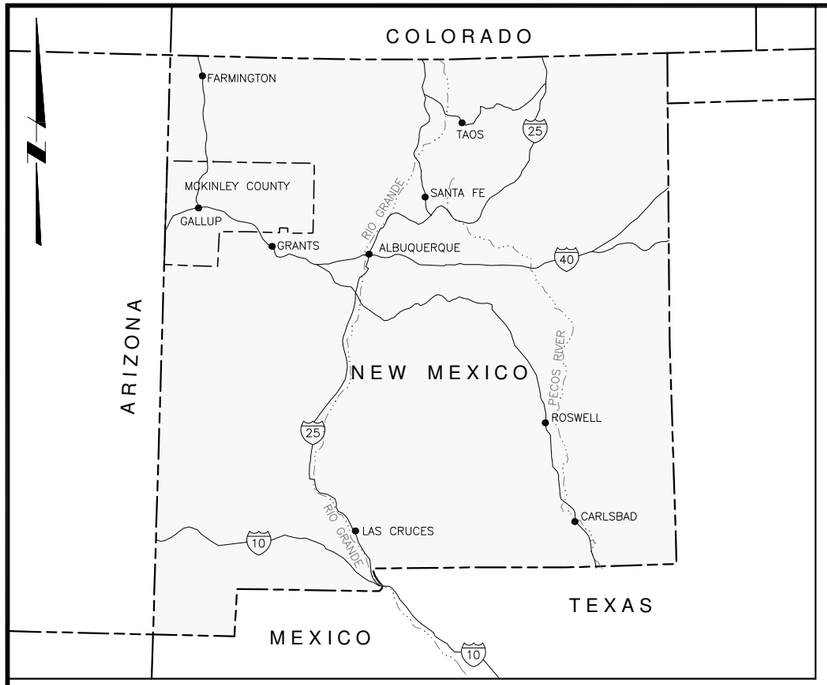
Based on the results of the Weston investigation and the RWPR RSE results from the northern portion of RWPR, further investigation of the continuing impacts to RWPR from the adjacent Quivira Mine may be appropriate. Unless the continuing impacts to RWPR from the area north of the east-west arroyo and adjacent to the Quivira mine are

addressed, any removal action conducted on RWPR is likely to only be temporarily effective.

5.0 ESTIMATE OF COSTS INCURRED

Estimate of costs incurred complying with the AOC is approximately $4.2 million. This includes costs to negotiate the AOC, prepare a design and work plans, removal, removal oversight, sampling and monitoring, and project management. This does not include costs incurred by EPA and its contractors and consultants.

DRAWINGS



LOCATION MAP
NOT TO SCALE

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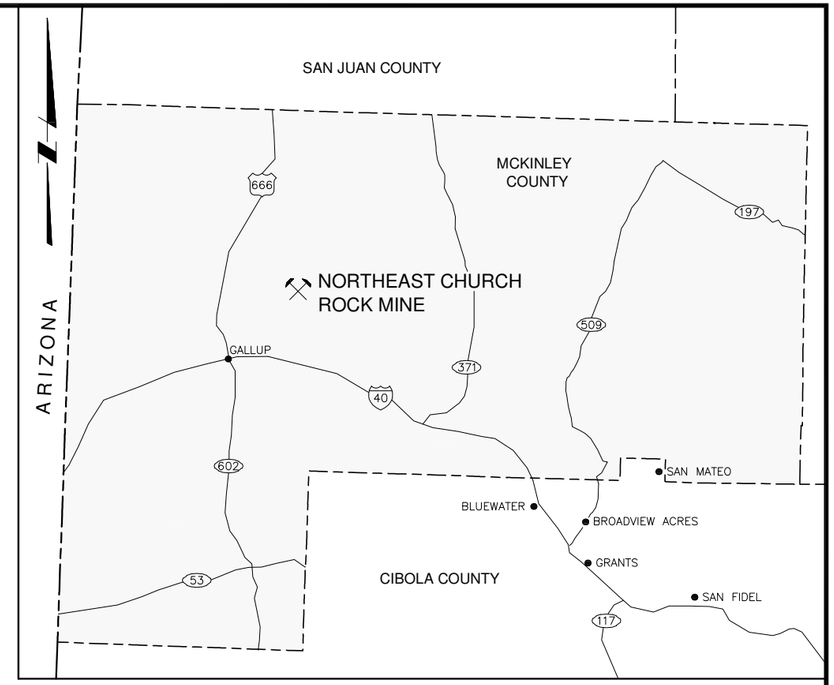

VICINITY MAP
NOT TO SCALE

NORTHEAST CHURCH ROCK MINE
IRA COMPLETION REPORT

Prepared for :

UNITED NUCLEAR CORPORATION

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ISSUE / REV	DESCRIPTION			
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		TECH	ENG	DATE

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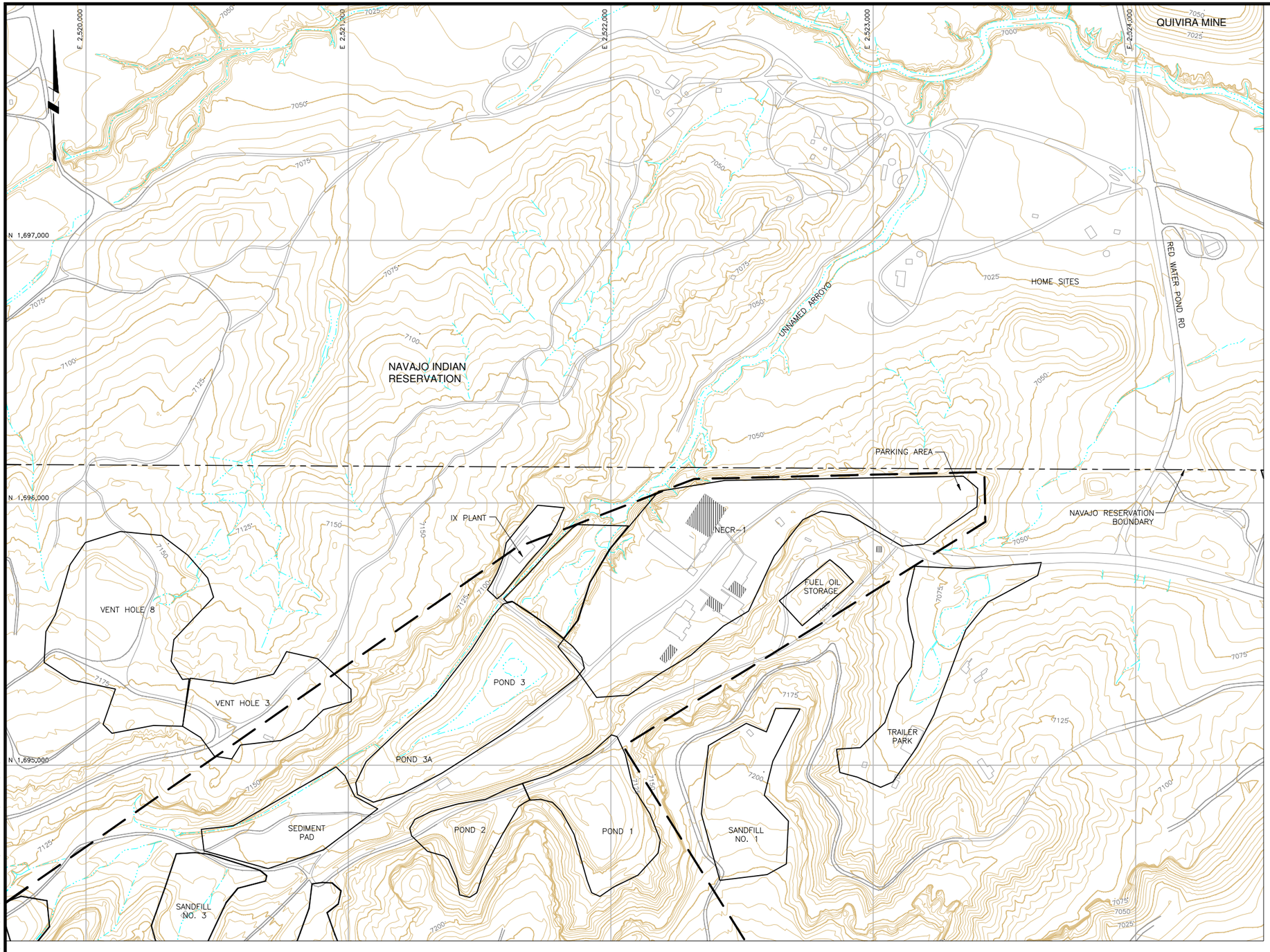
DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: COVER AND INDEX SHEET

MWH

DRAWING: 1 of 9
REVISION: 0
FILE NAME: 1008501D008



LEGEND:

- 7040 — PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- ASBESTOS REMOVAL AREA

PLAN

SCALE
200' 0 200' 400'
CONTOUR INTERVAL = 5'

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

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DRAWING REFERENCE(S):
ORIGINAL SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. AND USGS 10m DIGITAL ELEVATION MODELS (DEM).

PROJECTION:
STATE PLANE COORADINATES
ZONE:
NEW MEXICO WEST
DATUM:
NAD 83
UNITS:
US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: ORIGINAL CONDITIONS

MWH

DRAWING: 2 of 9
REVISION: 0
FILE NAME: 1008501D009

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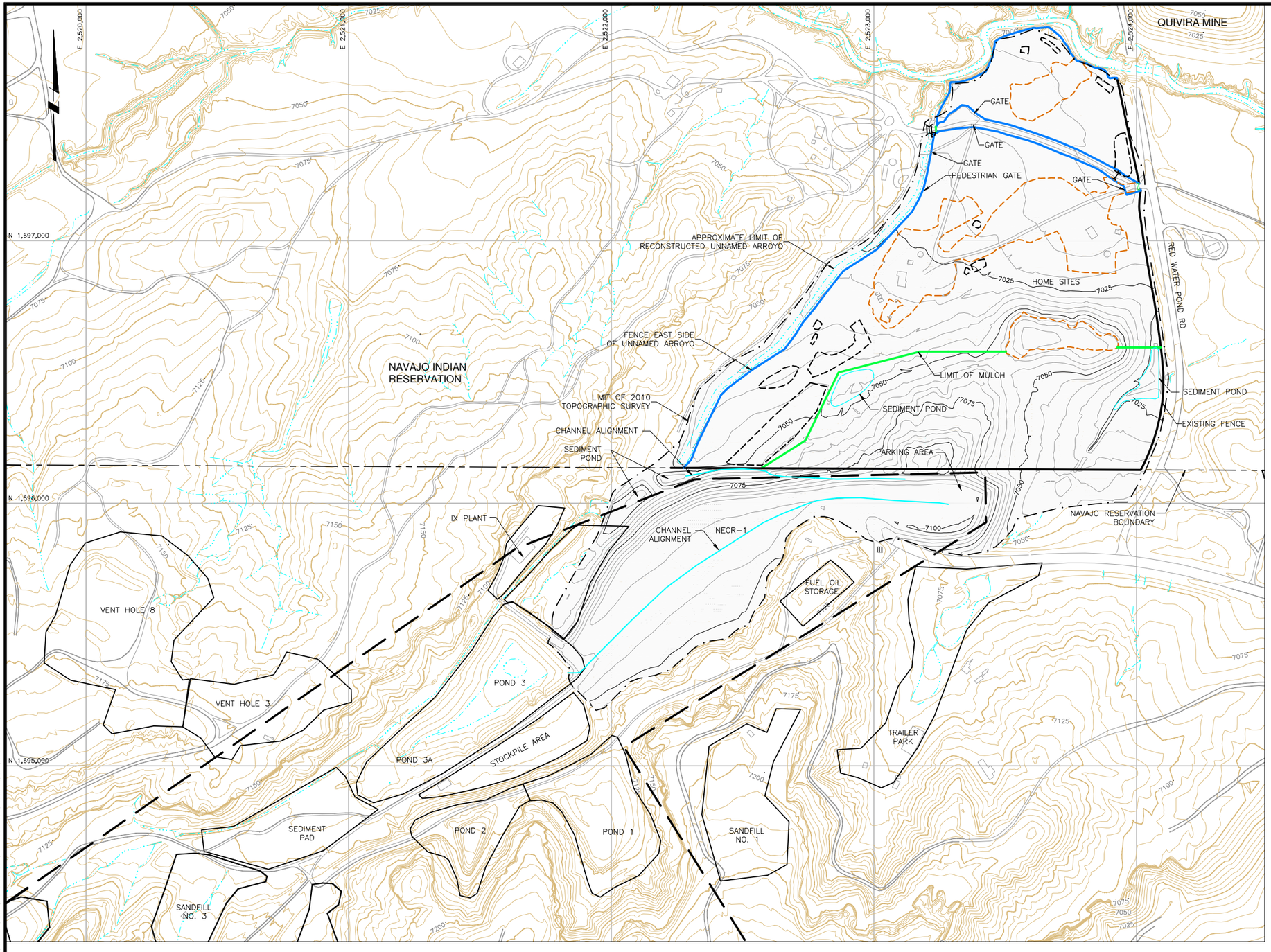

LEGEND:

- PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- IRA REGRADE GROUND SURFACE CONTOUR & ELEVATION, FEET
- LIMIT OF 2010 TOPOGRAPHIC SURVEY
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- INTERIM REMOVAL ACTION EXCAVATION BOUNDARY
- DEEP EXCAVATION BOUNDARY
- EXISTING FENCE
- NEW FENCE
- LIMIT OF MULCH
- CHANNEL ALIGNMENT
- PHYSICAL STRUCTURE
- CULVERTS
- CATTLE GUARD

PLAN

SCALE
200' 0 200' 400'
CONTOUR INTERVAL = 5'

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

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DRAWING REFERENCE(S):
1. ORIGINAL SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. AND USGS 10m DIGITAL ELEVATION MODELS (DEM).
2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.

ORIGINAL FILES LOCATED AT:
\\USSBS1S01\CAD_ENGINEERING_SUPPORT\DESIGN-DRAFTING\CLIENTS_O-Z\UNITED NUCLEAR CORPORATION\NECR\009-DRAWINGS FROM SUBCONTRACTORS\NECR IRA ASBUILT SURVEY\96012T0P03-MAY 24.DWG

PROJECTION:
STATE PLANE COORADINATES
ZONE:
NEW MEXICO WEST
DATUM:
NAD 83
UNITS:
US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: FINAL CONDITIONS

MWH

DRAWING: 3 of 9
REVISION: 0
FILE NAME: 1008501D010

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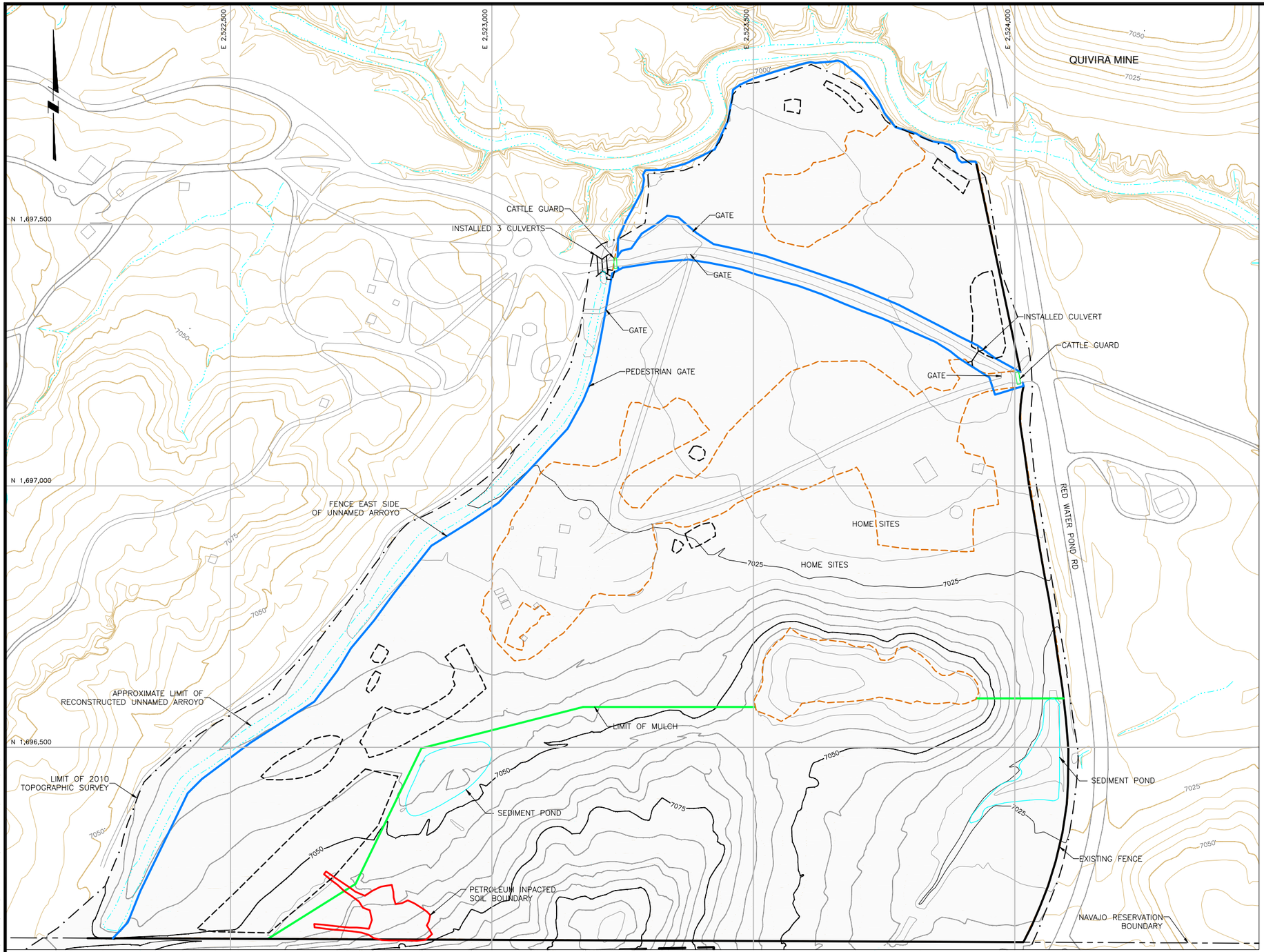

LEGEND:

- PRE–IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- IRA REGRADE GROUND SURFACE CONTOUR & ELEVATION, FEET
- LIMIT OF 2010 TOPOGRAPHIC SURVEY
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- INTERIM REMOVAL ACTION EXCAVATION BOUNDARY
- DEEP EXCAVATION BOUNDARY
- EXISTING FENCE
- NEW FENCE
- LIMIT OF MULCH
- CHANNEL ALIGNMENT
- PETROLEUM IMPACTED SOIL BOUNDARY
- PHYSICAL STRUCTURE
- CULVERTS
- CATTLE GUARD

PLAN

SCALE
100' 0 100' 200'
CONTOUR INTERVAL = 5'

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

DISCLAIMER:
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2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.
   ORIGINAL FILES LOCATED AT: \\USSBS1S01\CAD_ENGINEERING_SUPPORT\DESIGN–DRAFTING\CLIENTS_O–Z\UNITED NUCLEAR CORPORATION\NECR\009–DRAWINGS FROM SUBCONTRACTORS\NECR IRA ASBUILT SURVEY\96012TOPO3–MAY 24.DWG

PROJECTION:
STATE PLANE COORDINATES
ZONE:
NEW MEXICO WEST
DATUM:
NAD 83
UNITS:
US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: DETAILED FINAL CONDITIONS STEP OUT AREA

MWH

DRAWING: 4 of 9
REVISION: 0
FILE NAME: 1008501D012

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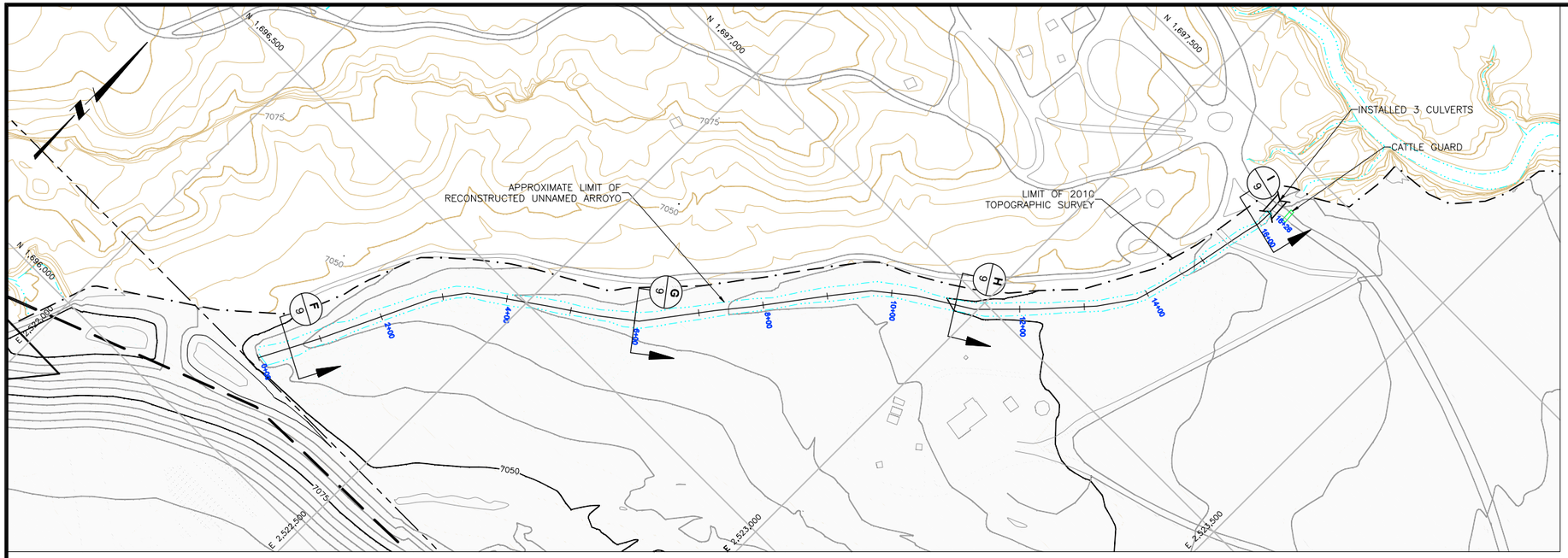
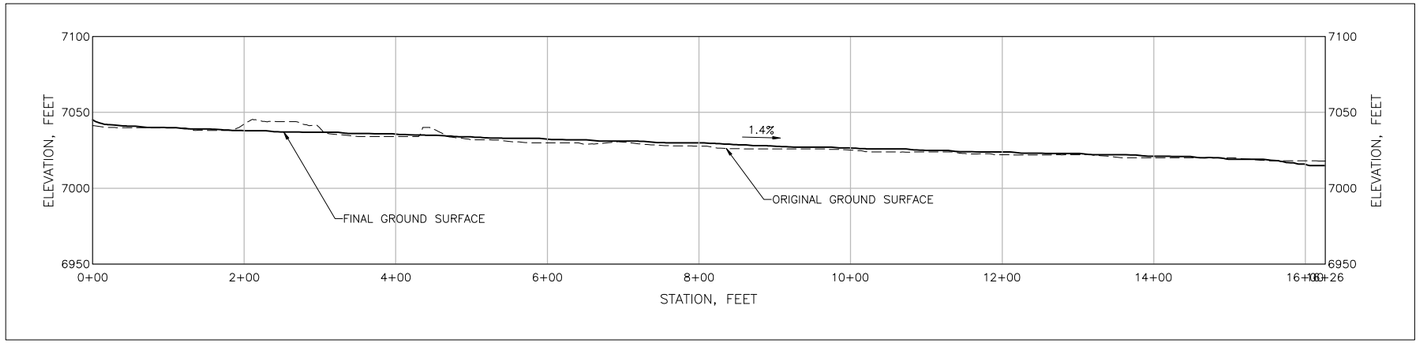


PLAN

SCALE
100' 0 100' 200'
CONTOUR INTERVAL = 5'

LEGEND:

- 7040 — PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- 7040 — IRA REGRADE GROUND SURFACE CONTOUR & ELEVATION, FEET
- LIMIT OF 2010 TOPOGRAPHIC SURVEY
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- CULVERTS
- CATTLE GUARD



PROFILE

UNNAMED ARROYO

VERTICAL SCALE
50' 0 50'

HORIZONTAL SCALE
100' 0 100'

VERTICAL EXAGGERATION = 2X

ISSUE / REV	DESCRIPTION			
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

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2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.

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PROJECTION:
STATE PLANE COORADINATES
ZONE:
NEW MEXICO WEST
DATUM:
NAD 83
UNITS:
US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: PLAN AND PROFILE UNNAMED ARROYO

MWH

DRAWING: 5 of 9
REVISION: 0
FILE NAME: 1008501D014

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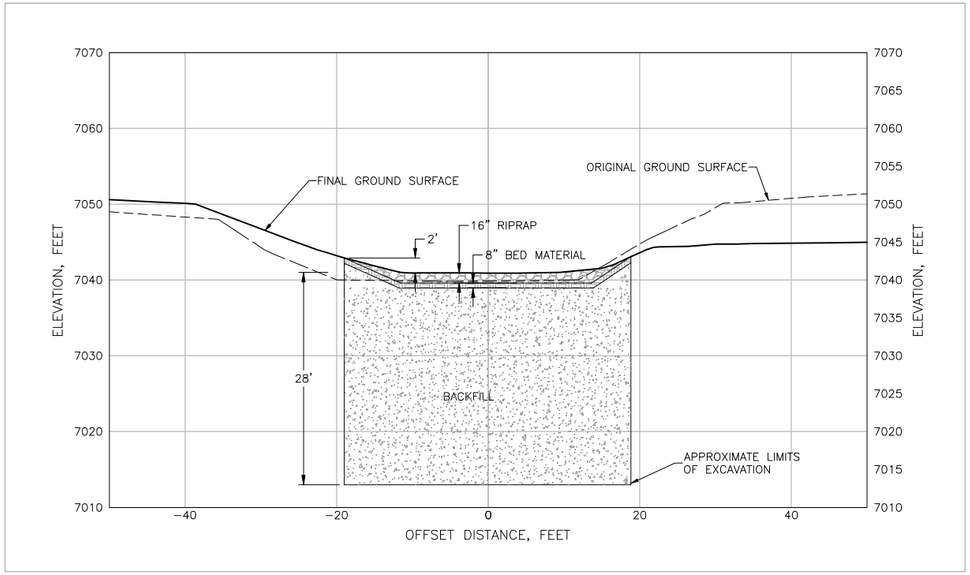
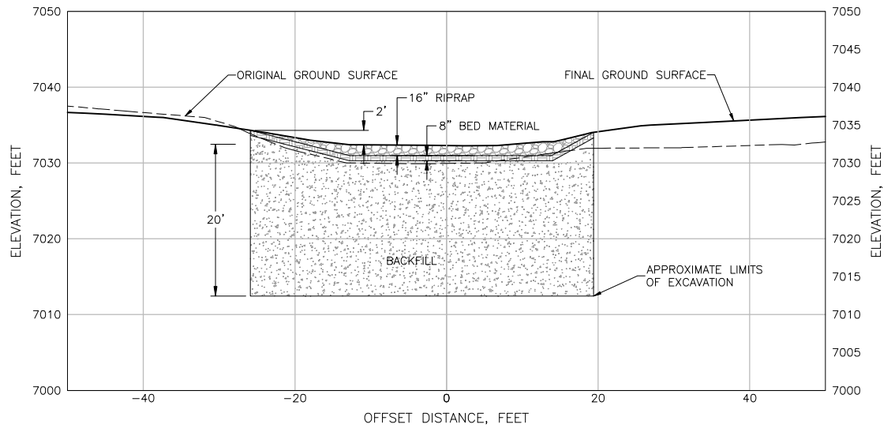


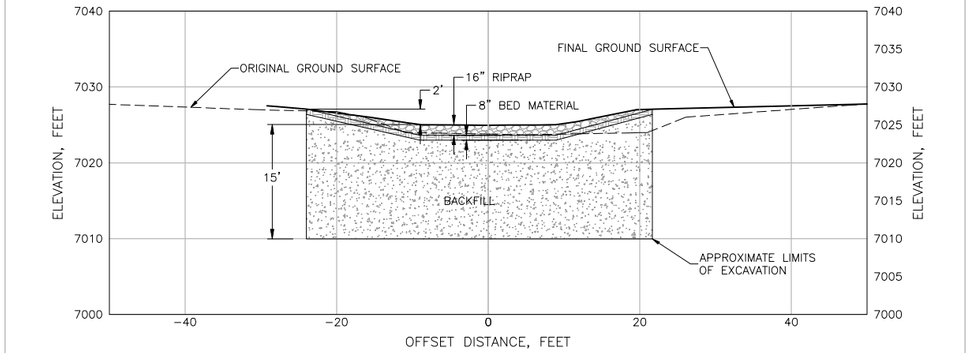
SECTION
F / 9
STATION 0+50

VERTICAL SCALE 10' 0 10'
HORIZONTAL SCALE 10' 0 10'
VERTICAL EXAGGERATION = 1X



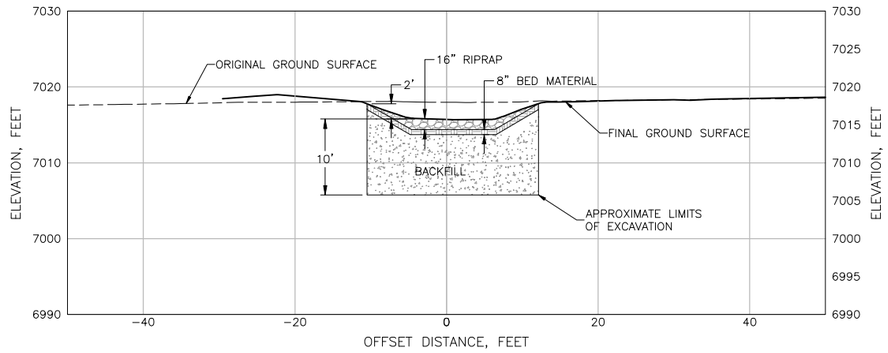
SECTION
G / 9
STATION 6+00

VERTICAL SCALE 10' 0 10'
HORIZONTAL SCALE 10' 0 10'
VERTICAL EXAGGERATION = 1X



SECTION
H / 9
STATION 11+00

VERTICAL SCALE 10' 0 10'
HORIZONTAL SCALE 10' 0 10'
VERTICAL EXAGGERATION = 1X



SECTION
I / 9
STATION 16+00

VERTICAL SCALE 10' 0 10'
HORIZONTAL SCALE 10' 0 10'
VERTICAL EXAGGERATION = 1X

ISSUE / REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

DRAWING REFERENCE(S):
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2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.

ORIGINAL FILES LOCATED AT:
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PROJECTION:
STATE PLANE COORADINATES
ZONE:
NEW MEXICO WEST
DATUM:
NAD 83
UNITS:
US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: UNNAMED ARROYO SECTIONS
DRAWING: 6 of 9
REVISION: 0
FILE NAME: 1008501D015

MWH

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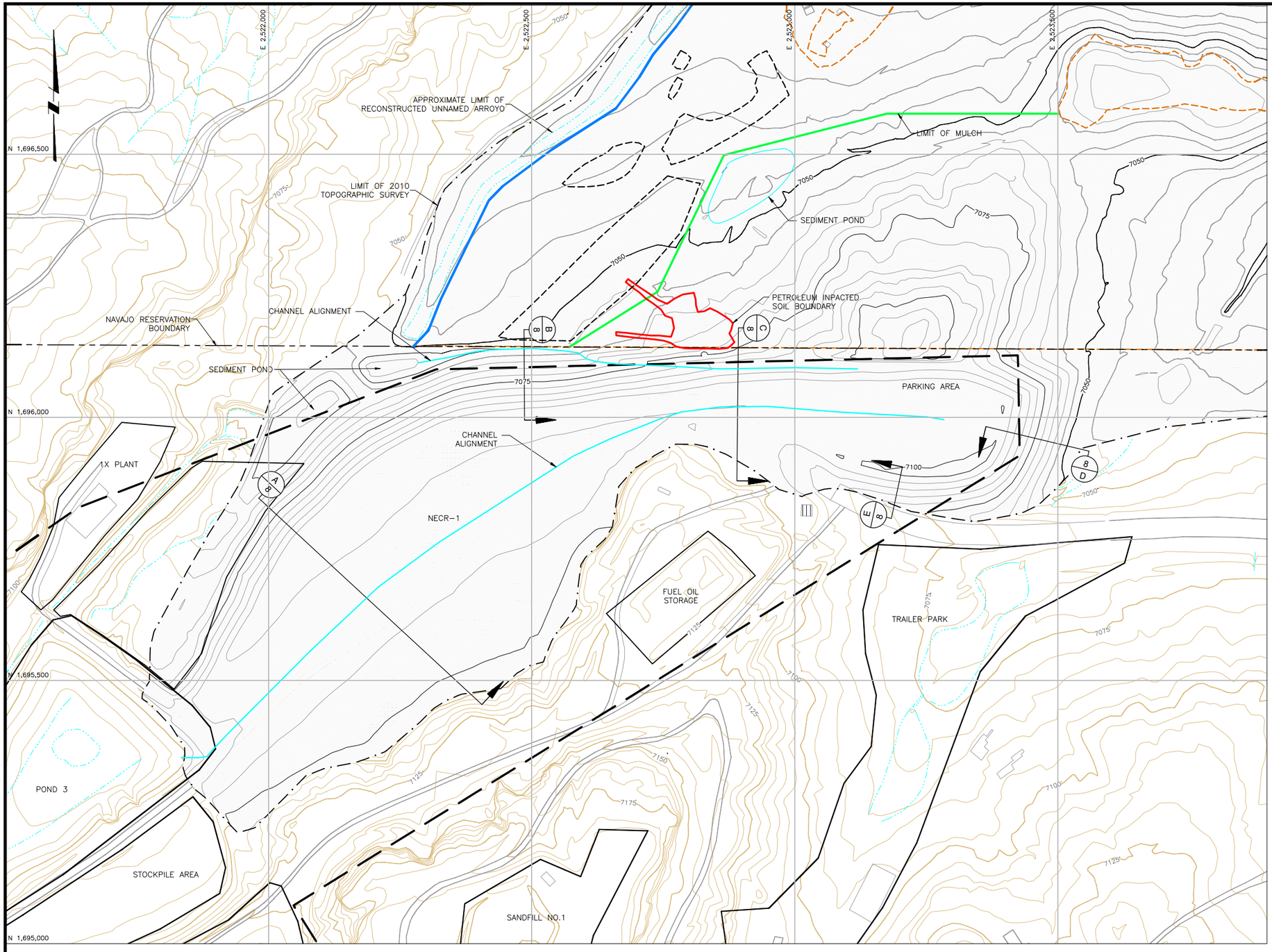

LEGEND:

- PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- IRA REGRADE GROUND SURFACE CONTOUR & ELEVATION, FEET
- LIMIT OF 2010 TOPOGRAPHIC SURVEY
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE NAVAJO RESERVATION BOUNDARY
- ROADS
- NATURAL DRAINAGE
- INTERIM REMOVAL ACTION EXCAVATION BOUNDARY
- DEEP EXCAVATION BOUNDARY
- EXISTING FENCE
- NEW FENCE
- LIMIT OF MULCH
- CHANNEL ALIGNMENT
- PETROLEUM IMPACTED SOIL BOUNDARY
- PHYSICAL STRUCTURE
- CULVERTS
- CATTLE GUARD

PLAN

SCALE
100' 0 100' 200'
CONTOUR INTERVAL = 5'

ISSUE / REV	DESCRIPTION			
0	ISSUED TO AGENCIES	CHF	JET	06/28/10
		TECH	ENG	DATE

DISCLAIMER:
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2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.

ORIGINAL FILES LOCATED AT:
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PROJECTION: STATE PLANE COORADINATES
ZONE: NEW MEXICO WEST
DATUM: NAD 83
UNITS: US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: DETAILED FINAL CONDITIONS NECR-1

MWH

DRAWING: 7 of 9
REVISION: 0
FILE NAME: 1008501D011

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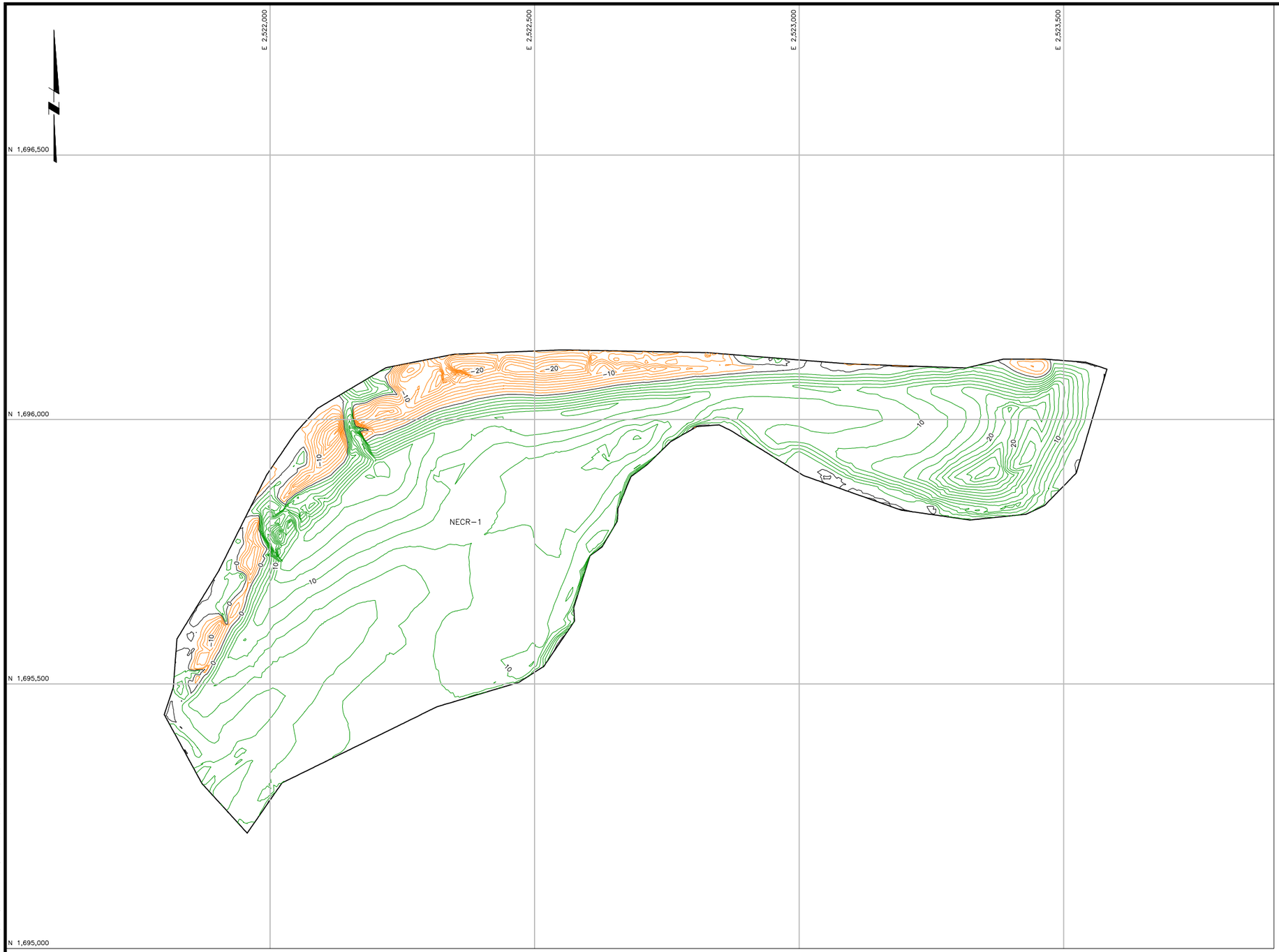

LEGEND:

–10 ISOPACH CUT

10 ISOPACH FILL

REGRADE BOUNDARY

VOLUME TABLE			
NAME	VOLUME CUT (C.Y.)	VOLUME FILL (C.Y.)	NET (C.Y.)
NECR–1	22,540	182,915	FILL: 160,375

PLAN

SCALE

100' 0 100' 200'

CONTOUR INTERVAL = 2'

ISSUE / REV	DESCRIPTION			
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

DISCLAIMER:
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2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.

ORIGINAL FILES LOCATED AT:
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PROJECTION:
STATE PLANE COORADINATES

ZONE:
NEW MEXICO WEST

DATUM:
NAD 83

UNITS:
US FEET

DESIGNED BY	J. THOMPSON	06/28/10
DRAWN BY	C. FOWLER	06/28/10
CHECKED BY	E. MARKS	06/28/10
APPROVED BY	J. THOMPSON	06/28/10
PROJECT MANAGER	T. LEESON	06/28/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE

PROJECT: IRA COMPLETION REPORT

TITLE: CUT-FILL ISOPACH NECR-1

MWH

DRAWING: 8 of 9

REVISION: 0

FILE NAME: 1008501D013

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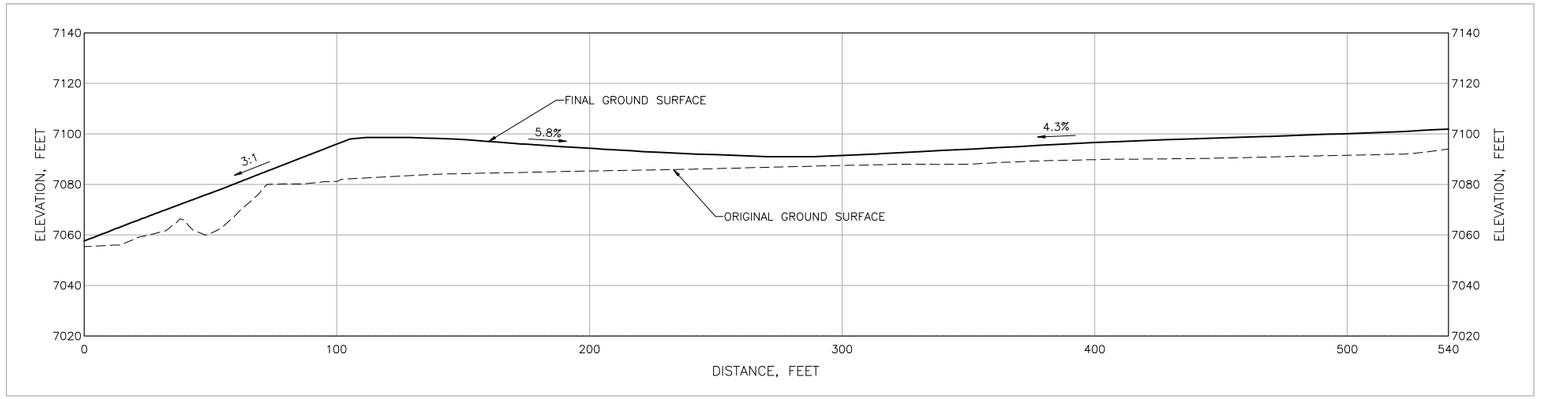
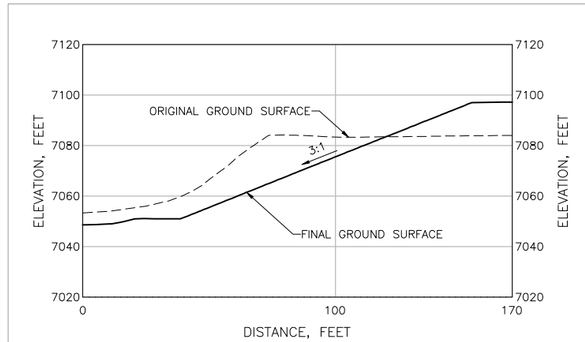


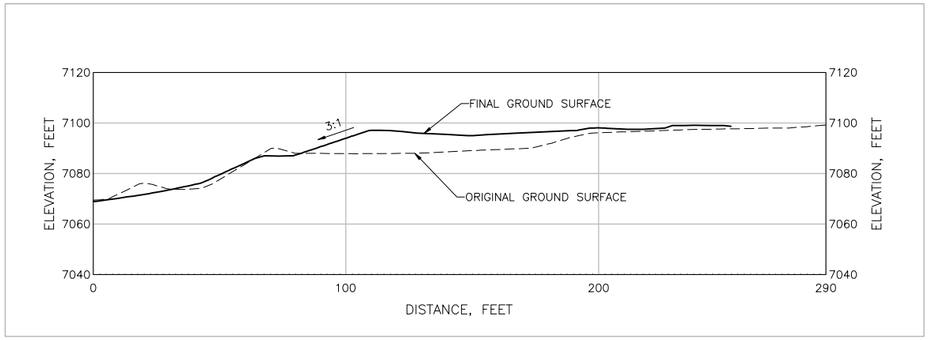
SECTION
A/8 NECR-1 WEST

VERTICAL SCALE 30' 0 30' HORIZONTAL SCALE 30' 0 30'
VERTICAL EXAGGERATION = 1X



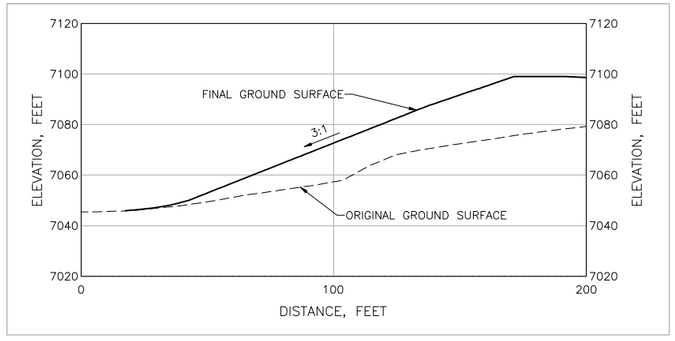
SECTION
B/8 NECR-1 NORTHWEST

VERTICAL SCALE 30' 0 30' HORIZONTAL SCALE 30' 0 30'
VERTICAL EXAGGERATION = 1X



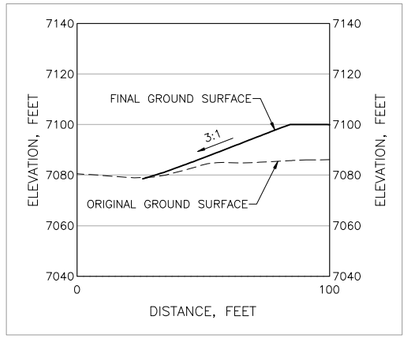
SECTION
C/8 NECR-1 NORTH

VERTICAL SCALE 30' 0 30' HORIZONTAL SCALE 30' 0 30'
VERTICAL EXAGGERATION = 1X



SECTION
D/8 NECR-1 NORTHEAST

VERTICAL SCALE 30' 0 30' HORIZONTAL SCALE 30' 0 30'
VERTICAL EXAGGERATION = 1X



SECTION
E/8 NECR-1 SOUTH

VERTICAL SCALE 30' 0 30' HORIZONTAL SCALE 30' 0 30'
VERTICAL EXAGGERATION = 1X

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED TO AGENCIES	CHF	JET	06/28/10

DISCLAIMER:
THIS DRAWING WAS DEVELOPED THROUGH THE APPLICATION OF PROFESSIONAL ENGINEERING SKILL AND PROPRIETARY METHODOLOGIES, PROCESSES, AND KNOW HOW OF MWH AS AUTHOR, ALL PURSUANT TO THE TERMS OF A CONTRACTUAL SCOPE OF WORK GOVERNING ITS PREPARATION. THIS DRAWING MAY NOT BE USED OR MODIFIED OTHER THAN IN STRICT ACCORDANCE WITH THE TERMS OF THE GOVERNING CONTRACT AND SCOPE OF WORK OR OTHERWISE ABSENT THE INVOLVEMENT AND CONSENT OF THE AUTHOR. ANY ALTERATION OR ADAPTATION OF THIS DRAWING SHALL BE CONSISTENT WITH THE AUTHOR'S CONTRACTUAL AND PROPRIETARY RIGHTS AND BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY OF MWH.

DRAWING REFERENCE(S):
1. ORIGINAL SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. AND USGS 10m DIGITAL ELEVATION MODELS (DEM).
2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.

ORIGINAL FILES LOCATED AT:
\\USSBS1S01\CAD_ENGINEERING_SUPPORT\DESIGN-DRAFTING\CLIENTS_Q-Z\UNITED NUCLEAR CORPORATION\NECR\009-DRAWINGS FROM SUBCONTRACTORS\NECR IRA ASBUILT SURVEY\96012TOPO3-MAY 24.DWG

PROJECTION: STATE PLANE COORADINATES
ZONE: NEW MEXICO WEST
DATUM: NAD 83
UNITS: US FEET

DESIGNED BY	J. THOMPSON	06/28/10	
DRAWN BY	C. FOWLER	06/28/10	
CHECKED BY	E. MARKS	06/28/10	
APPROVED BY	J. THOMPSON	06/28/10	
PROJECT MANAGER	T. LEESON	06/28/10	
CLIENT APPROVAL	XXX		
CLIENT REFERENCE NO.			

UNC
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: IRA COMPLETION REPORT
TITLE: NECR-1 PILE SECTIONS

MWH

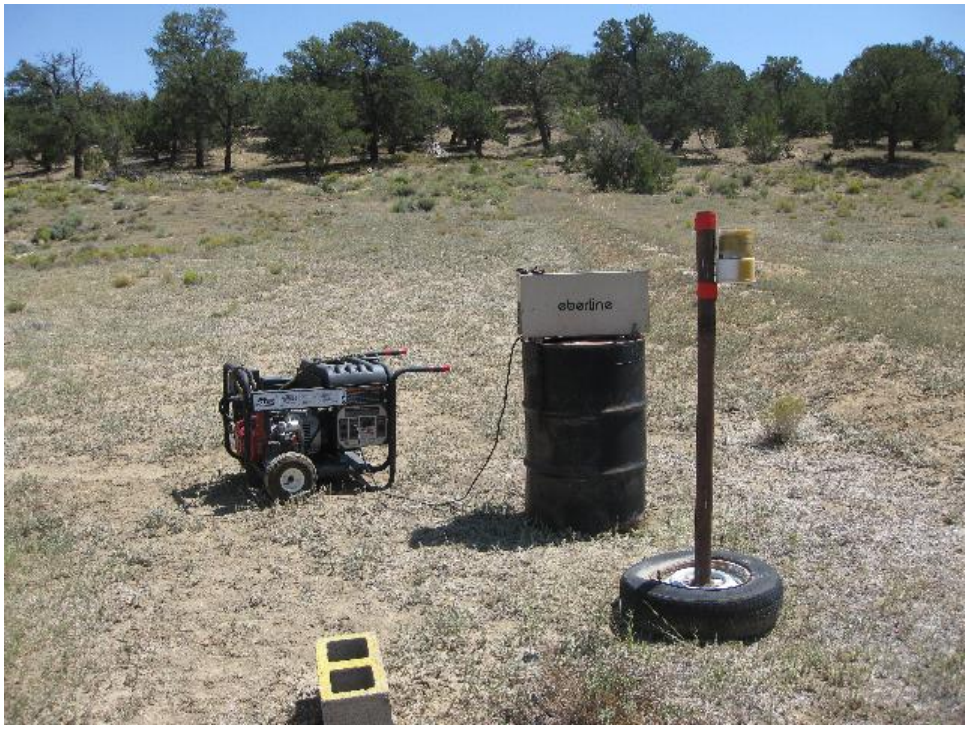
DRAWING: 9 of 9
REVISION: 0
FILE NAME: 1008501D016

N:\Design-Drafting\Clients_Q-Z\United Nuclear Corporation\NECR\013-Sheet Set\IRA Asbuilt Completion Report\1008501D016

APPENDIX A

REMOVAL ACTION PHOTOS

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 1 **Date:** Aug 18, 2009 **Location:** NECR Mine **Direction:** Northwest **Comments:** Upwind air monitoring location	
Photograph ID: 2 **Date:** Aug 18, 2009 **Location:** NECR Mine **Direction:** North **Comments:** Downwind air monitoring location	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 3

Date: Aug 18, 2009

Location:
NECR Mine

Direction:
North

Comments:
Overview of NECR-1 and Step-out area prior to construction

Photograph ID: 4

Date: Aug 19, 2009

Location:
NECR Mine

Direction:
Southwest

Comments:
Concrete demolition in progress

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 5

Date: Aug 20, 2009

Location:
NECR Mine

Direction:
West

Comments:
Fuel tank in containment berm

Photograph ID: 6

Date: Aug 25, 2009

Location:
NECR Mine

Direction:
Southwest

Comments:
Demolished remains of blue building. NECR-1 shaft with on-site dust monitor

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 7 **Date:** Aug 25, 2009 **Location:** NECR Mine **Direction:** West **Comments:** Demolition of warehouse concrete pad	
Photograph ID: 8 **Date:** Aug 25, 2009 **Location:** NECR Mine **Direction:** Northwest **Comments:** Construction of sediment pond at west toe of NECR-1	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 9 **Date:** Aug 27, 2009 **Location:** NECR Mine **Direction:** Northwest **Comments:** Grading of West outslope of NECR-1	
Photograph ID: 10 **Date:** Sep 9, 2009 **Location:** Red water Pond Road **Direction:** Northwest **Comments:** Subsurface sampling on Red Water Pond Road	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 11

Date: Sep 9, 2009

Location:
Red water Pond Road

Direction:
Northeast

Comments:
Subsurface sampling on Red Water Pond Road

Photograph ID: 12

Date: Sep 9, 2009

Location:
Red water Pond Road

Direction:
N/A

Comments:
Ludlum 2221 meter setup for comaprison of Red Water Pond Road sample material against reference sample.

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 13

Date: Sep 12, 2009

Location:
Step-out Area

Direction:
Southeast

Comments:
Excavation of top 6 inches of material on south side of driveway in Zone 4. Orange snow fence on left side of photo is separating the driveway from the construction area.

Photograph ID: 14

Date: Sep 12, 2009

Location:
Step-out Area

Direction:
Southwest

Comments:
Excavation under trees on hill side in Zone 2 using a skidsteer

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 15 **Date:** Sep 15, 2009 **Location:** Step-out Area **Direction:** East **Comments:** Excvation of Zone 4 using motor grader	
Photograph ID: 16 **Date:** Sep 17, 2009 **Location:** Hill Side **Direction:** Southeast **Comments:** Removal of soil from hill side in Zone 2. Dozer is pushing material that was removed from underneath trees using skidsteer.	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 17

Date: Sep 17, 2009

Location:
Step-out Area

Direction:
East

Comments:
Rena Martin from Dinetahdoo Cultural Resource Managment recording potential burial site on hill side in Step-out Area

Photograph ID: 18

Date: Sep 23, 2009

Location:
Step-out Area

Direction:
Southeast

Comments:
Monitoring of removal of contaminated soils from around sweat lodge (TCP-1)

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 19

Date: Sep 23, 2009

Location:
Step-out Area

Direction:
Northeast

Comments:
Monitoring of removal of contaminated soils from around sweat lodge (TCP-1)

Photograph ID: 20

Date: Sep 30, 2009

Location:
Step-out Area

Direction:
North

Comments:
Nuclear density guage testing of compaction test pad

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 21 **Date:** Sep 30, 2009 **Location:** Step-out Area **Direction:** South **Comments:** Construction of compaction test pad	
Photograph ID: 22 **Date:** Nov 10, 2009 **Location:** West Dust Monitoring Station **Direction:** Southeast **Comments:** Barrel in foreground contains burning domestic garbage. West dust track monitor is visible down wind of burning garbage in background of photo	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 23 **Date:** Nov 12, 2009 **Location:** Permit Area **Direction:** Southwest **Comments:** Plastic cover over petroleum contaminated soils	
Photograph ID: 24 **Date:** Nov 18, 2009 **Location:** Stepout Area **Direction:** North **Comments:** Backfill of unnamed arroyo	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 25 **Date:** Nov 19, 2009 **Location:** Stepout Area **Direction:** South **Comments:** Installation of culverts where unnamed road crosses unnamed arroyo.	
Photograph ID: 26 **Date:** Nov 20, 2009 **Location:** Stepout Areas **Direction:** Northeast **Comments:** Water truck applying water to backfill in unnamed arroyo during compaction	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 27 **Date:** Nov 21, 2009 **Location:** Stepout Area **Direction:** East **Comments:** Stripping 1 foot of additional material from west side of hillside in stepout area	
Photograph ID: 28 **Date:** Nov 22, 2009 **Location:** Stepout Area **Direction:** Northwest **Comments:** Overview of stepout area and unnamed arroyo backfill progress	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 29 **Date:** Nov 22, 2009 **Location:** Borrow **Direction:** Southeast **Comments:** Excavator loading tandem truck with clean material in borrow area	
Photograph ID: 30 **Date:** Nov 22, 2009 **Location:** Stepout Area **Direction:** West **Comments:** Used barricade fencing placed in the bottom of the petroleum contaminated soil excavation. Fencing is being used to demarcate limit of current excavation when excavation of soils continues.	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 31 **Date:** Dec 2, 2009 **Location:** Step-out Area **Direction:** East **Comments:** Hillside excavation using JD 850 bulldozer	
Photograph ID: 32 **Date:** Dec 5, 2009 **Location:** Unnamed Arroyo **Direction:** South **Comments:** Placement of bedding material in the unnamed arroyo	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 33 **Date:** Dec 5, 2009 **Location:** Unnamed Arroyo **Direction:** North **Comments:** Placement of riprap in the south end of the unnamed arroyo. Photo taken from the crest of the NECR-1 pile.	
Photograph ID: 34 **Date:** Dec 5, 2009 **Location:** Step-out Area **Direction:** North **Comments:** Excavation of areas above the correlated action level in Zone 1. Grading of bedding material in the unnamed arroyo is in the back left side of the photo.	

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 35

Date: Dec 8, 2009

Location:
NECR-1

Direction:
North

Comments:
Snow covering parked tandem trucks on the top surface of the NECR-1 pile. Construction activities suspended for the day due to unsafe conditions resulting from the snow fall.

Photograph ID: 36

Date: Dec 8, 2009

Location:
Step-out Area

Direction:
East

Comments:
Snow accumulation in the step-out area near the T. Nez residence.

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 37

Date: Dec 13, 2009

Location:
Step-out Area

Direction:

Comments:
IRA status survey 80 ft grid location being tested by AVM. Snow was cleared at each testing location prior to gamma count.

Photograph ID: 38

Date: Dec 17, 2009

Location:
NECR-1

Direction:
Southwest

Comments:
Grading of NECR-1 top surface.

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 39

Date: Dec 13, 2009

Location:
Step-out Area

Direction:
Northwest

Comments:
Post removal view of small area in Zone 4 west of the unnamed arroyo north of the culvert crossing.

Photograph ID: 40

Date: Dec 17, 2009

Location:
Step-out Area

Direction:
East

Comments:
Unnamed road through Zone 4 before regrading of the roadway drainage swale

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 41

Date: Dec 17, 2009

Location:
Step-out Area

Direction:
East

Comments:
Unnamed road through Zone 4 after regrading of the roadway drainage swale

Photograph ID: 42

Date: May 3, 2010

Location:
Step-out Area

Direction:
Southeast

Comments:
Cleaned cattleguard at Red Water Pond Road

Customer:	**[Enter Client Name]**	**Project Number:**	**100100.0101**
Site Name:	**[Enter Site Name]**	**Site Location:**	**[Enter Site Location]**

Photograph ID: 43

Date: May 3, 2010

Location:
Step-out Area

Direction:
Northwest

Comments:
New Cattleguard at unnamed arroyo

APPENDIX B

METHOD SPECIFICATION FOR COMPACTION OF BACKFILL MATERIAL IN THE UNNAMED ARROYO

MWH

BUILDING A BETTER WORLD

October 27, 2009

Mr. Andrew Bain
Remedial Project Manager, Superfund Program
U.S. Environmental Protection Agency, Region 9
75 Hawthorne St. (SFD-8-2) 9th Floor
San Francisco, CA 94105

Subject: Method Specification for Compaction of Backfill Material in the Unnamed Arroyo
Northeast Church Rock Mine Site, New Mexico

Dear Mr. Bain:

MWH is submitting this letter to the U.S. Environmental Protection Agency (USEPA) on behalf of the United Nuclear Corporation (UNC). This letter is intended to document the results of the compaction method specification test for backfilling the arroyo that was proposed to EPA in the Final Construction Plan dated September 11, 2009. This letter provides a description of the construction of the test pads, results of the compaction testing, and the method that will be used for compaction of the soil backfill in the unnamed arroyo. These methods apply only to the placement of soil backfill and do not apply to bedding and riprap materials.

A sample of soils from the borrow area was submitted to Earthworks Engineering Group, LLC for determination of maximum density using standard effort (ASTM method D 698). Results of the test are included in Attachment 1 and show that the maximum density is 110.6 pounds per cubic foot at 14.1 percent moisture.

Two compaction test pads were constructed on September 30, 2009 using material from the designated borrow area shown in the Construction Plan (MWH, 2009). The test pads were constructed adjacent to the unnamed arroyo in Zone 4 north of the existing culvert. Contaminated materials had been excavated from the test area and the area had scanned below the correlated action level prior to compaction testing. One test pad was compacted using a John Deere 1050 bulldozer. The second test pad was compacted with a John Deere 850 bulldozer.

The test pads were constructed to dimensions four times the length and two times the width of each piece of equipment. Borrow material was stockpiled adjacent to the test pad area and was moved to the test pad using a wheeled loader. The loader placed the material in the test pad area but did not roll over staged (non-compacted) material on the test pad. Once sufficient material was placed in the test pad area for an 18 inch lift, the test pad was sprayed with two passes from the water truck and was leveled with the dozer performing the compaction. Two additional passes with the water truck were made after the pad was leveled. Then the bulldozer made two passes with the tracks over the test pad. Each pass consisted of traveling forward and backward over the entire pad. Following the second pass, density measurements were

1475 Pine Grove Road
Suite 109
Steamboat Springs, CO 80487
TEL 970-879-6260
FAX 970-879-9048
www.mwhglobal.com

made at four random locations across the pad using a nuclear density gauge. Following density measurements a second lift was construction on top of the first. Results of the compaction tests are included in Attachment 2 and show that the average density for each lift exceeded 90 percent relative density.

Based on these results, the compaction method specification for the John Deere 1050 bulldozer will be:

- Lift thickness not greater than 18 inches
- Four passes with the water truck, or as necessary for a moisture content approximately between 8 and 14 percent
- Four passes of the tracks (two forward and two backward) over all areas of the backfill

The compaction method specification for the John Deere 850 bulldozer will be:

- Lift thickness not greater than 12 inches
- Four passes with the water truck, or as necessary for a moisture content approximately between 8 and 14 percent
- Four passes of the tracks (two forward and two backward) over all areas of the backfill

MACTEC plans on beginning backfilling of the southern portion of the arroyo on or about October 28, 2009.

Sincerely,

MWH Americas, Inc.

Jed Thompson
Supervising Civil Engineer

cc: Frieda White, NN EPA (4 copies)
Lance Hauer, General Electric

ATTACHMENT 1

PROCTOR TEST RESULTS

Project: NECR IRA Construction
EEG Project No.: A09-268
Sample: received as of 9/21/09
Method: ASTM D-698, A, Dry, Manual

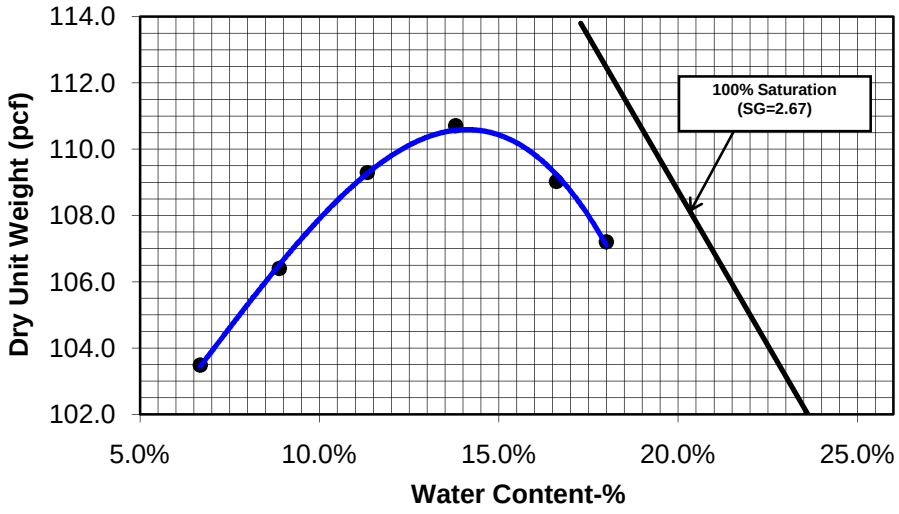
Unified Classification: CL
Description: Lean Clay

As Received Moisture Content: 4.7%

Sieve:	1	3/4	3/8	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200
Percent Passing:	100.0%	100.0%	99.2%	97.8%	95.8%	94.3%	93.4%	92.4%	89.4%	64.9%

Liquid Limit: 31%
Plasticity Index: 14%

Compaction Curve:



Oversize Correction Data:

Fine Fraction:	-
Fine Fraction Moisture Content:	-
Dry Unit Weight of Fine Fraction:	-
Coarse Fraction:	-
Bulk Specific Gravity:	-
Coarse Aggregate Moisture Content:	-

Max Dry Unit Weight (pcf): 110.6

Opt. Water Content (%): 14.1%

Estimated R-Value

Earthworks Engineering Group, LLC
314 El Pueblo NW
Albuquerque, NM 87114
(505) 899-4886

ATTACHMENT 2

Earthworks Engineering Group, LLC

Geotechnical Engineering - Materials Testing - Distress Investigations

Project: NECR IRA Gallop Test pads
Date: 09/30/09
Client: MWH
EEG Project No: A09-268

Compaction Test Results

DG

Location Key

BF - Backfill
FTG - Footing
TR - Trench
BP - Building Pad
Ret - Retaining Wall

Elevation Key

FSG - Fin. Subgrade
AB - Agg. Base
SP - Springline
BTM - Bottom
FAB - Finish Agg. Base

No.	Location	Elev	Proctor	Dry	% H2O	Rel Dens
	Test Pad 850					
	1st lift #1 18" thick		110.6	100.0	9.7	90.4%
	1st lift #2 18" thick		110.6	102.4	10.5	92.6%
	1st lift #3 18" thick		110.6	105.7	11.2	95.6%
	1st lift #4 18" thick		110.6	105.6	8.3	95.5%
	avg					93.5%
	Test Pad 850					
	2nd Lift #5 36" total tickness		110.6	103.9	9.3	93.9%
	2nd Lift #6 36" total tickness		110.6	104.0	9.9	94.0%
	2nd Lift #7 36" total tickness		110.6	101.6	7.8	91.9%
	2nd Lift #8 36" total tickness (dug down 7")		110.6	89.1	7.0	80.6%
	avg					90.1%

Reviewed By:

314 EL PUEBLO RD NW • ALBUQUERQUE, NM • 87114
PHONE: 505 899 4886 • FAX: 505 899 4861

Earthworks Engineering Group, LLC

Geotechnical Engineering - Materials Testing - Distress Investigations

Project: NECR IRA Gallop Test pads
Date: 09/30/09
Client: MWH
EEG Project No: A09-268

Compaction Test Results

DG

Location Key

BF - Backfill
FTG - Footing
TR - Trench
BP - Building Pad
Ret - Retaining Wall

Elevation Key

FSG - Fin. Subgrade
AB - Agg. Base
SP - Springline
BTM - Bottom
FAB - Finish Agg. Base

No.	Location	Elev	Proctor	Dry	% H2O	Rel Dens
	Test Pad 1050					
	1st lift #1 15" thick		110.6	100.4	9.2	90.8%
	1st lift #2 15" thick		110.6	103.5	8.4	93.6%
	1st lift #3 15" thick		110.6	105.3	10.4	95.2%
	1st lift #4 15" thick		110.6	91.8	8.5	83.0%
	avg					90.6%
	Test Pad 1050					
	2nd Lift #5 24" total tickness		110.6	105.7	7.4	95.6%
	2nd Lift #6 24" total tickness		110.6	103.2	8.2	93.3%
	2nd Lift #7 24" total tickness		110.6	101.5	8.1	91.8%
	2nd Lift #8 24" total tickness		110.6	103.5	9.1	93.6%
	avg					93.6%

Reviewed By:

314 EL PUEBLO RD NW • ALBUQUERQUE, NM • 87114
PHONE: 505 899 4886 • FAX: 505 899 4861

APPENDIX C

RIPRAP QUALITY AND GRADATION DATA

MWH

BUILDING A BETTER WORLD

MEMORANDUM

TO:	Andrew Bain	DATE:	November 13, 2009
FROM:	James Thompson	REFERENCE:	1007552
SUBJECT:	Transmittal of Riprap Material Quality Data		

Pursuant to the revised Northeast Church Rock Interim Removal Action Construction Plan (Construction Plan), attached are material quality data for riprap and bedding materials from the General Rock Products quarry located near Thoreau, New Mexico. Material quality data in Attachment 1 meets the quality requirements presented in the Construction Plan (Construction Plan). The bedding material gradation included in Attachment 2 is slightly outside of the specification but is suitable for use. Gamma scan results are included in Attachment 3 and are below correlated action level based on the correlation in the Construction Plan. Preliminary laboratory analysis indicates that the material contains 0.51 pCi/g and is currently being validated. A laboratory data report will be provided once validation is complete. We anticipate importing and beginning to place bedding material and riprap the first week of December.

Attachments: 1 – Material Quality Results
2 – Gradation Data
3 – Gamma Scan Results

cc: Freida White, NNEPA – 4 copies
Lance Hauer, GE

ATTACHMENT 1

Western Technologies Inc.
The Quality People
Since 1955

400 South Lorena Avenue
Farmington, New Mexico 87401
(505) 327-4966 • fax 327-5293

PHYSICAL PROPERTIES OF AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **06-24-09**
Job No. **3149JK027**
Event / Invoice No. **31490129**
Authorized by **ERNEST JESOP** Date **06-09-09**
Sampled by **CLIENT** Date **06-09-09**
Submitted by **CLIENT** Date **06-09-09**
Lab No. **3715-17**

Project **THOREAU CRUSHER CONTROL**
Contractor **GENERAL ROCK PRODUCTS**
Type / Use of Material **AGGREGATE BASE COURSE (3 SAMPLES)**
Sample Source / Location **THOREAU PIT/BELT AT PIT**
Testing Authorized : **SPEC GRAV & ABSORP, LA RESIST, ORGANIC IMPUR, FRAC FACES, AGG INDEX, SOUNDNESS**
Special Instructions :

Location **THOREAU, NM**
Arch. / Engr. **N/A**
Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Source / Location Desig. By **CLIENT** Date **06-09-09**

TEST RESULTS

SIEVE ANALYSIS ☐ ASTM C136 ☐ AASHTO T27
FINER THAN #200 ☐ ASTM C117 ☐ AASHTO T11

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION

LIQUID LIMIT & PLASTIC PROPERTIES
☐ ASTM D4318 ☐ AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED ☐ YES ☐ NO
ESTIMATED % RETAINED ON NO 40

	RESULTS	SPECS
LIQUID LIMIT →		
PLASTIC LIMIT →		
PLASTICITY INDEX →		

FINENESS MODULUS
☐ ASTM C125 →

ORGANIC IMPURITIES
☐ ASTM C40
☒ AASHTO T21 PLATE NO. → 1

CLEANNESS VALUE
☐ CA 227 →

PHYSICAL PROPERTIES		RESULTS	SPECS
UNIT WEIGHT & VOIDS ☐ ASTM C29 ☐ AASHTO T19 ☐ RODDING ☐ JIGGING ☐ LOOSE	FINE AGGREGATE — UNIT WEIGHT, PCF →		
	VOIDS, % →		
	COARSE AGGREGATE — UNIT WEIGHT, PCF →		
	VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE ☐ ASTM C128 ☐ AASHTO T84 AGGREGATE DRIED ☐ YES ☐ NO	BULK SPECIFIC GRAVITY →		
	BULK SPECIFIC GRAVITY (SSD) →		
	APPARENT SPECIFIC GRAVITY →		
	ABSORPTION, % →		
COARSE AGGREGATE ☐ ASTM C127 ☒ AASHTO T85 AGGREGATE DRIED ☒ YES ☐ NO	BULK SPECIFIC GRAVITY →	2.62	
	BULK SPECIFIC GRAVITY (SSD) →	2.66	
	APPARENT SPECIFIC GRAVITY →	2.72	
	ABSORPTION, % →	1.3	
SAND EQUIVALENT VALUE ☐ ASTM D2419 ☐ AASHTO T176	SE, % →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE ☐ ASTM C131 ☒ AASHTO T96	GRADING 100 REV., %LOSS →		
	GRADING **B** 500 REV., %LOSS →	23	
LARGE COARSE AGGREGATE ☐ ASTM C535	GRADING 200 REV., %LOSS →		
	GRADING 1000 REV., %LOSS →		
LIGHTWEIGHT PIECES ☐ ASTM C123 ☐ AASHTO T113	FINE AGGREGATE, % →		
	COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES ☐ ASTM C142 ☐ AASHTO T112	FINE AGGREGATE, % →		
	COARSE AGGREGATE, % →		
FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT ☐ AZ 212 ☐ FLH T507 ☒ NMDOT FF=1	ONE OR MORE FACES, % →	100.0	
	TWO OR MORE FACES, % →	100.0	50 MIN
DURABILITY INDEX ☐ ASTM D3744 ☐ AASHTO T210 PROCEDURE : A ☐ COARSE B ☐ FINE C ☐ COARSE & FINE	D_c →		
	D_f →		
UNCOMPACTED VOID CONTENT ☐ AZ 247 ☐ ASTM C1252 METHOD	VC, % →		

Comments : **PAGE 1 OF 6**
AGGREGATE INDEX PER SECTION 910 = 13.5,SPEC-35 MAX

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LABORATORY REPORT ON AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **06-22-09**
Job No. **3149JK027**
Event / Invoice No. **31490129** Lab No. **3715-17A**
Authorized By **ERNEST JESOP** Date **06-09-09**
Sampled By **CLIENT** Date **06-09-09**
Submitted By **CLIENT** Date **06-09-09**

Project **THOREAU CRUSHER CONTROL** Location **THOREAU, NM**
Contractor **GENERAL ROCK PRODUCTS** Arch. / Engr. **N/A**
Type / Use of Aggregate **AGGREGATE BASE COURSE (3 SAMPLES)** Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Sample Source / Location **THOREAU PIT/BELT AT PIT** Source / Location Desig. By **CLIENT** Date **06-09-09**
Reference: **SOUNDNESS:** ☐ **ASTM C88** ☒ **AASHTO T104** ☐ **SODIUM SULFATE** ☒ **MAGNESIUM SULFATE**
ABRASION RESISTANCE: ☐ **ASTM C131** ☒ **AASHTO T96** ☐ **ASTM C535**
Special Instructions:

TEST RESULTS

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE %	WEIGHT OF TEST FRACTIONS BEFORE TEST GRAMS	PASSING DESIGNATED SIEVE AFTER TEST %	WEIGHTED PERCENTAGE LOSS	ALLOWABLE PERCENTAGE LOSS SODIUM	ALLOWABLE PERCENTAGE LOSS MAGNESIUM
SOUNDNESS TEST OF FINE AGGREGATE		SOLUTION CONDITION: ☐ NEW ☐ USED			NO. OF CYCLES	
MINUS NO. 100						
NO. 50 TO NO. 100						
NO. 30 TO NO. 50						
NO. 16 TO NO. 30						
NO. 8 TO NO. 16						
NO. 4 TO NO. 8						
3/8 IN. TO NO. 4						
TOTAL						
SOUNDNESS TEST OF COARSE AGGREGATE		SOLUTION CONDITION: ☒ NEW ☐ USED			NO. OF CYCLES **5**	
2 1/2 IN. TO 1 1/2 IN.						
1 1/2 IN. TO 3/4 IN.						
3/4 IN. TO 3/8 IN.	**57**	**1004.2**	**7.42**	**3.3**		
3/8 IN. TO NO. 4	**43**	**302.2**	**11.42**	**7.2**		
TOTAL	**100**	**1306.4**	**18.84**	**10.5**		

QUALITATIVE EXAMINATION OF COARSE SIZE PARTICLES EXHIBITING DISTRESS

SIEVE SIZE	SPLITTING NO.	SPLITTING %	CRUMBLING NO.	CRUMBLING %	CRACKING NO.	CRACKING %	FLAKING NO.	FLAKING %	TOTAL NO. PARTICLES BEFORE TEST
2 1/2 IN. TO 1 1/2 IN.									
1 1/2 IN. TO 3/4 IN.									

RESISTANCE TO DEGRADATION BY L.A. MACHINE		% LOSS	SPECIFICATION
SMALL COARSE AGGREGATE - GRADING **B**	100 REV. →		
	500 REV. →	**23**	
LARGE COARSE AGGREGATE - GRADING	200 REV. →		
	1000 REV. →		

Comments: **PAGE 2 OF 6**

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LABORATORY REPORT ON AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **06-22-09**
Job No. **3149JK027**
Event / Invoice No. **31490129** Lab No. **3715-17B**
Authorized By **ERNEST JESOP** Date **06-09-09**
Sampled By **CLIENT** Date **06-09-09**
Submitted By **CLIENT** Date **06-09-09**

Project **THOREAU CRUSHER CONTROL** Location **THOREAU, NM**
Contractor **GENERAL ROCK PRODUCTS** Arch. / Engr. **N/A**
Type / Use of Aggregate **AGGREGATE BASE COURSE (3 SAMPLES)** Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Sample Source / Location **THOREAU PIT/BELT AT PIT** Source / Location Desig. By **CLIENT** Date **06-09-09**
Reference: **SOUNDNESS:** ☐ **ASTM C88** ☒ **AASHTO T104** ☐ **SODIUM SULFATE** ☒ **MAGNESIUM SULFATE**
ABRASION RESISTANCE: ☐ **ASTM C131** ☒ **AASHTO T96** ☐ **ASTM C535**
Special Instructions:

TEST RESULTS

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE %	WEIGHT OF TEST FRACTIONS BEFORE TEST GRAMS	PASSING DESIGNATED SIEVE AFTER TEST %	WEIGHTED PERCENTAGE LOSS	ALLOWABLE PERCENTAGE LOSS SODIUM	ALLOWABLE PERCENTAGE LOSS MAGNESIUM
SOUNDNESS TEST OF FINE AGGREGATE	SOLUTION CONDITION: ☐ NEW ☐ USED				NO. OF CYCLES	
MINUS NO. 100						
NO. 50 TO NO. 100						
NO. 30 TO NO. 50						
NO. 16 TO NO. 30						
NO. 8 TO NO. 16						
NO. 4 TO NO. 8						
3/8 IN. TO NO. 4						
TOTAL						
SOUNDNESS TEST OF COARSE AGGREGATE	SOLUTION CONDITION: ☒ NEW ☐ USED				NO. OF CYCLES 5	
2 1/2 IN. TO 1 1/2 IN.						
1 1/2 IN. TO 3/4 IN.						
3/4 IN. TO 3/8 IN.	57	1000.9	6.0	3.4		
3/8 IN. TO NO. 4	43	300.0	14.2	6.1		
TOTAL	100	1300.9	20.2	9.5		

QUALITATIVE EXAMINATION OF COARSE SIZE PARTICLES EXHIBITING DISTRESS

SIEVE SIZE	SPLITTING NO.	SPLITTING %	CRUMBLING NO.	CRUMBLING %	CRACKING NO.	CRACKING %	FLAKING NO.	FLAKING %	TOTAL NO. PARTICLES BEFORE TEST
2 1/2 IN. TO 1 1/2 IN.									
1 1/2 IN. TO 3/4 IN.									

RESISTANCE TO DEGRADATION BY L.A. MACHINE		% LOSS	SPECIFICATION
SMALL COARSE AGGREGATE – GRADING **B**	100 REV. →		
	500 REV. →	23	
LARGE COARSE AGGREGATE – GRADING	200 REV. →		
	1000 REV. →		

Comments: **PAGE 3 OF 6**

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LABORATORY REPORT ON AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **06-22-09**
Job No. **3149JK027**
Event / Invoice No. **31490129** Lab No. **3715-17C**
Authorized By **ERNEST JESOP** Date **06-09-09**
Sampled By **CLIENT** Date **06-09-09**
Submitted By **CLIENT** Date **06-09-09**

Project **THOREAU CRUSHER CONTROL** Location **THOREAU, NM**
Contractor **GENERAL ROCK PRODUCTS** Arch. / Engr. **N/A**
Type / Use of Aggregate **AGGREGATE BASE COURSE (3 SAMPLES)** Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Sample Source / Location **THOREAU PIT/BELT AT PIT** Source / Location Desig. By **CLIENT** Date **06-09-09**
Reference: **SOUNDNESS:** ☐ **ASTM C88** ☒ **AASHTO T104** ☐ **SODIUM SULFATE** ☒ **MAGNESIUM SULFATE**
ABRASION RESISTANCE: ☐ **ASTM C131** ☒ **AASHTO T96** ☐ **ASTM C535**
Special Instructions:

TEST RESULTS

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE %	WEIGHT OF TEST FRACTIONS BEFORE TEST GRAMS	PASSING DESIGNATED SIEVE AFTER TEST %	WEIGHTED PERCENTAGE LOSS	ALLOWABLE PERCENTAGE LOSS SODIUM	ALLOWABLE PERCENTAGE LOSS MAGNESIUM
SOUNDNESS TEST OF FINE AGGREGATE	SOLUTION CONDITION: ☐ NEW ☐ USED				NO. OF CYCLES	
MINUS NO. 100						
NO. 50 TO NO. 100						
NO. 30 TO NO. 50						
NO. 16 TO NO. 30						
NO. 8 TO NO. 16						
NO. 4 TO NO. 8						
3/8 IN. TO NO. 4						
TOTAL						
SOUNDNESS TEST OF COARSE AGGREGATE	SOLUTION CONDITION: ☒ NEW ☐ USED				NO. OF CYCLES 5	
2 1/2 IN. TO 1 1/2 IN.						
1 1/2 IN. TO 3/4 IN.						
3/4 IN. TO 3/8 IN.	57	1001.6	6.7	3.8		
3/8 IN. TO NO. 4	43	300.5	9.6	4.3		
TOTAL	100	1302.1	16.3	8.1		

QUALITATIVE EXAMINATION OF COARSE SIZE PARTICLES EXHIBITING DISTRESS

SIEVE SIZE	SPLITTING NO.	SPLITTING %	CRUMBLING NO.	CRUMBLING %	CRACKING NO.	CRACKING %	FLAKING NO.	FLAKING %	TOTAL NO. PARTICLES BEFORE TEST
2 1/2 IN. TO 1 1/2 IN.									
1 1/2 IN. TO 3/4 IN.									

RESISTANCE TO DEGRADATION BY L.A. MACHINE		% LOSS	SPECIFICATION
SMALL COARSE AGGREGATE – GRADING **B**	100 REV. →		
	500 REV. →	23	
LARGE COARSE AGGREGATE – GRADING	200 REV. →		
	1000 REV. →		

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LABORATORY REPORT ON AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **06-22-09**
Job No. **3149JK027**
Event / Invoice No. **31490129** Lab No. **3715-17D**
Authorized By **ERNEST JESOP** Date **06-09-09**
Sampled By **CLIENT** Date **06-09-09**
Submitted By **CLIENT** Date **06-09-09**

Project **THOREAU CRUSHER CONTROL** Location **THOREAU, NM**
Contractor **GENERAL ROCK PRODUCTS** Arch. / Engr. **N/A**
Type / Use of Aggregate **AGGREGATE BASE COURSE (3 SAMPLES)** Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Sample Source / Location **THOREAU PIT/BELT AT PIT** Source / Location Desig. By **CLIENT** Date **06-09-09**
Reference: **SOUNDNESS:** ☐ **ASTM C88** ☒ **AASHTO T104** ☐ **SODIUM SULFATE** ☒ **MAGNESIUM SULFATE**
ABRASION RESISTANCE: ☐ **ASTM C131** ☒ **AASHTO T96** ☐ **ASTM C535**
Special Instructions:

TEST RESULTS

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE %	WEIGHT OF TEST FRACTIONS BEFORE TEST GRAMS	PASSING DESIGNATED SIEVE AFTER TEST %	WEIGHTED PERCENTAGE LOSS	ALLOWABLE PERCENTAGE LOSS SODIUM	ALLOWABLE PERCENTAGE LOSS MAGNESIUM
SOUNDNESS TEST OF FINE AGGREGATE		SOLUTION CONDITION: ☐ NEW ☐ USED			NO. OF CYCLES	
MINUS NO. 100						
NO. 50 TO NO. 100						
NO. 30 TO NO. 50						
NO. 16 TO NO. 30						
NO. 8 TO NO. 16						
NO. 4 TO NO. 8						
3/8 IN. TO NO. 4						
TOTAL						
SOUNDNESS TEST OF COARSE AGGREGATE		SOLUTION CONDITION: ☒ NEW ☐ USED			NO. OF CYCLES 5	
2 1/2 IN. TO 1 1/2 IN.						
1 1/2 IN. TO 3/4 IN.						
3/4 IN. TO 3/8 IN.	57	1001.5	7.8	4.4		
3/8 IN. TO NO. 4	43	300.2	10.5	4.5		
TOTAL	100	1301.7	18.3	8.9		

QUALITATIVE EXAMINATION OF COARSE SIZE PARTICLES EXHIBITING DISTRESS

SIEVE SIZE	SPLITTING NO.	SPLITTING %	CRUMBLING NO.	CRUMBLING %	CRACKING NO.	CRACKING %	FLAKING NO.	FLAKING %	TOTAL NO. PARTICLES BEFORE TEST
2 1/2 IN. TO 1 1/2 IN.									
1 1/2 IN. TO 3/4 IN.									

RESISTANCE TO DEGRADATION BY L.A. MACHINE		% LOSS	SPECIFICATION
SMALL COARSE AGGREGATE – GRADING **B**	100 REV. →		
	500 REV. →	23	
LARGE COARSE AGGREGATE – GRADING	200 REV. →		
	1000 REV. →		

Comments: **PAGE 5 OF 6**

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LABORATORY REPORT ON AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **06-22-09**
Job No. **3149JK027**
Event / Invoice No. **31490129** Lab No. **3715-17E**
Authorized By **ERNEST JESOP** Date **06-09-09**
Sampled By **CLIENT** Date **06-09-09**
Submitted By **CLIENT** Date **06-09-09**

Project **THOREAU CRUSHER CONTROL** Location **THOREAU, NM**
Contractor **GENERAL ROCK PRODUCTS** Arch. / Engr. **N/A**
Type / Use of Aggregate **AGGREGATE BASE COURSE (3 SAMPLES)** Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Sample Source / Location **THOREAU PIT/BELT AT PIT** Source / Location Desig. By **CLIENT** Date **06-09-09**
Reference: **SOUNDNESS:** ☐ **ASTM C88** ☒ **AASHTO T104** ☐ **SODIUM SULFATE** ☒ **MAGNESIUM SULFATE**
ABRASION RESISTANCE: ☐ **ASTM C131** ☒ **AASHTO T96** ☐ **ASTM C535**
Special Instructions:

TEST RESULTS

SIEVE SIZE	GRADING OF ORIGINAL SAMPLE %	WEIGHT OF TEST FRACTIONS BEFORE TEST GRAMS	PASSING DESIGNATED SIEVE AFTER TEST %	WEIGHTED PERCENTAGE LOSS	ALLOWABLE PERCENTAGE LOSS SODIUM	ALLOWABLE PERCENTAGE LOSS MAGNESIUM
SOUNDNESS TEST OF FINE AGGREGATE		SOLUTION CONDITION: ☐ NEW ☐ USED			NO. OF CYCLES	
MINUS NO. 100						
NO. 50 TO NO. 100						
NO. 30 TO NO. 50						
NO. 16 TO NO. 30						
NO. 8 TO NO. 16						
NO. 4 TO NO. 8						
3/8 IN. TO NO. 4						
TOTAL						
SOUNDNESS TEST OF COARSE AGGREGATE		SOLUTION CONDITION: ☒ NEW ☐ USED			NO. OF CYCLES 5	
2 1/2 IN. TO 1 1/2 IN.						
1 1/2 IN. TO 3/4 IN.						
3/4 IN. TO 3/8 IN.	57	1001.1	6.5	3.7		
3/8 IN. TO NO. 4	43	300.6	12.8	5.5		
TOTAL	100	1301.7	19.3	9.2		

QUALITATIVE EXAMINATION OF COARSE SIZE PARTICLES EXHIBITING DISTRESS

SIEVE SIZE	SPLITTING NO.	SPLITTING %	CRUMBLING NO.	CRUMBLING %	CRACKING NO.	CRACKING %	FLAKING NO.	FLAKING %	TOTAL NO. PARTICLES BEFORE TEST
2 1/2 IN. TO 1 1/2 IN.									
1 1/2 IN. TO 3/4 IN.									

RESISTANCE TO DEGRADATION BY L.A. MACHINE		% LOSS	SPECIFICATION
SMALL COARSE AGGREGATE – GRADING **B**	100 REV. →		
	500 REV. →	23	
LARGE COARSE AGGREGATE – GRADING	200 REV. →		
	1000 REV. →		

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ATTACHMENT 2

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PHYSICAL PROPERTIES OF AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **10-09-09**
Job No. **3149JK027**
Event / Invoice No. **31490220** Lab No. **4184A**
Authorized by **ERNEST JESOP** Date **10-06-09**
Sampled by **CLIENT** Date **10-06-09**
Submitted by **CLIENT** Date **10-06-09**

Project **THOREAU CRUSHER CONTROL**
Contractor **GENERAL ROCK PRODUCTS**
Type / Use of Material **FILTER AGGREGATE/FILTER AGGREGATE**
Sample Source / Location **THOREAU PIT/BELT AT PIT**
Testing Authorized : **SIEVE ANALYSIS**
Special Instructions :

Location **THOREAU, NM**
Arch. / Engr. **N/A**
Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Source / Location Desig. By **CLIENT** Date **10-06-09**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27
FINER THAN #200 [X] ASTM C117 [ ] AASHTO T11

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
4		
3	100	100
2	95	
1-1/2"	90	95-100
1"	79	60-100
3/4"	66	
1/2"	43	
3/8"	28	
1/4"	10	
No.4	3	15-55
8	1	
10	1	0-15
16	1	
30	1	
40	1	
50	1	
100	1	
200	0.6	

LIQUID LIMIT & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED [ ] YES [ ] NO
ESTIMATED % RETAINED ON NO 40

	RESULTS	SPECS
LIQUID LIMIT →		
PLASTIC LIMIT →		
PLASTICITY INDEX →		

FINENESS MODULUS
[ ] ASTM C125 →

ORGANIC IMPURITIES
[ ] ASTM C40
[ ] AASHTO T21 PLATE NO. →

CLEANNESS VALUE
[ ] CA 227 →

PHYSICAL PROPERTIES		RESULTS	SPECS
UNIT WEIGHT & VOIDS	FINE AGGREGATE UNIT WEIGHT, KG/M³ → VOIDS, % → COARSE AGGREGATE UNIT WEIGHT, KG/M³ → VOIDS, % →		
	[ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE		
SPECIFIC GRAVITY & ABSORPTION	FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
	COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO BULK SPECIFIC GRAVITY → BULK SPECIFIC GRAVITY (SSD) → APPARENT SPECIFIC GRAVITY → ABSORPTION, % →		
SAND EQUIVALENT VALUE	[ ] ASTM D2419 [ ] AASHTO T176 SE, % →		
RESISTANCE TO DEGRADATION	SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96 GRADING 100 REV., %LOSS → GRADING 500 REV., %LOSS →		
	LARGE COARSE AGGREGATE [ ] ASTM C535 GRADING 200 REV., %LOSS → GRADING 1000 REV., %LOSS →		
LIGHTWEIGHT PIECES	[ ] ASTM C123 [ ] AASHTO T113 FINE AGGREGATE, % → COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES	[ ] ASTM C142 [ ] AASHTO T112 FINE AGGREGATE, % → COARSE AGGREGATE, % →		
FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT	[ ] AZ 212 [ ] FLH T507 [ ] FAA ONE OR MORE FACES, % → TWO OR MORE FACES, % →		
DURABILITY INDEX	[ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE : A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE D_c → D_f →		
UNCOMPACTED VOID CONTENT	[ ] AZ 247 [ ] ASTM C1252 METHOD VC, % →		

Comments :

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PHYSICAL PROPERTIES OF AGGREGATES

Client **GENERAL ROCK PRODUCTS**
PO BOX 1496
COLORADO CITY, AZ 86021

Date of Report **10-22-09**
Job No. **3149JK027**
Event / Invoice No. **31490220** Lab No. **4207**
Authorized by **ERNEST JESOP** Date **10-15-09**
Sampled by **CLIENT** Date **10-15-09**
Submitted by **CLIENT** Date **10-15-09**

Project **THOREAU CRUSHER CONTROL**
Contractor **GENERAL ROCK PRODUCTS**
Type / Use of Material **RIPRAP AGGREGATE/RIPRAP AGGREGATE**
Sample Source / Location **THOREAU PIT/BELT AT PIT**
Testing Authorized : **SIEVE ANALYSIS**
Special Instructions :

Location **THOREAU, NM**
Arch. / Engr. **N/A**
Supplier / Source **GENERAL ROCK PRODUCTS/THOREAU PIT**
Source / Location Desig. By **CLIENT** Date **10-15-09**

TEST RESULTS

SIEVE ANALYSIS [X] ASTM C136 [ ] AASHTO T27
FINER THAN #200 [X] ASTM C117 [ ] AASHTO T11

SIEVE	ACCUMULATIVE % PASSING	SPECIFICATION
11-1/2	100	75-100
8"	32	
7-1/2"	32	30-70
6"	25	
5"	6	
4"	6	0-25
3"	1	
2-1/2"	0	
2"	0	
1"	0	
No.4	0	
8	0	
10	0	
16	0	
30	0	
40	0	
50	0	
100	0	
200	0.0	

LIQUID LIMIT & PLASTIC PROPERTIES
[ ] ASTM D4318 [ ] AASHTO T89 & T90
METHOD
SAMPLE AIR DRIED [ ] YES [ ] NO
ESTIMATED % RETAINED ON NO 40

	RESULTS	SPECS
LIQUID LIMIT →		
PLASTIC LIMIT →		
PLASTICITY INDEX →		

FINENESS MODULUS
[ ] ASTM C125 →

ORGANIC IMPURITIES
[ ] ASTM C40
[ ] AASHTO T21
PLATE NO. →

CLEANNESS VALUE
[ ] CA 227 →

PHYSICAL PROPERTIES		RESULTS	SPECS
UNIT WEIGHT & VOIDS [ ] ASTM C29 [ ] AASHTO T19 [ ] RODDING [ ] JIGGING [ ] LOOSE	FINE AGGREGATE UNIT WEIGHT, KG/M³ →		
	FINE AGGREGATE VOIDS, % →		
	COARSE AGGREGATE UNIT WEIGHT, KG/M³ →		
	COARSE AGGREGATE VOIDS, % →		
SPECIFIC GRAVITY & ABSORPTION FINE AGGREGATE [ ] ASTM C128 [ ] AASHTO T84 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY →		
	BULK SPECIFIC GRAVITY (SSD) →		
	APPARENT SPECIFIC GRAVITY →		
	ABSORPTION, % →		
COARSE AGGREGATE [ ] ASTM C127 [ ] AASHTO T85 AGGREGATE DRIED [ ] YES [ ] NO	BULK SPECIFIC GRAVITY →		
	BULK SPECIFIC GRAVITY (SSD) →		
	APPARENT SPECIFIC GRAVITY →		
	ABSORPTION, % →		
SAND EQUIVALENT VALUE [ ] ASTM D2419 [ ] AASHTO T176	SE, % →		
RESISTANCE TO DEGRADATION SMALL COARSE AGGREGATE [ ] ASTM C131 [ ] AASHTO T96	GRADING 100 REV., %LOSS →		
	GRADING 500 REV., %LOSS →		
LARGE COARSE AGGREGATE [ ] ASTM C535	GRADING 200 REV., %LOSS →		
	GRADING 1000 REV., %LOSS →		
LIGHTWEIGHT PIECES [ ] ASTM C123 [ ] AASHTO T113	FINE AGGREGATE, % →		
	COARSE AGGREGATE, % →		
CLAY LUMPS & FRIABLE PARTICLES [ ] ASTM C142 [ ] AASHTO T112	FINE AGGREGATE, % →		
	COARSE AGGREGATE, % →		
FRACTURED FACES OF COARSE AGGREGATES BY WEIGHT [ ] AZ 212 [ ] FLH T507 [ ] FAA	ONE OR MORE FACES, % →		
	TWO OR MORE FACES, % →		
DURABILITY INDEX [ ] ASTM D3744 [ ] AASHTO T210 PROCEDURE : A [ ] COARSE B [ ] FINE C [ ] COARSE & FINE	D_c →		
	D_f →		
UNCOMPACTED VOID CONTENT [ ] AZ 247 [ ] ASTM C1252 METHOD	VC, % →		

Comments :

Copies to : **CLIENT - (2)**
GENERAL ROCK PRODUCTS - E. JESOP (EMAIL) (1)

REVIEWED BY T Wade

ATTACHMENT 3

Attachment C, SOP #RAD-03a
Gamma Radiation Survey @ UNC's NECR Mine Site

Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Lud 2221/254769, Detector Lud 44-10/PR27762

Instrument Calibration Date: 4-12-09, Instrument Daily Function Check Performed: Yes

2"x2" NaI Detector Collimated ✓ Yes or _____ No.

Survey Area/Unit Description General Rock Products - Rock Pit area located near Thoreau, NM

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
9-25-09	Filter Rock Material				
1330	Pile :				
	East Side			1472	Bucket sample taken
	South Side			1740	or collected of filter
	West Side			1691	material.
	North Side			1663	
	Northeast Side			1687	
	Rip Rap Rock				
	material Pile :				
	East Side			1587	
	South Side			1646	
	West Side			1529	
"	North Side			1641	
	Northeast Side			1637	

Technician Signature Mark Chisholm Jr. Reviewed by Mark Chisholm Jr.

APPENDIX D

ASBESTOS REMOVAL AND DISPOSAL DOCUMENTATION

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

Via E-mail and U.S. Mail

September 29, 2009

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

RE: *Northeast Church Rock Mine Site, Interim Removal Action*
Asbestos Abatement Work Plan, Southwest Abatement, Inc., September 15, 2009, EPA approval with modifications

Dear Mr. Hauer:

This letter is in response to the Asbestos Abatement Work Plan received September 15, 2009 for the Northeast Church Rock Mine Site ("NECR Site" or "Site"), Interim Removal Action (IRA), Step-Out Area provided on behalf of respondents United Nuclear and General Electric (collectively "Respondents"). EPA reviewed the Asbestos Abatement Work Plan, addressing tile found in the building pads, provided pursuant to the Administrative Order on Consent (AOC) for the IRA. I am providing EPA's comments on the CP.

In consultation with the Navajo Nation and my team, I am approving the Asbestos Abatement Work Plan with two modifications.

1. **Section 6, last item.** Spelling – lightening.

2. **Section 11, Paragraph 1**

This section states "All individuals proposed as workers will be trained in accordance with the OSHA regulation in 29 CFR 1926.1101." It is STARTs understanding that, all workers at the NECR site must be trained in Hazardous Waste Operations per the OSHA regulations in 29 CFR 1910.120. This would be in addition to training required for asbestos removal workers.

This acknowledges my approval to proceed with implementation of the Asbestos Abatement Work Plan for the NECR Step-Out Interim Removal Action with the revisions

noted in this correspondence and to continue submitting the documents stipulated in the AOC. Please contact me at (415) 972-3167 with any questions.

Sincerely,

Andrew Bain
Remedial Project Manager
EPA Region 9

Cc: Harry L. Allen, EPA (via email)
Freida White, NNEPA/NSP (via email)
David A. Taylor, NDOJ (via email)
Laurie Williams, EPA (via email)

New Mexico
ENVIRONMENT DEPARTMENT

Air Quality Bureau
1301 Siler Road, Building B
Santa Fe, NM 87507-3113
Phone (505) 476-4300
Fax (505) 476-4375
www.nmenv.state.nm.us

BILL RICHARDSON
Governor

DIANE DENISH
Lieutenant Governor

RON CURRY
Secretary

JON GOLDSTEIN
Deputy Secretary

For Official Use Only

NMED ONLY: Approved**:** ☒ Denied: ☐ AI No. **n/a** Tracking No: **AQBA-77-018**

Approved

The Air Quality Bureau staff has reviewed the NESHAP notification submitted for

Facility Description: **Northeast Church Rock Mine Site**
10 miles North on I40 on Hwy 566
Gallup, NM 87305

Start Date:10/1/09

and it has been determined that the minimum requirements as specified within 40 CFR 61.145 have been met. Therefore, the notice is approved. **This Approval Letter must be kept at the worksite and made available for inspection, whether or not asbestos is present.**

For asbestos stripping/removal operations or demolition operations that start after the originally scheduled start date, you must notify the NMED Air Quality Bureau with a revised NESHAP notification that references the above mentioned tracking number prior to the originally scheduled start date.

For asbestos stripping/removal operations or demolition operations that start before the originally scheduled start date, you must provide the Bureau with a revised notice at least 10 working days prior to any asbestos stripping or removal or demolition operation begins.

Approving Official:Chris Rosacker Date:9/25/09

Title:Environmental Compliance Specialist

Janet Napolitano
Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION – COMPLAINCE SECTION
1110 West Washington Street · Phoenix, Arizona 85007
(602) 771-2300 · www.azdeq.gov

Stephen A. Owens
Director

ASBESTOS NESHAP WASTE SHIPMENT RECORD

GENERATOR

1a. Work Site Name, Address & County
NORTHEAST CHURCH ROCK MINE SITE
STATE HWY 566, GALLUP, NM McKINLEY CTY.

1b. Owner/Generator's Name and Mailing Address
UNITED NUCLEAR CORPORATION
HIGHWAY 566, PO BOX 3077
GALLUP, NM 87301

2. Operator's Name & Mailing Address
SAME AS 1B

3. Waste Disposal Site (WDS) Name, Address and Physical Location
WASTE MANAGEMENT BUTTONFIELD STATION LANDFILL
40404 S. 99TH AVE, MOBILE, AZ 85239

4a. Asbestos NESHAP Regulatory Agency Name & Address for Work Site
NEW MEXICO ENVIRONMENT DEPARTMENT
AIR QUALITY BUREAU 1301 SILER RD
SANTA FE, NM 87507-3113

4b. Asbestos NESHAP Regulatory Agency for WDS: Name & Address
MARICOPA COUNTY AIR QUALITY DEPARTMENT
1001 NORTH CENTRAL AVENUE SUITE 400
PHOENIX, AZ 85004

5. Description of Materials	6. Containers: Number	Containers: Type	7. Total Quantity Removed in $m^3(yd)^3$
FLOOR TILE			
Friable Asbestos Material RQ, ASBESTOS, 9, NA2212, III	1	roll-off	9.26 yd^3
Nonfriable Asbestos Material	NA	NA	NA

8a. Special Transportation, Treatment, Storage or Disposal Information
double-bagged in 6 mil poly prior to placement in roll-off container

8b. Bill of Lading Information Waste Management # WM 40740

8c. Alternate Waste Disposal Site Information NA

8d. Emergency Response Telephone No. 505-905-6651

9. OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

NOTE: The Waste Operator must retain a copy of this form.

PRINTED/TYPED Name & Title: Max Chischilly, Radiation Safety Officer (RSO)
Signature: Max Chischilly
MO DAY YR: 10-12-09

TRANSPORTER

10. Transporter 1 (Acknowledgement of Receipt of Materials)
PRINTED/TYPED Name & Title
Signature
MO DAY YR

11. Transporter 2 (Acknowledgement of Receipt of Materials)
PRINTED/TYPED Name & Title
Signature
MO DAY YR

DISPOSAL SITE

12. Discrepancy Indication Space

13. Waste Disposal site Owner or Operator of receipt of Asbestos materials covered by this manifest except as noted in item 12
PRINTED/TYPED Name & Title
Signature
MO DAY YR

WASTE MANAGEMENT, INC.

ONE MANIFEST PER LOAD, CALL FACILITY 24 HOURS IN ADVANCE TO SCHEDULE AND CONFIRM.

WM 40740

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

AIR QUALITY DIVISION - COMPLIANCE SECTION 1110 W. Washington St
~~3033 North Central Avenue • Phoenix, Arizona 85012~~ Phoenix, AZ 85007

ASBESTOS NESHAP WASTE SHIPMENT RECORD

GENERATOR

1a Work Site Name, Address & County
Northeast Church Rock Mine Site
State Highway 566, Gallup, NM
McKinley County

1b. Owner/Generator's Name and Mailing Address
United Nuclear Corporation
Highway 566, P.O. Box 3077
Gallup, NM 87301
Owner's Telephone No 505-905-6651

2 Operator's Name & Mailing Address
SAME AS 1b
Operator's Telephone No.

3 Waste Disposal Site (WDS) Name, Address and Physical Location
Butterfield Station Landfill
40404 S 99th Ave
Mobile AZ 85139 602-256-0630

4a Asbestos NESHAP Regulatory Agency Name & Address for Work Site
New Mexico Environment Department
Air Quality Bureau 1301 Siler Rd
Santa Fe, NM 87507-3113

4b. Asbestos NESHAP Regulatory Agency for WDS: Name & Address
Maricopa County Air Quality Department
1001 North Central Avenue, Suite 400
Phoenix, AZ 85004

5 Description of Materials	6 Containers: Number	Containers: Type	7 Total Quantity Removed in m^3 (yd^3)
Friable Asbestos Material: Floor tile; RQ, ASBESTOS, 9, NA2212, III	1	Roll-off	9.26 yd^3
Nonfriable Asbestos Material	NA	NA	NA

8a Special Transportation, Treatment, Storage or Disposal Information **PROFILE APPROVAL NO.** BFS 101336AZ

8b Bill of Lading Information NORTH AMERICAN EMERGENCY RESPONSE GUIDE 171, OR NAERG 171

8c Alternate Waste Disposal Site Information NA

8d Emergency Response Telephone No 505-905-6651

9 OPERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

NOTE: the waste Operator must retain a copy of this form.
Printed/Typed Name & Title: Max Chischilly, Radiation Safety Officer (RSO)
X Signature: Max Chischilly MO 10 DAY 12 YR 09

TRANSPORTER

10 Transporter 1 (Acknowledgement of Receipt of Materials)
Printed/Typed Name & Title, Address & Telephone No: MP Environmental 3045 S 51st Ave Phoenix AZ 602-278-6233
Signature: MP MO 10 DAY 12 YR 09

11 Transporter 2 (Acknowledgement of Receipt of Materials)
Printed/Typed Name & Title, Address & Telephone No
Signature MO DAY YR

DISPOSAL SITE

12 Discrepancy Indication Space

13 Waste Disposal site Owner or Operator of receipt of Asbestos materials covered by this manifest except as noted in Item 12
Printed/Typed Name & Title
Signature MO DAY YR

OPERATOR: RETAIN THIS COPY WITH TRANSPORTER 1 SIGNATURE (ITEM 10)

APPENDIX E

SEED CERTIFICATES

FROM
Granite Seed Company 1697 W 2100 N
Lehi, UT 84043

MIX # 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV	50.00 + 0.00 - TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA	97.00 + 0.00 - TZ WA
12.64	SIDEOATS GRAMA	VAUGHN	93.00 + 0.00 - TX
11.87	INDIAN RICEGRASS	RIMROCK	99.00 + 0.00 - TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA	97.00 + 0.00 - TZ WY
7.08	BLUE GRAMA	VNS	83.00 + 0.00 - TZ TX
6.32	GALLETA GRASS	VIVA	93.00 + 0.00 - TZ TX
3.16	SQUIRRELTAIL	VNS	93.00 + 0.00 - WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS BULK
19.50 LBS PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

NOTICE - ARBITRATION/CONCILIATION/MEDIATION MAY BE REQUIRED
Under the seed laws of several states arbitration, mediation or conciliation is required as a prerequisite to maintaining a legal action based upon the failure of seed to which this notice is attached to produce as represented. The consumer shall file a complaint along with the required filing fee (where applicable) with the Commissioner/Director/Secretary of Agriculture, Seed Commissioner, or Chief Agricultural Officer within such time as to permit inspection of the crops, plants or trees by the designated agency and the seeds man from whom the seed was purchased. A copy of the complaint shall be sent to the seller by certified or registered mail or as otherwise provided by state statute

SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM
Granite Seed Company 1697 W 2100 N
Lehi, UT 84043

MIX # 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV	50.00 + 0.00 - TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA	97.00 + 0.00 - TZ WA
12.64	SIDEOATS GRAMA	VAUGHN	93.00 + 0.00 - TX
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7.08	BLUE GRAMA	VNS	83.00 + 0.00 - TZ TX
6.32	GALLETA GRASS	VIVA	93.00 + 0.00 - TZ TX
3.16	SQUIRRELTAIL	VNS	93.00 + 0.00 - WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS BULK
19.50 LBS PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV 50.00 + 0.00 -	TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
11.87	INDIAN RICEGRASS	RIMROCK 99.00 + 0.00 -	TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA 97.00 + 0.00 -	TZ WY
7.08	BLUE GRAMA	VNS 83.00 + 0.00 -	TZ TX
6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop Date Tested: 09/29/2009
8.10 Inert Matter Restricted Weed: None
0.03 Weed Seed % Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36	WINTERFAT	VNS 91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR 95.00 + 0.00 -	TZ WA
12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 -	TZ AZ
6.54	PALMER PENSTEMON	VNS 93.00 + 0.00 -	TZ UT
6.40	SAND DROPSEED	VNS 95.00 + 0.00 -	TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 -	TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS 95.00 + 0.00 -	TZ OR

0.00 Other Crop Date Tested: 01/05/2010
31.81 Inert Matter Restricted Weed: None
0.02 Weed Seed % Hard Seed: 0.00

NET WEIGHT: 37.01 LBS. BULK
23.58 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV 50.00 + 0.00 -	TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
11.87	INDIAN RICEGRASS	RIMROCK 99.00 + 0.00 -	TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA 97.00 + 0.00 -	TZ WY
7.08	BLUE GRAMA	VNS 83.00 + 0.00 -	TZ TX
6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

NOTICE - ARBITRATION/CONCILIATION/MEDIATION MAY BE REQUIRED
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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV 50.00 + 0.00 -	TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
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6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N
Lehi. UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV	50.00 + 0.00 - TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA	97.00 + 0.00 - TZ WA
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0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP. NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi. UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36	WINTERFAT	VNS	91.00 + 0.00 - TZ NM
12.80	LEWIS BLUE FLAX	APPAR	95.00 + 0.00 - TZ WA
12.80	MEXICAN CLIFFROSE	VNS	95.00 + 0.00 - TZ UT
9.36	DESERT GLOBEMALLOW	VNS	97.00 + 0.00 - TZ AZ
6.54	PALMER PENSTEMON	VNS	93.00 + 0.00 - TZ UT
6.40	SAND DROPSEED	VNS	95.00 + 0.00 - TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 - TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 - TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 37.01 LBS BULK
23.58 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

NOTICE - ARBITRATION/CONCILIATION/MEDIATION MAY BE REQUIRED
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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP. NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36 WINTERFAT	VNS	91.00 + 0.00 - TZ	NM
12.80 LEWIS BLUE FLAX	APPAR	95.00 + 0.00 - TZ	WA
12.80 MEXICAN CLIFFROSE	VNS	95.00 + 0.00 - TZ	UT
9.36 DESERT GLOBEMALLOW	VNS	97.00 + 0.00 - TZ	AZ
6.54 PALMER PENSTEMON	VNS	93.00 + 0.00 - TZ	UT
6.40 SAND DROPSEED	VNS	95.00 + 0.00 - TZ	CO
3.75 WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 - TZ	NV
3.16 ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 - TZ	OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

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BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

196401
MIX #: 71863

GE SEED MIX BROADCAST
3 ACRE BAG

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13.36 WINTERFAT	VNS	91.00 + 0.00 - TZ	NM
12.80 LEWIS BLUE FLAX	APPAR	95.00 + 0.00 - TZ	WA
12.80 MEXICAN CLIFFROSE	VNS	95.00 + 0.00 - TZ	UT
9.36 DESERT GLOBEMALLOW	VNS	97.00 + 0.00 - TZ	AZ
6.54 PALMER PENSTEMON	VNS	93.00 + 0.00 - TZ	UT
6.40 SAND DROPSEED	VNS	95.00 + 0.00 - TZ	CO
3.75 WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 - TZ	NV
3.16 ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 - TZ	OR

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GALLUP
GALLUP, NM 87301

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Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM	+ HARD	ORIGIN
13.36 WINTERFAT	VNS	91.00	+ 0.00 -	TZ NM
12.80 LEWIS BLUE FLAX	APPAR	95.00	+ 0.00 -	TZ WA
12.80 MEXICAN CLIFFROSE	VNS	95.00	+ 0.00 -	TZ UT
9.36 DESERT GLOBEMALLOW	VNS	97.00	+ 0.00	TZ AZ
6.54 PALMER PENSTEMON	VNS	93.00	+ 0.00 -	TZ UT
6.40 SAND DROPSEED	VNS	95.00	+ 0.00 -	TZ CO
3.75 WYOMING BIG SAGEBRUSH	VNS	80.00	+ 0.00 -	TZ NV
3.16 ROCKY MOUNTAIN PENSTEMON	VNS	95.00	+ 0.00 -	TZ OF

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31.81 Inert Matter
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GALLUP
GALLUP, NM 87301

FROM:
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Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM	+ HARD	ORIGIN
13.36 WINTERFAT	VNS	91.00	+ 0.00 -	TZ NM
12.80 LEWIS BLUE FLAX	APPAR	95.00	+ 0.00 -	TZ WA
12.80 MEXICAN CLIFFROSE	VNS	95.00	+ 0.00 -	TZ UT
9.36 DESERT GLOBEMALLOW	VNS	97.00	+ 0.00 -	TZ AZ
6.54 PALMER PENSTEMON	VNS	93.00	+ 0.00 -	TZ UT
6.40 SAND DROPSEED	VNS	95.00	+ 0.00 -	TZ CO
3.75 WYOMING BIG SAGEBRUSH	VNS	80.00	+ 0.00 -	TZ NV
3.16 ROCKY MOUNTAIN PENSTEMON	VNS	95.00	+ 0.00 -	TZ OF

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31.81 Inert Matter
0.02 Weed Seed

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BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36	WINTERFAT	VNS 91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR 95.00 + 0.00 -	TZ WA
12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 -	TZ AZ
6.54	PALMER PENSTEMON	VNS 93.00 + 0.00 -	TZ UT
6.40	SAND DROPSEED	VNS 95.00 + 0.00 -	TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 -	TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS 95.00 + 0.00 -	TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
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NET WEIGHT: 37.01 LBS. BULK
23.58 LBS. PLS

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV 50.00 + 0.00 -	TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
11.87	INDIAN RICEGRASS	RIMROCK 99.00 + 0.00 -	TZ M
9.09	THICKSPIKE WHEATGRASS	CRITANA 97.00 + 0.00 -	TZ WY
7.08	BLUE GRAMA	VNS 83.00 + 0.00 -	TZ TX
6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

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CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
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Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36	WINTERFAT	VNS	91.00 + 0.00 - TZ NM
12.80	LEWIS BLUE FLAX	APPAR	95.00 + 0.00 - TZ WA
12.80	MEXICAN CLIFFROSE	VNS	95.00 + 0.00 - TZ UT
9.36	DESERT GLOBEMALLOW	VNS	97.00 + 0.00 - TZ AZ
6.54	PALMER PENSTEMON	VNS	93.00 + 0.00 - TZ UT
6.40	SAND DROPSEED	VNS	95.00 + 0.00 - TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 - TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 - TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 37.01 LBS. BULK
23.58 LBS. PLS

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GALLUP
GALLUP, NM 87301

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GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV	50.00 + 0.00 - TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA	97.00 + 0.00 - TZ WA
12.64	SIDEOATS GRAMA	VAUGHN	93.00 + 0.00 - TX
11.87	INDIAN RICEGRASS	RIMROCK	99.00 + 0.00 - TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA	97.00 + 0.00 - TZ WY
7.08	BLUE GRAMA	VNS	83.00 + 0.00 - TZ TX
6.32	GALLETA GRASS	VIVA	93.00 + 0.00 - TZ TX
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0.04 Other Crop
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13.36	WINTERFAT	VNS 91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR 95.00 + 0.00 -	TZ WA
12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 -	TZ AZ
6.54	PALMER PENSTEMON	VNS 93.00 + 0.00 -	TZ UT
6.40	SAND DROPSEED	VNS 95.00 + 0.00 -	TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 -	TZ NV
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18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ W
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
11.87	INDIAN RICEGRASS	RIMROCK 99.00 + 0.00 -	TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA 97.00 + 0.00 -	TZ WY
7.08	BLUE GRAMA	VNS 83.00 + 0.00 -	TZ TX
6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

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GALLUP, NM 87301

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Lehi, UT 84043

MIX #: 71863 196401

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ACRE BAG

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12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 -	TZ AZ
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GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV	50.00 + 0.00 - TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA	97.00 + 0.00 - TZ WA
12.64	SIDEOATS GRAMA	VAUGHN	93.00 + 0.00 - TX
11.87	INDIAN RICEGRASS	RIMROCK	99.00 + 0.00 - TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA	97.00 + 0.00 - TZ WY
7.08	BLUE GRAMA	VNS	83.00 + 0.00 - TZ TX
6.32	GALLETA GRASS	VIVA	93.00 + 0.00 - TZ TX
3.16	SQUIRRELTAIL	VNS	93.00 + 0.00 - WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

NOTICE - ARBITRATION/CONCILIATION/MEDIATION MAY BE REQUIRED
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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
ACRE BAG

DORM OR
% PURE GERM + HARD ORIGIN
23.50 FOURWING SALTBUSH HIGH ELEV 50.00 + 0.00 TZ NM
18.17 WESTERN WHEATGRASS ARRIBA 97.00 + 0.00 TZ
12.64 SIDEOATS GRAMA VAUGHN 93.00 + 0.00
11.87 INDIAN RICEGRASS RIMROCK 99.0
9.09 THICKSPIKE WHEATGRASS CRITANA 97.0
7.08 BLUE GRAMA VNS 83.00 + 0.00 - TZ
6.32 GALLETA GRASS VIVA 93.00 + 0.00 TZ TX
3.16 SQUIRRELTAIL VNS 93.00 + 0.00 -

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

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BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX #: 71863

196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36 WINTERFAT	VNS	91.00 + 0.00 -	TZ NM
12.80 LEWIS BLUE FLAX	APPAR	95.00 + 0.00 -	TZ WA
12.80 MEXICAN CLIFFROSE	VNS	95.00 + 0.00 -	TZ UT
9.36 DESERT GLOBEMALLOW	VNS	97.00 + 0.00 -	TZ AZ
6.54 PALMER PENSTEMON	VNS	93.00 + 0.00 -	TZ UT
6.40 SAND DROPSEED	VNS	95.00 + 0.00 -	TZ CO
3.75 WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 -	TZ NV
3.16 ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 -	TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 37.01 LBS. BULK
23.58 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

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CALL FOR MEETING LOCATION IN
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GALLUP, NM 87301

FROM:
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Lehi, UT 84043

MIX #: 71863

196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36 WINTERFAT	VNS	91.00 + 0.00 -	TZ NM
12.80 LEWIS BLUE FLAX	APPAR	95.00 + 0.00 -	TZ WA
12.80 MEXICAN CLIFFROSE	VNS	95.00 + 0.00 -	TZ UT
9.36 DESERT GLOBEMALLOW	VNS	97.00 + 0.00 -	TZ AZ
6.54 PALMER PENSTEMON	VNS	93.00 + 0.00 -	TZ UT
6.40 SAND DROPSEED	VNS	95.00 + 0.00 -	TZ CO
3.75 WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 -	TZ NV
3.16 ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 -	TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

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23.58 LBS. PLS

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3 ACRE BAG

% PURE		GERM + HARD	DORM	ORIGIN
13.36	WINTERFAT	VNS	91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR	95.00 + 0.00 -	TZ WA
12.80	MEXICAN CLIFFROSE	VNS	95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS	97.00 + 0.00 -	TZ AZ
6.54	PALMER PENSTEMON	VNS	93.00 + 0.00 -	TZ UT
6.40	SAND DROPSEED	VNS	95.00 + 0.00 -	TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS	80.00 + 0.00 -	TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS	95.00 + 0.00 -	TZ OR

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31.81 Inert Matter
0.02 Weed Seed

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13.36	WINTERFAT	VNS	91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR	95.00 + 0.00 -	TZ WA
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9.36	DESERT GLOBEMALLOW	VNS	97.00 + 0.00 -	TZ AZ
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3 ACRE BAG

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13.36	WINTERFAT	VNS 91.00 + 0.00 - TZ	NM
12.80	LEWIS BLUE FLAX	APPAR 95.00 + 0.00 - TZ	WA
12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 - TZ	UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 - TZ	AZ
6.54	PALMER PENSTEMON	VNS 93.00 + 0.00 - TZ	UT
6.40	SAND DROPSEED	VNS 95.00 + 0.00 - TZ	CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 - TZ	NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS 95.00 + 0.00 - TZ	OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

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9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 - TZ	AZ
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6.40	SAND DROPSEED	VNS 95.00 + 0.00 - TZ	CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 - TZ	NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS 95.00 + 0.00 - TZ	OR

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31.81 Inert Matter
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GALLUP, NM 87301

FROM:
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Lehi, UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV	50.00 + 0.00 - TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA	97.00 + 0.00 - TZ WA
12.64	SIDEOATS GRAMA	VAUGHN	93.00 + 0.00 - TX
11.87	INDIAN RICEGRASS	RIMROCK	99.00 + 0.00 - TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA	97.00 + 0.00 - TZ WY
7.08	BLUE GRAMA	VNS	83.00 + 0.00 - TZ TX
6.32	GALLETA GRASS	VIVA	93.00 + 0.00 - TZ TX
3.16	SQUIRRELTAIL	VNS	93.00 + 0.00 - WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

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0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

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19.50 LBS. PLS

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CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N.
Lehi, UT 84043

MIX # 71863

196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36	WINTERFAT	VNS 91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR 95.00 + 0.00 -	TZ WA
12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 -	TZ AZ
6.54	PALMER PENSTEMON	VNS 93.00 + 0.00 -	TZ UT
6.40	SAND DROPSEED	VNS 95.00 + 0.00 -	TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 -	TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS 95.00 + 0.00 -	TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 37.01 LBS. BULK
23.58 LBS. PLS

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SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

3A

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV 50.00 + 0.00 -	TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
11.87	INDIAN RICEGRASS	RIMROCK 99.00 + 0.00 -	TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA 97.00 + 0.00 -	TZ WY
7.08	BLUE GRAMA	VNS 83.00 + 0.00 -	TZ TX
6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

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19.50 LBS. PLS

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FROM:
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Lehi. UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
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18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
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3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

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GALLUP, NM 87301

FROM:
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Lehi. UT 84043

MIX #: 71862 196401

GE SEED MIX DRILL
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
23.50	FOURWING SALTBUSH	HIGH ELEV 50.00 + 0.00 -	TZ NM
18.17	WESTERN WHEATGRASS	ARRIBA 97.00 + 0.00 -	TZ WA
12.64	SIDEOATS GRAMA	VAUGHN 93.00 + 0.00 -	TX
11.87	INDIAN RICEGRASS	RIMROCK 99.00 + 0.00 -	TZ MT
9.09	THICKSPIKE WHEATGRASS	CRITANA 97.00 + 0.00 -	TZ WY
7.08	BLUE GRAMA	VNS 83.00 + 0.00 -	TZ TX
6.32	GALLETA GRASS	VIVA 93.00 + 0.00 -	TZ TX
3.16	SQUIRRELTAIL	VNS 93.00 + 0.00 -	WA

0.04 Other Crop
8.10 Inert Matter
0.03 Weed Seed

Date Tested: 09/29/2009
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 25.53 LBS. BULK
19.50 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

NOTICE - ARBITRATION/CONCILIATION/MEDIATION MAY BE REQUIRED
Under the seed laws of several states arbitration, mediation or conciliation is required as a prerequisite to maintaining a legal action based upon the failure of seed to which this notice is attached to produce as represented. The consumer shall file a complaint along with the required filing fee (where applicable) with the Commissioner/Director/Secretary of Agriculture, Seed Commissioner, or Chief Agricultural Officer within such time as to permit inspection of the crops, plants or trees by the designated agency and the seeds man from whom the seed was purchased. A copy of the complaint shall be sent to the seller by certified or registered mail or as otherwise provided by state statute.

SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

FROM:
Granite Seed Company 1697 W. 2100 N
Lehi, UT 84043

MIX #: 71863 196401

GE SEED MIX BROADCAST
3 ACRE BAG

% PURE		DORM OR GERM + HARD	ORIGIN
13.36	WINTERFAT	VNS 91.00 + 0.00 -	TZ NM
12.80	LEWIS BLUE FLAX	APPAR 95.00 + 0.00 -	TZ WA
12.80	MEXICAN CLIFFROSE	VNS 95.00 + 0.00 -	TZ UT
9.36	DESERT GLOBEMALLOW	VNS 97.00 + 0.00 -	TZ AZ
6.54	PALMER PENSTEMON	VNS 93.00 + 0.00 -	TZ UT
6.40	SAND DROPSEED	VNS 95.00 + 0.00 -	TZ CO
3.75	WYOMING BIG SAGEBRUSH	VNS 80.00 + 0.00 -	TZ NV
3.16	ROCKY MOUNTAIN PENSTEMON	VNS 95.00 + 0.00 -	TZ OR

0.00 Other Crop
31.81 Inert Matter
0.02 Weed Seed

Date Tested: 01/05/2010
Restricted Weed: None
% Hard Seed: 0.00

NET WEIGHT: 37.01 LBS. BULK
23.58 LBS. PLS

GUARANTEE: Granite Seed guarantees its seed to be of promised quality and true to name as specified. Should seed prove to be other than labeled, liability shall be limited to replacement or refund of purchase price.

NOTICE - ARBITRATION/CONCILIATION/MEDIATION MAY BE REQUIRED
Under the seed laws of several states arbitration, mediation or conciliation is required as a prerequisite to maintaining a legal action based upon the failure of seed to which this notice is attached to produce as represented. The consumer shall file a complaint along with the required filing fee (where applicable) with the Commissioner/Director/Secretary of Agriculture, Seed Commissioner, or Chief Agricultural Officer within such time as to permit inspection of the crops, plants or trees by the designated agency and the seeds man from whom the seed was purchased. A copy of the complaint shall be sent to the seller by certified or registered mail or as otherwise provided by state statute.

SHIP TO: SLATER SEEDING
BRANDON - 775-777-5570
CALL FOR MEETING LOCATION IN
GALLUP
GALLUP, NM 87301

APPENDIX F

ENVIRONMENTAL MONITORING DATA

Attachment 2 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
8/31/2009	Down Wind	PM10	0.014	0.009	0.020
	Up Wind		0.016	0.011	0.022
	Difference		-0.002	-0.002	-0.002

Note:

National Ambient Air Quality Standard for PM10 is 0.150 mg/m^3

Attachment 1b - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
9/1/2009	Down Wind	PM_{10}	0.014	0.008	0.055
	Up Wind		0.014	0.008	0.029
	Difference		**0.000**	**0.000**	**0.026**
9/2/2009	Down Wind	PM_{10}	0.017	0.009	0.080
	Up Wind		0.011	0.008	0.039
	Difference		**0.006**	**0.001**	**0.041**
9/3/2009	Down Wind	PM_{10}	0.023	0.011	0.052
	Up Wind		0.015	0.009	0.041
	Difference		**0.008**	**0.002**	**0.011**
9/4/2009	Down Wind	PM_{10}	0.017	0.008	0.313
	Up Wind		0.011	0.006	0.081
	Difference		**0.006**	**0.002**	**0.232**
9/8/2009	Down Wind	PM_{10}	0.009	0.008	0.016
	Up Wind		0.007	0.005	0.012
	Difference		**0.002**	**0.003**	**0.004**
9/9/2009	Down Wind	PM_{10}	0.008	0.005	0.038
	Up Wind		0.005	0.003	0.009
	Difference		**0.003**	**0.002**	**0.029**
9/10/2009	Down Wind	PM_{10}	0.005	0.002	0.023
	Up Wind		0.003	0.001	0.006
	Difference		**0.002**	**0.001**	**0.017**
9/11/2009	Down Wind	PM_{10}	0.004	0.001	0.008
	Up Wind		0.006	0.002	0.009
	Difference		**-0.002**	**-0.001**	**-0.001**
9/12/2009	Down Wind	PM_{10}	0.009	0.005	0.039
	Up Wind		0.005	0.002	0.012
	Difference		**0.004**	**0.003**	**0.027**
9/14/2009	Down Wind	PM_{10}	0.008	0.005	0.017
	Up Wind		0.005	0.003	0.012
	Difference		**0.003**	**0.002**	**0.005**
9/15/2009	Down Wind	$PM_{2.5}$	0.004	0.002	0.006
	Up Wind		0.002	0.001	0.003
	Difference		**0.002**	**0.001**	**0.003**
9/16/2009	Down Wind	PM_{10}	0.006	0.002	0.033
	Up Wind		0.003	0.001	0.008
	Difference		**0.003**	**0.001**	**0.025**
9/18/2009	Down Wind	PM_{10}	0.010	0.006	0.016
	Up Wind		0.008	0.004	0.012
	Difference		**0.002**	**0.002**	**0.004**
9/19/2009	Down Wind	$PM_{2.5}$	0.007	0.005	0.011
	Up Wind		0.005	0.003	0.006
	Difference		**0.002**	**0.002**	**0.005**

Attachment 1b - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
9/21/2009	Down Wind	PM_{10}	0.010	0.008	0.015
	Up Wind		0.007	0.006	0.010
	Difference		**0.003**	**0.002**	**0.005**
9/22/2009	Down Wind	$PM_{2.5}$	0.004	0.001	0.013
	Up Wind		0.001	0.000	0.003
	Difference		**0.003**	**0.001**	**0.010**
9/23/2009	Down Wind	PM_{10}	0.004	0.000	0.011
	Up Wind		0.002	0.000	0.004
	Difference		**0.002**	**0.000**	**0.007**
9/24/2009	Down Wind	$PM_{2.5}$	0.005	0.001	0.009
	Up Wind		0.003	0.000	0.021
	Difference		**0.002**	**0.001**	**-0.012**
9/25/2009	Down Wind	PM_{10}	0.006	0.001	0.067
	Up Wind		0.005	0.002	0.037
	Difference		**0.001**	**-0.001**	**0.030**
9/26/2009	Down Wind N	$PM_{2.5}$	0.003	0.000	0.010
	Down Wind W		0.012	-0.007	0.022
	Up Wind		0.003	0.001	0.008
	Difference		**0.009**	**-0.001**	**0.014**
9/28/2009	Down Wind N	PM_{10}	0.020	0.006	0.083
	Down Wind W		0.020	-0.003	0.105
	Up Wind		0.013	0.006	0.017
	Difference		**0.007**	**0.000**	**0.088**
9/29/2009	Down Wind N	$PM_{2.5}$	0.007	0.003	0.031
	Down Wind W		0.003	-0.008	0.019
	Up Wind		0.005	0.003	0.007
	Difference		**0.002**	**0.000**	**0.024**
9/30/2009	Down Wind N	PM_{10}	0.050	0.010	0.339
	Down Wind W		0.056	0.012	0.383
	Up Wind		0.018	0.005	0.066
	Difference		**0.038**	**0.007**	**0.317**

As agreed to by the EPA on September 26, 2009, a second downwind dust monitoring station was placed west of the work area (Down Wind W).

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
10/1/2009	Down Wind N	$PM_{2.5}$	0.000	-0.001	0.004
	Down Wind W		0.008	0.000	0.020
	Up Wind		0.001	0.000	0.003
	Difference		**0.007**	**0.000**	**0.017**
10/2/2009	Down Wind N	PM_{10}	0.011	-0.001	0.256
	Down Wind W		0.019	0.000	0.041
	Up Wind		0.006	0.000	0.037
	Difference		**0.013**	**0.000**	**0.219**
10/3/2009	Down Wind N	$PM_{2.5}$	0.003	0.000	0.014
	Down Wind W		0.015	0.020	0.027
	Up Wind		0.002	0.000	0.026
	Difference		**0.013**	**0.020**	**0.001**
10/6/2009	Down Wind N	$PM_{2.5}$	0.006	0.003	0.007
	Down Wind W		0.012	0.001	0.019
	Up Wind		0.003	0.001	0.005
	Difference		**0.009**	**0.002**	**0.014**
10/7/2009	Down Wind N	PM_{10}	0.008	0.007	0.014
	Down Wind W		0.017	0.007	0.043
	Up Wind		0.004	0.003	0.009
	Difference		**0.013**	**0.004**	**0.034**
10/8/2009	Down Wind N	$PM_{2.5}$	0.004	0.003	0.006
	Down Wind W		0.007	0.000	0.015
	Up Wind		0.004	0.003	0.005
	Difference		**0.003**	**0.000**	**0.010**
10/9/2009	Down Wind N	PM_{10}	0.007	0.005	0.015
	Down Wind W		0.014	0.005	0.022
	Up Wind		0.006	0.004	0.021
	Difference		**0.008**	**0.001**	**0.001**
10/10/2009	Down Wind N	$PM_{2.5}$	0.005	0.003	0.009
	Down Wind W		0.009	0.000	0.020
	Up Wind		0.004	0.003	0.006
	Difference		**0.005**	**0.000**	**0.014**
10/12/2009	Down Wind N	PM_{10}	0.012	0.007	0.043
	Down Wind W		0.022	0.008	0.067
	Up Wind		0.007	0.005	0.010
	Difference		**0.015**	**0.003**	**0.057**
10/13/2009	Down Wind N	$PM_{2.5}$	0.004	0.003	0.011
	Down Wind W		0.009	0.001	0.019
	Up Wind		0.003	0.003	0.004
	Difference		**0.006**	**0.000**	**0.015**
10/14/2009	Down Wind N	PM_{10}	0.004	0.002	0.008
	Down Wind W		0.015	0.002	0.065
	Up Wind		0.003	0.002	0.004
	Difference		**0.012**	**0.000**	**0.061**
10/15/2009	Down Wind N	$PM_{2.5}$	0.004	0.002	0.008
	Down Wind W		0.014	0.002	0.020
	Up Wind		0.004	0.002	0.017
	Difference		**0.010**	**0.000**	**0.003**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
10/16/2009	Down Wind N	PM_{10}	0.006	0.003	0.022
	Down Wind W		0.018	0.002	0.059
	Up Wind		0.004	0.002	0.010
	Difference		**0.014**	**0.001**	**0.049**
10/17/2009	Down Wind N	$PM_{2.5}$	0.008	0.002	0.017
	Down Wind W		0.019	0.002	0.045
	Up Wind		0.005	0.001	0.010
	Difference		**0.014**	**0.001**	**0.035**
10/19/2009	Down Wind N	PM_{10}	0.017	0.005	0.337
	Down Wind W		0.029	0.012	0.229
	Up Wind		0.006	0.005	0.017
	Difference		**0.023**	**0.007**	**0.320**
10/20/2009	Down Wind N	$PM_{2.5}$	0.050	0.010	0.115
	Down Wind W		0.005	0.000	0.017
	Up Wind		0.002	0.001	0.004
	Difference		**0.048**	**0.009**	**0.111**
10/21/2009	Down Wind N	PM_{10}	0.004	0.002	0.010
	Down Wind W		0.002	0.000	0.012
	Up Wind		0.005	0.003	0.366
	Difference		**-0.001**	**-0.001**	**-0.354**
10/22/2009	Down Wind N	$PM_{2.5}$	0.006	0.001	0.023
	Down Wind W		0.011	0.001	0.055
	Up Wind		0.004	0.001	0.008
	Difference		**0.007**	**0.000**	**0.047**
10/23/2009	Down Wind N	PM_{10}	0.006	0.002	0.018
	Down Wind W		0.011	0.000	0.034
	Up Wind		0.004	0.003	0.006
	Difference		**0.007**	**-0.001**	**0.028**
10/24/2009	Down Wind N	$PM_{2.5}$	0.006	0.003	0.013
	Down Wind W		0.014	0.003	0.022
	Up Wind		0.005	0.003	0.006
	Difference		**0.009**	**0.000**	**0.016**
10/26/2009	Down Wind N	PM_{10}	0.005	0.002	0.045
	Down Wind W		0.009	0.000	0.073
	Up Wind		0.003	0.002	0.008
	Difference		**0.006**	**0.000**	**0.065**
10/27/2009	Down Wind N	$PM_{2.5}$	0.006	0.002	0.039
	Down Wind W		0.012	0.000	0.125
	Up Wind		0.004	0.002	0.006
	Difference		**0.008**	**0.000**	**0.119**
10/28/2009	Down Wind N	PM_{10}	0.006	0.000	0.047
	Down Wind W		0.004	-0.006	0.056
	Up Wind		0.003	0.002	0.004
	Difference		**0.003**	**-0.002**	**0.052**
10/29/2009	Down Wind N	$PM_{2.5}$	0.001	0.000	0.015
	Down Wind W		0.001	0.006	0.039
	Up Wind		0.003	0.001	0.007
	Difference		**-0.002**	**0.005**	**0.032**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
10/30/2009	Down Wind N	PM_{10}	0.003	0.002	0.007
	Down Wind W		0.004	-0.004	0.058
	Up Wind		0.003	0.002	0.005
	Difference		**0.001**	**0.000**	**0.053**
10/31/2009	Down Wind N	$PM_{2.5}$	0.003	0.002	0.008
	Down Wind W		0.010	0.001	0.020
	Up Wind		0.003	0.002	0.007
	Difference		**0.007**	**0.000**	**0.013**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
11/2/2009	Down Wind N	PM_{10}	0.006	0.001	0.031
	Down Wind W		0.027	0.004	0.077
	Up Wind		0.003	0.001	0.008
	Difference		**0.024**	**0.003**	**0.069**
11/3/2009	Down Wind N	$PM_{2.5}$	0.005	0.001	0.008
	Down Wind W		0.016	0.002	0.024
	Up Wind		0.004	0.001	0.007
	Difference		**0.012**	**0.001**	**0.017**
11/4/2009	Down Wind N	PM_{10}	0.004	0.003	0.004
	Down Wind W		0.011	0.007	0.017
	Up Wind		Battery died during day		
	Difference		-	-	-
11/5/2009	Down Wind N	$PM_{2.5}$	0.008	0.005	0.013
	Down Wind W		0.019	0.006	0.028
	Up Wind		0.006	0.003	0.009
	Difference		**0.013**	**0.003**	**0.019**
11/6/2009	Down Wind N	PM_{10}	0.036	0.009	0.106
	Down Wind W		0.042	0.019	0.112
	Up Wind		0.031	0.007	0.106
	Difference		**0.011**	**0.012**	**0.006**
11/7/2009	Down Wind N	$PM_{2.5}$	0.010	0.006	0.020
	Down Wind W		0.021	0.010	0.030
	Up Wind		0.009	0.005	0.014
	Difference		**0.012**	**0.005**	**0.016**
11/8/2009	Down Wind N	$PM_{2.5}$	0.005	0.004	0.009
	Down Wind W		0.010	0.008	0.014
	Up Wind		0.005	0.004	0.009
	Difference		**0.005**	**0.004**	**0.005**
11/9/2009	Down Wind N	PM_{10}	0.013	0.005	0.079
	Down Wind W		0.018	0.004	0.082
	Up Wind		0.006	0.004	0.025
	Difference		**0.012**	**0.001**	**0.057**
11/10/2009	Down Wind N	$PM_{2.5}$	0.012	0.005	0.026
	Down Wind W		0.033	0.009	0.225
	Up Wind		0.010	0.005	0.027
	Difference		**0.023**	**0.004**	**0.198**
11/11/2009	Down Wind N	PM_{10}	0.015	0.010	0.032
	Down Wind W		0.010	0.008	0.012
	Up Wind		0.024	0.010	0.062
	Difference		**-0.009**	**0.000**	**-0.03**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
11/12/2009	Down Wind N	$PM_{2.5}$	0.011	0.008	0.025
	Down Wind W		0.015	0.011	0.020
	Up Wind		0.009	0.007	0.012
	Difference		**0.006**	**0.004**	**0.013**
11/13/2009	Down Wind N	PM_{10}	0.008	0.003	0.080
	Down Wind W		0.004	0.000	0.015
	Up Wind		0.007	0.004	0.011
	Difference		**0.001**	**-0.001**	**0.069**
11/14/2009	Down Wind N	$PM_{2.5}$	0.007	0.002	0.014
	Down Wind W		0.003	0.000	0.008
	Up Wind		0.008	0.003	0.015
	Difference		**-0.001**	**-0.001**	**-0.001**
11/16/2009	Down Wind N	PM_{10}	0.005	0.001	0.021
	Down Wind W		0.002	-0.004	0.005
	Up Wind		0.004	0.003	0.009
	Difference		**0.001**	**-0.002**	**0.012**
11/17/2009	Down Wind N	$PM_{2.5}$	0.006	0.004	0.013
	Down Wind W		0.013	0.007	0.036
	Up Wind		0.006	0.004	0.008
	Difference		**0.007**	**0.003**	**0.028**
11/18/2009	Down Wind N	PM_{10}	0.021	0.008	0.042
	Down Wind W		0.019	0.006	0.125
	Up Wind		0.008	0.004	0.026
	Difference		**0.013**	**0.004**	**0.099**
11/19/2009	Down Wind N	$PM_{2.5}$	0.008	0.004	0.045
	Down Wind W		0.017	0.008	0.036
	Up Wind		0.007	0.004	0.013
	Difference		**0.010**	**0.004**	**0.032**
11/20/2009	Down Wind N	PM_{10}	0.013	0.003	0.111
	Down Wind W		0.019	0.008	0.044
	Up Wind		0.004	0.003	0.008
	Difference		**0.015**	**0.005**	**0.103**
11/21/2009	Down Wind N	$PM_{2.5}$	0.020	0.004	0.107
	Down Wind W		0.014	0.007	0.017
	Up Wind		0.005	0.004	0.006
	Difference		**0.015**	**0.003**	**0.101**
11/22/2009	Down Wind N	$PM_{2.5}$	0.009	0.003	0.019
	Down Wind W		0.012	0.003	0.034
	Up Wind		0.006	0.004	0.008
	Difference		**0.006**	**-0.001**	**0.026**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
11/23/2009	Down Wind N	PM_{10}	0.003	0.000	0.012
	Down Wind W		0.007	-0.003	0.064
	Up Wind		0.004	0.001	0.010
	Difference		**0.003**	**-0.001**	**0.054**
11/24/2009	Down Wind N	$PM_{2.5}$	0.001	0.000	0.019
	Down Wind W		0.007	-0.001	0.017
	Up Wind		0.001	0.000	0.002
	Difference		**0.006**	**0.000**	**0.017**
11/25/2009	Down Wind N	PM_{10}	0.004	0.000	0.038
	Down Wind W		0.008	-0.001	0.020
	Up Wind		0.002	0.000	0.007
	Difference		**0.006**	**0.000**	**0.031**
11/30/2009	Down Wind N	PM_{10}	0.006	0.002	0.020
	Down Wind W		0.009	0.003	0.027
	Up Wind		0.007	0.004	0.013
	Difference		**0.002**	**-0.001**	**0.014**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
12/1/2009	Down Wind N	$PM_{2.5}$	0.005	0.001	0.032
	Down Wind W		0.007	0.000	0.031
	Up Wind		0.004	0.001	0.010
	Difference		**0.003**	**0.000**	**0.022**
12/2/2009	Down Wind N	PM_{10}	0.007	0.001	0.034
	Down Wind W		0.009	0.001	0.041
	Up Wind		0.003	0.002	0.012
	Difference		**0.006**	**-0.001**	**0.029**
12/3/2009	Down Wind N	$PM_{2.5}$	0.000	0.000	0.002
	Down Wind W		-0.002	-0.007	0.006
	Up Wind		0.002	0.001	0.003
	Difference		**-0.002**	**-0.001**	**0.003**
12/4/2009	Down Wind N	PM_{10}	0.018	0.000	0.093
	Down Wind W		0.009	0.000	0.044
	Up Wind		0.004	0.002	0.017
	Difference		**0.014**	**-0.002**	**0.076**
12/5/2009	Down Wind N	$PM_{2.5}$	0.018	0.001	0.134
	Down Wind W		0.002	0.002	0.018
	Up Wind		0.003	0.002	0.006
	Difference		**0.015**	**0.000**	**0.128**
12/6/2009	Down Wind N	PM_{10}	0.029	0.002	0.151
	Down Wind W		0.005	-0.002	0.040
	Up Wind		0.010	0.001	0.232
	Difference		**0.019**	**0.001**	**-0.081**
12/7/2009	Down Wind N	PM_{10}	0.013	0.000	0.146
	Down Wind W		-0.001	-0.008	0.007
	Up Wind		0.005	0.001	0.007
	Difference		**0.008**	**-0.001**	**0.139**
12/9/2009	Down Wind N	$PM_{2.5}$	0.006	0.002	0.016
	Down Wind W		0.003	-0.001	0.012
	Up Wind		0.005	0.002	0.010
	Difference		**0.001**	**0.000**	**0.006**
12/10/2009	Down Wind N	PM_{10}	0.009	0.003	0.032
	Down Wind W		0.017	0.000	0.090
	Up Wind		0.007	0.002	0.037
	Difference		**0.010**	**0.001**	**0.053**
12/11/2009	Down Wind N	$PM_{2.5}$	0.005	0.001	0.015
	Down Wind W		0.008	0.000	0.021
	Up Wind		0.003	0.002	0.009
	Difference		**0.005**	**-0.001**	**0.012**
12/12/2009	Down Wind N	PM_{10}	0.014	0.002	0.092
	Down Wind W		0.004	-0.001	0.099
	Up Wind		0.003	0.001	0.006
	Difference		**0.011**	**0.001**	**0.093**

Attachment 1 - Northeast Church Rock Mine Site
IRA Perimeter Air Monitoring Results - Respirable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
12/13/2009	Down Wind N	$PM_{2.5}$	0.001	0.000	0.003
	Down Wind W		0.001	-0.002	0.005
	Up Wind		0.001	0.000	0.004
	Difference		**0.000**	**0.000**	**0.001**
12/14/2009	Down Wind N	$PM_{2.5}$	0.005	0.002	0.013
	Down Wind W		0.010	0.000	0.017
	Up Wind		0.004	0.002	0.014
	Difference		**0.006**	**0.000**	**0.003**
12/15/2009	Down Wind N	PM_{10}	0.004	0.002	0.011
	Down Wind W		0.005	-0.002	0.028
	Up Wind		0.004	0.002	0.011
	Difference		**0.001**	**0.000**	**0.017**
12/16/2009	Down Wind N	$PM_{2.5}$	0.005	0.003	0.014
	Down Wind W		0.006	-0.001	0.014
	Up Wind		0.003	0.001	0.023
	Difference		**0.003**	**0.002**	**-0.009**
12/17/2009	Down Wind N	PM_{10}	0.007	0.002	0.022
	Down Wind W		0.010	-0.002	0.097
	Up Wind		0.006	0.002	0.019
	Difference		**0.004**	**0.000**	**0.078**
12/18/2009	Down Wind N	$PM_{2.5}$	0.004	0.000	0.011
	Down Wind W		0.005	-0.005	0.010
	Up Wind		0.004	0.001	0.006
	Difference		**0.001**	**-0.001**	**0.005**
12/19/2009	Down Wind N	PM_{10}	0.011	0.004	0.018
	Down Wind W		0.015	0.001	0.133
	Up Wind		0.011	0.004	0.015
	Difference		**0.004**	**0.000**	**0.118**
12/21/2009	Down Wind N	$PM_{2.5}$	0.011	0.002	0.052
	Down Wind W		0.016	0.005	0.053
	Up Wind		0.004	0.003	0.006
	Difference		**0.012**	**0.002**	**0.047**
12/22/2009	Down Wind N	PM_{10}	0.005	0.001	0.031
	Down Wind W		-0.002	-0.006	0.014
	Up Wind		0.003	0.002	0.005
	Difference		**0.002**	**-0.001**	**0.026**
12/23/2009	Down Wind N	$PM_{2.5}$	0.000	0.000	0.001
	Down Wind W		Meter error - data not recorded		
	Up Wind		0.002	0.001	0.002
	Difference		**-0.002**	**-0.001**	**-0.001**

Northeast Church Rock Mine Site

IRA Perimeter Air Monitoring Results - Resparable Dust

Date	Station	Particle Size	Average (mg/m^3)	Minimum (mg/m^3)	Maximum (mg/m^3)
1/5/2010	Down Wind N	PM_{10}	0.008	0.001	0.031
	Down Wind W				
	Up Wind		0.004	0.001	0.014
	Difference		**0.004**	**0.000**	**0.017**
1/6/2010	Down Wind N	PM_{10}	0.006	0.002	0.025
	Down Wind W		0.009	0.003	0.028
	Up Wind		0.004	0.002	0.016
	Difference		**0.005**	**0.001**	**0.012**
1/7/2010	Down Wind N	$PM_{2.5}$	0.003	0.001	0.011
	Down Wind W		0.005	0.002	0.016
	Up Wind		0.003	0.001	0.005
	Difference		**0.002**	**0.001**	**0.011**
1/8/2010	Down Wind N	PM_{10}	0.003	0.001	0.016
	Down Wind W		0.005	0.002	0.025
	Up Wind		0.004	0.002	0.008
	Difference		**0.001**	**0.000**	**0.017**
1/11/2010	Down Wind N	$PM_{2.5}$	0.006	0.001	0.026
	Down Wind W		0.007	0.003	0.017
	Up Wind		0.006	0.002	0.008
	Difference		**0.001**	**0.001**	**0.018**
1/12/2010	Down Wind N	PM_{10}	0.013	0.003	0.061
	Down Wind W		0.013	0.004	0.044
	Up Wind		0.005	0.002	0.023
	Difference		**0.008**	**0.002**	**0.038**
1/13/2010	Down Wind N	$PM_{2.5}$	0.007	0.001	0.017
	Down Wind W		0.008	0.003	0.021
	Up Wind		0.005	0.002	0.026
	Difference		**0.003**	**0.001**	**-0.005**
1/14/2010	Down Wind N	PM_{10}	0.071	0.002	0.253
	Down Wind W		0.062	0.002	0.227
	Up Wind		0.015	0.002	0.037
	Difference		**0.056**	**0.000**	**0.216**
1/15/2010	Down Wind N	$PM_{2.5}$	0.012	0.002	0.078
	Down Wind W		0.006	0.003	0.017
	Up Wind		0.004	0.003	0.007
	Difference		**0.008**	**0.000**	**0.071**
1/16/2010	Down Wind N	PM_{10}	0.004	0.002	0.011
	Down Wind W		0.005	0.003	0.011
	Up Wind		0.005	0.003	0.014
	Difference		**0.000**	**0.000**	**-0.003**

Attachment 2 - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station	Sample Date	Sample ID	Airborne Particulate Activity (µCi/ml) (1)					DAC (µCi/ml) (2)					% of DAC (3)					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha (4)	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 1	8/18/2009	NECRD1-20090818	2.9E-14	1.4E-14	7.2E-15	7.2E-15	5.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.6%	1.6%	0.8%	36.2%	1.0%	Begin site setup and installation of silt fencing
Upwind 1		NECRU1-20090818	3.0E-14	1.5E-14	7.5E-15	7.5E-15	6.0E-15						1.7%	1.7%	0.8%	37.5%	1.0%	
Difference			**1.1E-15**	**5.6E-16**	**2.8E-16**	**2.8E-16**	**2.2E-16**						**-0.1%**	**-0.1%**	**0.0%**	**-1.4%**	**0.0%**	
Downwind 1	8/20/2009	NECRD1-20090820	1.0E-14	5.1E-15	2.5E-15	2.5E-15	2.0E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	12.7%	0.3%	Site setup, demolition of small tan building, concrete demo, relocation of debris to stockpile area
Upwind 1		NECRU1-20090820	1.2E-14	6.1E-15	3.0E-15	3.0E-15	2.4E-15						0.7%	0.7%	0.3%	15.2%	0.4%	
Difference			**2.0E-15**	**1.0E-15**	**5.0E-16**	**5.0E-16**	**4.0E-16**						**-0.1%**	**-0.1%**	**-0.1%**	**-2.5%**	**-0.1%**	
Downwind 1	8/21/2009	NECRD1-20090821	4.4E-14	2.2E-14	1.1E-14	1.1E-14	8.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	2.4%	2.4%	1.2%	54.7%	1.5%	Site setup, concrete demo, relocation of debris to stockpile area
Upwind 1		NECRU1-20090821	2.7E-14	1.3E-14	6.6E-15	6.6E-15	5.3E-15						1.5%	1.5%	0.7%	33.2%	0.9%	
Difference			**-1.7E-14**	**-8.6E-15**	**-4.3E-15**	**-4.3E-15**	**-3.4E-15**						**1.0%**	**1.0%**	**0.5%**	**21.5%**	**0.6%**	
Downwind 1	8/24/2009	NECRD1-20090824	3.2E-14	1.6E-14	7.9E-15	7.9E-15	6.3E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.8%	1.8%	0.9%	39.6%	1.1%	Clearing & grubbin of NECR-1, concrete demo, relocation of building debris, removed fence north of NECR-1
Upwind 1		NECRU1-20090824	2.1E-14	1.0E-14	5.2E-15	5.2E-15	4.2E-15						1.2%	1.2%	0.6%	26.2%	0.7%	
Difference			**-1.1E-14**	**-5.3E-15**	**-2.7E-15**	**-2.7E-15**	**-2.1E-15**						**0.6%**	**0.6%**	**0.3%**	**13.3%**	**0.4%**	
Downwind 1	8/26/2009	NECRD1-20090826	7.7E-15	3.9E-15	1.9E-15	1.9E-15	1.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.4%	0.4%	0.2%	9.7%	0.3%	Clearing & grubbin of NECR-1, concrete demo, relocation of building debris
Upwind 1		NECRU1-20090826	1.4E-14	6.8E-15	3.4E-15	3.4E-15	2.7E-15						0.8%	0.8%	0.4%	16.9%	0.5%	
Difference			**5.8E-15**	**2.9E-15**	**1.4E-15**	**1.4E-15**	**1.2E-15**						**-0.3%**	**-0.3%**	**-0.2%**	**-7.2%**	**-0.2%**	
Downwind 1	8/28/2009	NECRD1-20090828	4.2E-14	2.1E-14	1.1E-14	1.1E-14	8.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	2.4%	2.4%	1.2%	52.9%	1.4%	Grading NECR-1 slope, relocated debris to stockpile, tree trimming in Zones 1 and 2.
Upwind 1		NECRU1-20090828	2.9E-14	1.4E-14	7.1E-15	7.1E-15	5.7E-15						1.6%	1.6%	0.8%	35.7%	1.0%	
Difference			**-1.4E-14**	**-6.9E-15**	**-3.4E-15**	**-3.4E-15**	**-2.7E-15**						**0.8%**	**0.8%**	**0.4%**	**17.2%**	**0.5%**	
Downwind 1	8/31/2009	NECRD1-20090831	3.0E-14	1.5E-14	7.6E-15	7.6E-15	6.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.7%	1.7%	0.8%	38.0%	1.0%	Relocate debris to stockpile, grading of NECR-1 slope and tree trimming in Zones 1 and 2.
Upwind 1		NECRU1-20090831	7.6E-15	3.8E-15	1.9E-15	1.9E-15	1.5E-15						0.4%	0.4%	0.2%	9.6%	0.3%	
Difference			**-2.3E-14**	**-1.1E-14**	**-5.7E-15**	**-5.7E-15**	**-4.6E-15**						**1.3%**	**1.3%**	**0.6%**	**28.5%**	**0.8%**	

Note:

(1) U-nat, Ra-226 and Th-230 activity calculated from measured gross alpha activity @ faction of 0.5 for U-nat, 0.25 for Ra-226 and 0.25 for Th-230 of gross alpha activity, Pb-210 activity calculated at 80% Ra-226 based on assumption that 20% of radon (Pb-210 parent nuclides) emanates out of soil.

(2) DACs from 10CFR20, Appendix B, Table 2 for control and assessment of dose to the public

(3) Gross Alpha measurments recorded after 72 hours. Approximately 90% of radon daughters have decayed at time of record. If Gross Alpha monitoring criteria are not met, additional reading are taken at longer time intervals to identify radon contribution to results. Latest reading is reported.

(4) Calculated DAC for gross alpha activity by summing U-nat, Ra-226, Th-230 and Th-230 DACs for control measures, not a regulatory DAC.

Attachment 1a - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 1	9/2/2009	NECRD1-20090902	2.8E-14	1.4E-14	7.1E-15	7.1E-15	5.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.6%	1.6%	0.8%	35.4%	0.9%	Grading of NECR-1 slope. Limbing trees on hillside in Zone 2. Install silt fence
Upwind 1		NECRU1-20090902	1.4E-14	7.1E-15	3.5E-15	3.5E-15	2.8E-15						0.8%	0.8%	0.4%	17.7%	0.5%	
Difference			**-1.4E-14**	**-7.1E-15**	**-3.5E-15**	**-3.5E-15**	**-2.8E-15**						**0.8%**	**0.8%**	**0.4%**	**17.7%**	**0.5%**	
Downwind 1	9/4/2009	NECRD1-20090904	3.2E-14	1.6E-14	8.1E-15	8.1E-15	6.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.8%	1.8%	0.9%	40.5%	1.1%	Grading of NECR-1 slope. Limbing trees on hillside in Zone 2. Install silt fence
Upwind 1		NECRU1-20090904	1.6E-14	8.2E-15	4.1E-15	4.1E-15	3.3E-15						0.9%	0.9%	0.5%	20.5%	0.5%	
Difference			**-1.6E-14**	**-8.0E-15**	**-4.0E-15**	**-4.0E-15**	**-3.2E-15**						**0.9%**	**0.9%**	**0.4%**	**20.0%**	**0.5%**	
Downwind 2	9/8/2009	NECRD2-20090908	4.4E-14	2.2E-14	1.1E-14	1.1E-14	8.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	2.4%	2.4%	1.2%	54.4%	1.5%	Excavate step-out area Zone 4. Grading of NECR-1 slope
Upwind 1		NECRU1-20090908	2.8E-14	1.4E-14	7.1E-15	7.1E-15	5.7E-15						1.6%	1.6%	0.8%	35.6%	0.9%	
Difference			**-1.5E-14**	**-7.5E-15**	**-3.8E-15**	**-3.8E-15**	**-3.0E-15**						**0.8%**	**0.8%**	**0.4%**	**18.8%**	**0.5%**	
Downwind 2	9/9/2009	NECRD2-20090909	2.7E-15	1.3E-15	6.7E-16	6.7E-16	5.3E-16	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.1%	0.1%	0.1%	3.3%	0.1%	Excavate step-out area Zone 4. Grading of NECR-1 slope. Limbing trees on hillside in Zone 2
Upwind 1		NECRU1-20090909	1.1E-14	5.5E-15	2.8E-15	2.8E-15	2.2E-15						0.6%	0.6%	0.3%	13.9%	0.4%	
Difference			**8.4E-15**	**4.2E-15**	**2.1E-15**	**2.1E-15**	**1.7E-15**						**-0.5%**	**-0.5%**	**-0.2%**	**-10.5%**	**-0.3%**	
Downwind 2	9/11/2009	NECRD2-20090911	2.5E-14	1.2E-14	6.2E-15	6.2E-15	5.0E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.4%	1.4%	0.7%	31.1%	0.8%	Excavate step-out area Zone 2 hillside and Zone 4. Grading of NECR-1 slope
Upwind 1		NECRU1-20090911	2.1E-14	1.0E-14	5.1E-15	5.1E-15	4.1E-15						1.1%	1.1%	0.6%	25.7%	0.7%	
Difference			**-4.3E-15**	**-2.2E-15**	**-1.1E-15**	**-1.1E-15**	**-8.7E-16**						**0.2%**	**0.2%**	**0.1%**	**5.4%**	**0.1%**	
Downwind 2	9/14/2009	NECRD2-20090914	1.1E-14	5.3E-15	2.7E-15	2.7E-15	2.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	13.3%	0.4%	Excavate step-out area Zone 2 hillside and Zone 4. Grading of NECR-1 slope
Upwind 1		NECRU1-20090914	5.7E-15	2.9E-15	1.4E-15	1.4E-15	1.1E-15						0.3%	0.3%	0.2%	7.2%	0.2%	
Difference			**-4.9E-15**	**-2.4E-15**	**-1.2E-15**	**-1.2E-15**	**-9.8E-16**						**0.3%**	**0.3%**	**0.1%**	**6.1%**	**0.2%**	
Downwind 2	9/16/2009	NECRD2-20090916	1.6E-14	8.2E-15	4.1E-15	4.1E-15	3.3E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.9%	0.9%	0.5%	20.4%	0.5%	Excavate step-out area Zone 2 hillside and flats and Zone 4. Grading of NECR-1 slope
Upwind 1		NECRU1-20090916	1.2E-14	6.2E-15	3.1E-15	3.1E-15	2.5E-15						0.7%	0.7%	0.3%	15.5%	0.4%	
Difference			**-3.9E-15**	**-1.9E-15**	**-9.7E-16**	**-9.7E-16**	**-7.7E-16**						**0.2%**	**0.2%**	**0.1%**	**4.8%**	**0.1%**	
Downwind 2	9/18/2009	NECRD2-20090918	9.4E-15	4.7E-15	2.3E-15	2.3E-15	1.9E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.5%	0.5%	0.3%	11.7%	0.3%	Excavate step-out area Zones 2 and 4
Upwind 1		NECRU1-20090918	-2.8E-15	-1.4E-15	-7.0E-16	-7.0E-16	-5.6E-16						-0.2%	-0.2%	-0.1%	-3.5%	-0.1%	
Difference			**-1.2E-14**	**-6.1E-15**	**-3.0E-15**	**-3.0E-15**	**-2.4E-15**						**0.7%**	**0.7%**	**0.3%**	**15.2%**	**0.4%**	
Downwind 2	9/21/2009	NECRD2-20090921	2.7E-14	1.4E-14	6.8E-15	6.8E-15	5.4E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.5%	1.5%	0.8%	33.8%	0.9%	Grading north slope NECR-1 pile, excavate step-out area Zone 2 and 4
Upwind 1		NECRU1-20090921	5.5E-15	2.7E-15	1.4E-15	1.4E-15	1.1E-15						0.3%	0.3%	0.2%	6.8%	0.2%	
Difference			**-2.2E-14**	**-1.1E-14**	**-5.4E-15**	**-5.4E-15**	**-4.3E-15**						**1.2%**	**1.2%**	**0.6%**	**26.9%**	**0.7%**	
Downwind 2	9/23/2009	NECRD2-20090923	3.3E-14	1.6E-14	8.1E-15	8.1E-15	6.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.8%	1.8%	0.9%	40.7%	1.1%	Excavate step-out area Zones 1 and 2
Upwind 1		NECRU1-20090923	2.5E-14	1.3E-14	6.3E-15	6.3E-15	5.0E-15						1.4%	1.4%	0.7%	31.5%	0.8%	
Difference			**-7.4E-15**	**-3.7E-15**	**-1.8E-15**	**-1.8E-15**	**-1.5E-15**						**0.4%**	**0.4%**	**0.2%**	**9.2%**	**0.2%**	
Downwind 2	9/25/2009	NECRD2-20090925	5.3E-15	2.6E-15	1.3E-15	1.3E-15	1.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.3%	0.3%	0.1%	6.6%	0.2%	Grading slope NECR-1 pile, excavate step-out area Zone 2
Upwind 1		NECRU1-20090925	6.8E-15	3.4E-15	1.7E-15	1.7E-15	1.4E-15						0.4%	0.4%	0.2%	8.5%	0.2%	
Difference			**1.5E-15**	**7.7E-16**	**3.8E-16**	**3.8E-16**	**3.1E-16**						**-0.1%**	**-0.1%**	**0.0%**	**-1.9%**	**-0.1%**	

Note:

(1) U-nat, Ra-226 and Th-230 activity calculated from measured gross alpha activity @ faction of 0.5 for U-nat, 0.25 for Ra-226 and 0.25 for Th-230 of gross alpha activity, Pb-210 activity calculated at 80% Ra-226 based on assumption that 20% of radon (Pb-210 parent nuclides) emanates out of soil.

(2) DACs from 10CFR20, Appendix B, Table 2 for control and assessment of dose to the public

(3) Gross Alpha measurments recorded after 72 hours. Approximately 90% of radon daughters have decayed at time of record. If Gross Alpha monitoring criteria are not met, additional reading are taken at longer time intervals to identify radon contribution to results. Latest reading is reported.

(4) Calculated DAC for gross alpha activity by summing U-nat, Ra-226, Th-230 and Th-230 DACs for control measures, not a regulatory DAC.

Attachment 1 - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 2	9/28/2009	NECRD2-20090928	2.8E-14	1.4E-14	7.1E-15	7.1E-15	5.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.6%	1.6%	0.8%	35.4%	0.9%	Excavation Zones 2, 3,4 and Unnamed Arroyo, grading NECR-1 top surface & slope
Upwind 1		NECRU1-20090928	2.6E-14	1.3E-14	6.6E-15	6.6E-15	5.3E-15						1.5%	1.5%	0.7%	32.9%	0.9%	
Difference			**-2.0E-15**	**-9.9E-16**	**-4.9E-16**	**-4.9E-16**	**-4.0E-16**						**0.1%**	**0.1%**	**0.1%**	**2.5%**	**0.1%**	
Downwind 2	9/30/2009	NECRD2-20090930	4.0E-14	2.0E-14	1.0E-14	1.0E-14	8.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	2.2%	2.2%	1.1%	50.6%	1.3%	Excavation Zones 2, 3,4 and Unnamed Arroyo, grading NECR-1 top surface & slope
Upwind 1		NECRU1-20090930	2.5E-14	1.3E-14	6.3E-15	6.3E-15	5.0E-15						1.4%	1.4%	0.7%	31.5%	0.8%	
Difference			**-1.5E-14**	**-7.6E-15**	**-3.8E-15**	**-3.8E-15**	**-3.0E-15**						**0.8%**	**0.8%**	**0.4%**	**19.0%**	**0.5%**	
Downwind 2	10/2/2009	NECRD2-20091002	2.3E-14	1.2E-14	5.8E-15	5.8E-15	4.6E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.3%	1.3%	0.6%	28.8%	0.8%	Excavation Zones 1, 4 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091002	3.5E-14	1.7E-14	8.7E-15	8.7E-15	7.0E-15						1.9%	1.9%	1.0%	43.5%	1.2%	
Difference			**1.2E-14**	**5.9E-15**	**2.9E-15**	**2.9E-15**	**2.3E-15**						**-0.7%**	**-0.7%**	**-0.3%**	**-14.7%**	**-0.4%**	
Downwind 2	10/5/2009	NECRD2-20091005	6.1E-15	3.0E-15	1.5E-15	1.5E-15	1.2E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.3%	0.3%	0.2%	7.6%	0.2%	Excavation Zones 1, 4 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091005	2.1E-14	1.0E-14	5.2E-15	5.2E-15	4.2E-15						1.2%	1.2%	0.6%	26.0%	0.7%	
Difference			**1.5E-14**	**7.3E-15**	**3.7E-15**	**3.7E-15**	**2.9E-15**						**-0.8%**	**-0.8%**	**-0.4%**	**-18.4%**	**-0.5%**	
Downwind 2	10/7/2009	NECRD2-20091007	6.3E-14	3.1E-14	1.6E-14	1.6E-14	1.3E-14	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	3.5%	3.5%	1.7%	78.2%	2.1%	Excavation Zones 1 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091007	5.1E-14	2.6E-14	1.3E-14	1.3E-14	1.0E-14						2.9%	2.9%	1.4%	64.1%	1.7%	
Difference			**-1.1E-14**	**-5.6E-15**	**-2.8E-15**	**-2.8E-15**	**-2.3E-15**						**0.6%**	**0.6%**	**0.3%**	**14.1%**	**0.4%**	
Downwind 2	10/9/2009	NECRD2-20091009	2.4E-14	1.2E-14	6.1E-15	6.1E-15	4.9E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.3%	1.3%	0.7%	30.3%	0.8%	Excavation Zones 3, 4 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091009	3.1E-14	1.6E-14	7.8E-15	7.8E-15	6.3E-15						1.7%	1.7%	0.9%	39.1%	1.0%	
Difference			**7.0E-15**	**3.5E-15**	**1.8E-15**	**1.8E-15**	**1.4E-15**						**-0.4%**	**-0.4%**	**-0.2%**	**-8.8%**	**-0.2%**	
Downwind 2	10/12/2009	NECRD2-20091012	4.9E-14	2.5E-14	1.2E-14	1.2E-14	9.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	2.7%	2.7%	1.4%	61.4%	1.6%	Excavation Zones 2, 4 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091012	4.3E-14	2.2E-14	1.1E-14	1.1E-14	8.7E-15						2.4%	2.4%	1.2%	54.3%	1.4%	
Difference			**-5.7E-15**	**-2.8E-15**	**-1.4E-15**	**-1.4E-15**	**-1.1E-15**						**0.3%**	**0.3%**	**0.2%**	**7.1%**	**0.2%**	
Downwind 2	10/14/2009	NECRD2-20091014	1.4E-14	7.0E-15	3.5E-15	3.5E-15	2.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.8%	0.8%	0.4%	17.5%	0.5%	Excavation Zones 1, 2, 4 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091014	2.7E-14	1.4E-14	6.9E-15	6.9E-15	5.5E-15						1.5%	1.5%	0.8%	34.3%	0.9%	
Difference			**1.3E-14**	**6.7E-15**	**3.4E-15**	**3.4E-15**	**2.7E-15**						**-0.7%**	**-0.7%**	**-0.4%**	**-16.8%**	**-0.4%**	
Downwind 2	10/16/2009	NECRD2-20091016	5.5E-14	2.7E-14	1.4E-14	1.4E-14	1.1E-14	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	3.0%	3.0%	1.5%	68.4%	1.8%	Excavation Zones 1, 4 and Unnamed Arroyo, grading NECR-1 top surface
Upwind 1		NECRU1-20091016	5.7E-14	2.9E-14	1.4E-14	1.4E-14	1.1E-14						3.2%	3.2%	1.6%	71.5%	1.9%	
Difference			**2.5E-15**	**1.2E-15**	**6.2E-16**	**6.2E-16**	**5.0E-16**						**-0.1%**	**-0.1%**	**-0.1%**	**-3.1%**	**-0.1%**	
Downwind 2	10/19/2009	NECRD2-20091019	4.8E-14	2.4E-14	1.2E-14	1.2E-14	9.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	2.7%	2.7%	1.3%	60.6%	1.6%	Excavation Zone 4 and Unnamed Arroyo, grading NECR-1 top surface. Backfill of deep excavations in Zone 4
Upwind 1		NECRU1-20091019	4.0E-14	2.0E-14	1.0E-14	1.0E-14	8.0E-15						2.2%	2.2%	1.1%	50.1%	1.3%	
Difference			**-8.4E-15**	**-4.2E-15**	**-2.1E-15**	**-2.1E-15**	**-1.7E-15**						**0.5%**	**0.5%**	**0.2%**	**10.5%**	**0.3%**	
Downwind 2	10/21/2009	NECRD2-20091021	1.0E-14	5.2E-15	2.6E-15	2.6E-15	2.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	13.1%	0.3%	Excavation Zone 1 and Unnamed Arroyo, grading NECR-1 top surface. Backfill of deep excavations in Zone 4
Upwind 1		NECRU1-20091021	3.9E-15	2.0E-15	9.8E-16	9.8E-16	7.8E-16						0.2%	0.2%	0.1%	4.9%	0.1%	
Difference			**-6.5E-15**	**-3.3E-15**	**-1.6E-15**	**-1.6E-15**	**-1.3E-15**						**0.4%**	**0.4%**	**0.2%**	**8.2%**	**0.2%**	
Downwind 2	10/23/2009	NECRD2-20091023	3.9E-15	2.0E-15	9.9E-16	9.9E-16	7.9E-16	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.2%	0.2%	0.1%	4.9%	0.1%	Excavation Zone 1 and Unnamed Arroyo, grading NECR-1. Reconstruction of road through Zone 4.
Upwind 1		NECRU1-20091023	8.0E-15	4.0E-15	2.0E-15	2.0E-15	1.6E-15						0.4%	0.4%	0.2%	10.1%	0.3%	
Difference			**4.1E-15**	**2.0E-15**	**1.0E-15**	**1.0E-15**	**8.2E-16**						**-0.2%**	**-0.2%**	**-0.1%**	**-5.1%**	**-0.1%**	

Attachment 1 - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 2	10/26/2009	NECRD2-20091026						1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13						Generator at the Downwind Station NECRD2 shutoff approximately six minutes after start. Excavation Zone 1 and Unnamed Arroyo, grading NECR-1. Reconstruction of road through Zone 4.
Upwind 1		NECRU1-20091026	7.4E-13	3.7E-13	1.9E-13	1.9E-13	1.5E-13											
Difference																		
Downwind 2	10/28/2009	NECRD2-20091028	1.1E-14	5.3E-15	2.7E-15	2.7E-15	2.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	13.3%	0.4%	Excavation Zone 4, Unnamed Arroyo and petroleum contaminated soils in Zone 1. Grading NECR-1.
Upwind 1		NECRU1-20091028	-1.3E-15	-6.7E-16	-3.4E-16	-3.4E-16	-2.7E-16						-0.1%	-0.1%	0.0%	-1.7%	0.0%	
Difference			**-1.2E-14**	**-6.0E-15**	**-3.0E-15**	**-3.0E-15**	**-2.4E-15**						**0.7%**	**0.7%**	**0.3%**	**15.0%**	**0.4%**	
Downwind 2	10/30/2009	NECRD2-20091030	1.9E-14	9.5E-15	4.8E-15	4.8E-15	3.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.1%	1.1%	0.5%	23.9%	0.6%	Excavation Zone 1, Unnamed Arroyo and petroleum contaminated soils in Zone 1. Grading NECR-1. Hauling borrow material to Unnamed Arroyo.
Upwind 1		NECRU1-20091030	1.1E-14	5.3E-15	2.6E-15	2.6E-15	2.1E-15						0.6%	0.6%	0.3%	13.2%	0.4%	
Difference			**-8.6E-15**	**-4.3E-15**	**-2.1E-15**	**-2.1E-15**	**-1.7E-15**						**0.5%**	**0.5%**	**0.2%**	**10.7%**	**0.3%**	

Note:

(1) U-nat, Ra-226 and Th-230 activity calculated from measured gross alpha activity @ faction of 0.5 for U-nat, 0.25 for Ra-226 and 0.25 for Th-230 of gross alpha activity, Pb-210 activity calculated at 80% Ra-226 based on assumption that 20% of radon (Pb-210 parent nuclides) emanates out of soil.

(2) DACs from 10CFR20, Appendix B, Table 2 for control and assessment of dose to the public

(3) Gross Alpha measurments recorded after 72 hours. Approximately 90% of radon daughters have decayed at time of record. If Gross Alpha monitoring criteria are not met, additional reading are taken at longer time intervals to identify radon contribution to results. Latest reading is reported.

(4) Calculated DAC for gross alpha activity by summing U-nat, Ra-226, Th-230 and Th-230 DACs for control measures, not a regulatory DAC.

Attachment 1 - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 2	11/2/2009	NECRD2-20091102	7.6E-15	3.8E-15	1.9E-15	1.9E-15	1.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.4%	0.4%	0.2%	9.4%	0.3%	Excavate and backfill unnamed arroyo Excavate TPH
Upwind 1		NECRU1-20091102	2.0E-14	9.9E-15	4.9E-15	4.9E-15	3.9E-15						1.1%	1.1%	0.5%	24.7%	0.7%	
Difference			**1.2E-14**	**6.1E-15**	**3.0E-15**	**3.0E-15**	**2.4E-15**						**-0.7%**	**-0.7%**	**-0.3%**	**-15.2%**	**-0.4%**	
Downwind 2	11/4/2009	NECRD2-20091104	1.3E-14	6.7E-15	3.3E-15	3.3E-15	2.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.7%	0.7%	0.4%	16.7%	0.4%	Excavate and backfill unnamed arroyo Excavate TPH
Upwind 1		NECRU1-20091104	6.8E-15	3.4E-15	1.7E-15	1.7E-15	1.4E-15						0.4%	0.4%	0.2%	8.5%	0.2%	
Difference			**-6.6E-15**	**-3.3E-15**	**-1.6E-15**	**-1.6E-15**	**-1.3E-15**						**0.4%**	**0.4%**	**0.2%**	**8.2%**	**0.2%**	
Downwind 2	11/6/2009	NECRD2-20091106	1.4E-14	7.1E-15	3.5E-15	3.5E-15	2.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.8%	0.8%	0.4%	17.7%	0.5%	Excavate and backfill unnamed arroyo Excavate TPH Excavation of hillside materials
Upwind 1		NECRU1-20091106	8.0E-15	4.0E-15	2.0E-15	2.0E-15	1.6E-15						0.4%	0.4%	0.2%	10.0%	0.3%	
Difference			**-6.1E-15**	**-3.1E-15**	**-1.5E-15**	**-1.5E-15**	**-1.2E-15**						**0.3%**	**0.3%**	**0.2%**	**7.7%**	**0.2%**	
Downwind 2	11/9/2009	NECRD2-20091109	1.4E-14	7.0E-15	3.5E-15	3.5E-15	2.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.8%	0.8%	0.4%	17.5%	0.5%	Excavate and backfill unnamed arroyo Excavation of hillside materials
Upwind 1		NECRU1-20091109	2.7E-15	1.4E-15	6.8E-16	6.8E-16	5.4E-16						0.2%	0.2%	0.1%	3.4%	0.1%	
Difference			**-1.1E-14**	**-5.6E-15**	**-2.8E-15**	**-2.8E-15**	**-2.3E-15**						**0.6%**	**0.6%**	**0.3%**	**14.1%**	**0.4%**	
Downwind 2	11/12/2009	NECRD2-20091112	4.6E-15	2.3E-15	1.1E-15	1.1E-15	9.1E-16	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.3%	0.3%	0.1%	5.7%	0.2%	Excavate and backfill unnamed arroyo Excavate haul road east side of unnamed arroyo
Upwind 1		NECRU1-20091112	3.2E-14	1.6E-14	8.1E-15	8.1E-15	6.5E-15						1.8%	1.8%	0.9%	40.3%	1.1%	
Difference			**2.8E-14**	**1.4E-14**	**6.9E-15**	**6.9E-15**	**5.5E-15**						**-1.5%**	**-1.5%**	**-0.8%**	**-34.6%**	**-0.9%**	
Downwind 2	11/13/2009	NECRD2-20091113	1.3E-14	6.4E-15	3.2E-15	3.2E-15	2.6E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.7%	0.7%	0.4%	16.1%	0.4%	Excavate and backfill unnamed arroyo Excavation of hillside materials Excavate haul road east side of unnamed arroyo
Upwind 1		NECRU1-20091113	2.7E-14	1.4E-14	6.8E-15	6.8E-15	5.4E-15						1.5%	1.5%	0.8%	33.9%	0.9%	
Difference			**1.4E-14**	**7.1E-15**	**3.6E-15**	**3.6E-15**	**2.8E-15**						**-0.8%**	**-0.8%**	**-0.4%**	**-17.8%**	**-0.5%**	
Downwind 2	11/16/2009	NECRD2-20091116	1.1E-14	5.3E-15	2.6E-15	2.6E-15	2.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	13.2%	0.4%	Excavate and backfill unnamed arroyo Excavation of hillside materials Excavate haul road east side of unnamed arroyo
Upwind 1		NECRU1-20091116	3.0E-15	1.5E-15	7.6E-16	7.6E-16	6.1E-16						0.2%	0.2%	0.1%	3.8%	0.1%	
Difference			**-7.5E-15**	**-3.8E-15**	**-1.9E-15**	**-1.9E-15**	**-1.5E-15**						**0.4%**	**0.4%**	**0.2%**	**9.4%**	**0.3%**	
Downwind 2	11/18/2009	NECRD2-20091118	2.1E-14	1.0E-14	5.2E-15	5.2E-15	4.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.1%	1.1%	0.6%	25.8%	0.7%	Excavate and backfill unnamed arroyo Excavation of hillside materials Excavate haul road east side of unnamed arroyo
Upwind 1		NECRU1-20091118	1.4E-14	7.0E-15	3.5E-15	3.5E-15	2.8E-15						0.8%	0.8%	0.4%	17.4%	0.5%	
Difference			**-6.7E-15**	**-3.3E-15**	**-1.7E-15**	**-1.7E-15**	**-1.3E-15**						**0.4%**	**0.4%**	**0.2%**	**8.3%**	**0.2%**	
Downwind 2	11/20/2009	NECRD2-20091120	2.1E-14	1.1E-14	5.3E-15	5.3E-15	4.2E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.2%	1.2%	0.6%	26.4%	0.7%	Excavate and backfill unnamed arroyo Excavation of hillside materials Excavate haul road east side of unnamed arroyo
Upwind 1		NECRU1-20091120	Filter holder failure										-	-	-	-	-	
Difference													**-**	**-**	**-**	**-**	**-**	
Downwind 2	11/23/2009	NECRD2-20091123	1.3E-15	6.5E-16	3.2E-16	3.2E-16	2.6E-16	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.1%	0.1%	0.0%	1.6%	0.0%	Backfill unnamed arroyo Excavation of hillside materials
Upwind 1		NECRU1-20091123	1.3E-15	6.6E-16	3.3E-16	3.3E-16	2.6E-16						0.1%	0.1%	0.0%	1.7%	0.0%	
Difference			**2.4E-17**	**1.2E-17**	**6.0E-18**	**6.0E-18**	**4.8E-18**						**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	
Downwind 2	11/24/2009	NECRD2-20091124	1.4E-15	7.2E-16	3.6E-16	3.6E-16	2.9E-16	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.1%	0.1%	0.0%	1.8%	0.0%	Backfill unnamed arroyo Excavation of hillside materials Grading NECR-1
Upwind 1		NECRU1-20091124	1.4E-15	7.0E-16	3.5E-16	3.5E-16	2.8E-16						0.1%	0.1%	0.0%	1.8%	0.0%	
Difference			**-2.5E-17**	**-1.3E-17**	**-6.3E-18**	**-6.3E-18**	**-5.0E-18**						**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	

Attachment 1 - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 2	11/25/2009	NECRD2-20091125	1.1E-14	5.5E-15	2.7E-15	2.7E-15	2.2E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	13.7%	0.4%	
Upwind 1		NECRU1-20091125	2.0E-14	9.9E-15	4.9E-15	4.9E-15	4.0E-15						1.1%	1.1%	0.5%	24.7%	0.7%	Backfill unnamed arroyo Excavation of hillside materials
Difference			**8.8E-15**	**4.4E-15**	**2.2E-15**	**2.2E-15**	**1.8E-15**						**-0.5%**	**-0.5%**	**-0.2%**	**-11.0%**	**-0.3%**	

Note:

(1) U-nat, Ra-226 and Th-230 activity calculated from measured gross alpha activity @ faction of 0.5 for U-nat, 0.25 for Ra-226 and 0.25 for Th-230 of gross alpha activity, Pb-210 activity calculated at 80% Ra-226 based on assumption that 20% of radon (Pb-210 parent nuclides) emanates out of soil.

(2) DACs from 10CFR20, Appendix B, Table 2 for control and assessment of dose to the public

(3) Gross Alpha measurments recorded after 72 hours. Approximately 90% of radon daughters have decayed at time of record. If Gross Alpha monitoring criteria are not met, additional reading are taken at longer time intervals to identify radon contribution to results. Latest reading is reported.

(4) Calculated DAC for gross alpha activity by summing U-nat, Ra-226, Th-230 and Th-230 DACs for control measures, not a regulatory DAC.

Attachment 1 - North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 2	11/30/2009	NECRD2-20091130	1.3E-14	6.5E-15	3.2E-15	3.2E-15	2.6E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.7%	0.7%	0.4%	16.2%	0.4%	Excavation from hillside Haul from borrow to backfill unnamed arroyo
Upwind 1		NECRU1-20091130	6.7E-15	3.3E-15	1.7E-15	1.7E-15	1.3E-15						0.4%	0.4%	0.2%	8.4%	0.2%	
			-6.3E-15	**-3.1E-15**	**-1.6E-15**	**-1.6E-15**	**-1.3E-15**						**0.3%**	**0.3%**	**0.2%**	**7.9%**	**0.2%**	
Downwind 2	12/2/2009	NECRD2-20091202	7.4E-15	3.7E-15	1.8E-15	1.8E-15	1.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.4%	0.4%	0.2%	9.2%	0.2%	Excavation from hillside Haul from borrow to backfill unnamed arroyo
Upwind 1		NECRU1-20091202	9.7E-15	4.9E-15	2.4E-15	2.4E-15	1.9E-15						0.5%	0.5%	0.3%	12.2%	0.3%	
			2.4E-15	**1.2E-15**	**5.9E-16**	**5.9E-16**	**4.7E-16**						**-0.1%**	**-0.1%**	**-0.1%**	**-2.9%**	**-0.1%**	
Downwind 2	12/4/2009	NECRD2-20091204	5.6E-15	2.8E-15	1.4E-15	1.4E-15	1.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.3%	0.3%	0.2%	7.0%	0.2%	Excavation from hillside Haul from borrow to backfill unnamed arroyo
Upwind 1		NECRU1-20091204	8.2E-15	4.1E-15	2.1E-15	2.1E-15	1.6E-15						0.5%	0.5%	0.2%	10.3%	0.3%	
			2.6E-15	**1.3E-15**	**6.5E-16**	**6.5E-16**	**5.2E-16**						**-0.1%**	**-0.1%**	**-0.1%**	**-3.3%**	**-0.1%**	
Downwind 2	12/7/2009	NECRD2-20091207	2.4E-14	1.2E-14	5.9E-15	5.9E-15	4.8E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.3%	1.3%	0.7%	29.7%	0.8%	Haul from borrow to backfill unnamed arroyo Placing riprap in unnamed arroyo Excavate Zone 1
Upwind 1		NECRU1-20091207	8.2E-15	4.1E-15	2.1E-15	2.1E-15	1.6E-15						0.5%	0.5%	0.2%	10.3%	0.3%	
			-1.6E-14	**-7.8E-15**	**-3.9E-15**	**-3.9E-15**	**-3.1E-15**						**0.9%**	**0.9%**	**0.4%**	**19.5%**	**0.5%**	
Downwind 2	12/9/2009	NECRD2-20091209	-1.5E-15	-7.4E-16	-3.7E-16	-3.7E-16	-3.0E-16	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	-0.1%	-0.1%	0.0%	-1.8%	0.0%	Haul from borrow to backfill unnamed arroyo Placing riprap in unnamed arroyo Excavate Zone 1
Upwind 1		NECRU1-20091209	5.8E-15	2.9E-15	1.5E-15	1.5E-15	1.2E-15						0.3%	0.3%	0.2%	7.3%	0.2%	
			7.3E-15	**3.7E-15**	**1.8E-15**	**1.8E-15**	**1.5E-15**						**-0.4%**	**-0.4%**	**-0.2%**	**-9.1%**	**-0.2%**	
Downwind 2	12/11/2009	NECRD2-20091211	8.7E-15	4.4E-15	2.2E-15	2.2E-15	1.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.5%	0.5%	0.2%	10.9%	0.3%	Haul from borrow to backfill unnamed arroyo Placing riprap in unnamed arroyo Excavate Zone 1
Upwind 1		NECRU1-20091211	6.3E-15	3.2E-15	1.6E-15	1.6E-15	1.3E-15						0.4%	0.4%	0.2%	7.9%	0.2%	
			-2.4E-15	**-1.2E-15**	**-6.1E-16**	**-6.1E-16**	**-4.9E-16**						**0.1%**	**0.1%**	**0.1%**	**3.1%**	**0.1%**	
Downwind 2	12/14/2009	NECRD2-20091214	-1.4E-14	-6.9E-15	-3.4E-15	-3.4E-15	-2.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	-0.8%	-0.8%	-0.4%	-17.1%	-0.5%	Haul material from borrow to backfill Zone 4 Excavate Zone 2
Upwind 1		NECRU1-20091214	-8.6E-15	-4.3E-15	-2.1E-15	-2.1E-15	-1.7E-15						-0.5%	-0.5%	-0.2%	-10.7%	-0.3%	
			5.1E-15	**2.6E-15**	**1.3E-15**	**1.3E-15**	**1.0E-15**						**-0.3%**	**-0.3%**	**-0.1%**	**-6.4%**	**-0.2%**	
Downwind 2	12/16/2009	NECRD2-20091216	2.0E-14	9.8E-15	4.9E-15	4.9E-15	3.9E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.1%	1.1%	0.5%	24.5%	0.7%	Backfill TPH excavation Excavate Zone 1 Backfill deep excavations in Zone 4 Grading NECR-1 pile
Upwind 1		NECRU1-20091216	1.4E-15	6.9E-16	3.5E-16	3.5E-16	2.8E-16						0.1%	0.1%	0.0%	1.7%	0.0%	
			-1.8E-14	**-9.1E-15**	**-4.6E-15**	**-4.6E-15**	**-3.6E-15**						**1.0%**	**1.0%**	**0.5%**	**22.8%**	**0.6%**	
Downwind 2	12/18/2009	NECRD2-20091218	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.0%	0.0%	0.0%	0.0%	0.0%	Backfill TPH excavation Excavate Zone 1 Backfill deep excavations in Zone 4 Grading NECR-1 pile Construct sediment pond in Zone 2
Upwind 1		NECRU1-20091218	2.7E-15	1.4E-15	6.8E-16	6.8E-16	5.4E-16						0.2%	0.2%	0.1%	3.4%	0.1%	
			2.7E-15	**1.4E-15**	**6.8E-16**	**6.8E-16**	**5.4E-16**						**-0.2%**	**-0.2%**	**-0.1%**	**-3.4%**	**-0.1%**	
Downwind 2	12/21/2009	NECRD2-20091221	1.3E-14	6.4E-15	3.2E-15	3.2E-15	2.5E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.7%	0.7%	0.4%	15.9%	0.4%	Excavate Zone 1 Backfill deep excavations in Zones 1 &3 Construct by pass in unnamed arroyo south of culverts
Upwind 1		NECRU1-20091221	6.7E-15	3.4E-15	1.7E-15	1.7E-15	1.3E-15						0.4%	0.4%	0.2%	8.4%	0.2%	
			-6.0E-15	**-3.0E-15**	**-1.5E-15**	**-1.5E-15**	**-1.2E-15**						**0.3%**	**0.3%**	**0.2%**	**7.5%**	**0.2%**	
Downwind 2	12/22/2009	NECRD2-20091222	2.3E-14	1.2E-14	5.8E-15	5.8E-15	4.6E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	1.3%	1.3%	0.6%	29.0%	0.8%	Excavate Zone 1 Backfill deep excavations in Zones 1 &3
Upwind 1		NECRU1-20091222	4.6E-15	2.3E-15	1.2E-15	1.2E-15	9.2E-16						0.3%	0.3%	0.1%	5.8%	0.2%	
			-1.9E-14	**-9.3E-15**	**-4.6E-15**	**-4.6E-15**	**-3.7E-15**						**1.0%**	**1.0%**	**0.5%**	**23.2%**	**0.6%**	

Note:

(1) U-nat, Ra-226 and Th-230 activity calculated from measured gross alpha activity @ faction of 0.5 for U-nat, 0.25 for Ra-226 and 0.25 for Th-230 of gross alpha activity, Pb-210 activity calculated at 80% Ra-226 based on assumption that 20% of radon (Pb-210 parent nuclides) emanates out of soil.

(2) DACs from 10CFR20, Appendix B, Table 2 for control and assessment of dose to the public

(3) Gross Alpha measurments recorded after 72 hours. Approximately 90% of radon daughters have decayed at time of record. If Gross Alpha monitoring criteria are not met, additional reading are taken at longer time intervals to identify radon contribution to results. Latest reading is reported.

(4) Calculated DAC for gross alpha activity by summing U-nat, Ra-226, Th-230 and Th-230 DACs for control measures, not a regulatory DAC.

North East Church Rock Mine Site
IRA Perimeter Air Monitoring Results-Radiological Particulate

Perimeter Air Station [5]	Sample Date	Sample ID	Airborne Particulate Activity (uCi/ml) [1]					DAC (uCi/ml) [2]					% of DAC [3]					Comments
			Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha [4]	U-nat	Ra-226	Th-230	Pb-210	Gross Alpha	U-nat	Ra-226	Th-230	Pb-210	
Downwind 2	1/4/2010	NECRD2-20100104	6.9E-15	3.4E-15	1.7E-15	1.7E-15	1.4E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.4%	0.4%	0.2%	8.6%	0.2%	Backfill and grade step-out area Grade NECR-1 top surface
Upwind 1		NECRU1-20100104	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0%	0.0%	0.0%	0.0%	0.0%	
			-6.9E-15	**-3.4E-15**	**-1.7E-15**	**-1.7E-15**	**-1.4E-15**						**0.4%**	**0.4%**	**0.2%**	**8.6%**	**0.2%**	
Downwind 2	1/6/2010	NECRD2-20100106	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.0%	0.0%	0.0%	0.0%	0.0%	Backfill and grade step-out area Grade NECR-1 top surface
Upwind 1		NECRU1-20100106	2.6E-15	1.3E-15	6.4E-16	6.4E-16	5.1E-16						0.1%	0.1%	0.1%	3.2%	0.1%	
			2.6E-15	**1.3E-15**	**6.4E-16**	**6.4E-16**	**5.1E-16**						**-0.1%**	**-0.1%**	**-0.1%**	**-3.2%**	**-0.1%**	
Downwind 2	1/8/2010	NECRD2-20100108	1.2E-14	5.9E-15	2.9E-15	2.9E-15	2.4E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.7%	0.7%	0.3%	14.7%	0.4%	Cover NECR-1 top surface
Upwind 1		NECRU1-20100108	-5.6E-15	-2.8E-15	-1.4E-15	-1.4E-15	-1.1E-15						-0.3%	-0.3%	-0.2%	-7.1%	-0.2%	
			-1.7E-14	**-8.7E-15**	**-4.4E-15**	**-4.4E-15**	**-3.5E-15**						**1.0%**	**1.0%**	**0.5%**	**21.8%**	**0.6%**	
Downwind 2	1/11/2010	NECRD2-20100111	1.0E-14	5.2E-15	2.6E-15	2.6E-15	2.1E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.6%	0.6%	0.3%	12.9%	0.3%	Cover NECR-1 side slopes
Upwind 1		NECRU1-20100111	-3.7E-15	-1.9E-15	-9.4E-16	-9.4E-16	-7.5E-16						-0.2%	-0.2%	-0.1%	-4.7%	-0.1%	
			-1.4E-14	**-7.0E-15**	**-3.5E-15**	**-3.5E-15**	**-2.8E-15**						**0.8%**	**0.8%**	**0.4%**	**17.6%**	**0.5%**	
Downwind 2	1/13/2010	NECRD2-20100113	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.0%	0.0%	0.0%	0.0%	0.0%	Cover NECR-1 side slopes
Upwind 1		NECRU1-20100113	-1.3E-14	-6.5E-15	-3.2E-15	-3.2E-15	-2.6E-15						-0.7%	-0.7%	-0.4%	-16.2%	-0.4%	
			-1.3E-14	**-6.5E-15**	**-3.2E-15**	**-3.2E-15**	**-2.6E-15**						**0.7%**	**0.7%**	**0.4%**	**16.2%**	**0.4%**	
Downwind 2	1/15/2010	NECRD2-20100115	8.3E-15	4.2E-15	2.1E-15	2.1E-15	1.7E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.5%	0.5%	0.2%	10.4%	0.3%	Cover NECR-1 side slopes
Upwind 1		NECRU1-20100115	-2.8E-15	-1.4E-15	-6.9E-16	-6.9E-16	-5.5E-16						-0.2%	-0.2%	-0.1%	-3.4%	-0.1%	
			-1.1E-14	**-5.5E-15**	**-2.8E-15**	**-2.8E-15**	**-2.2E-15**						**0.6%**	**0.6%**	**0.3%**	**13.8%**	**0.4%**	
Downwind 2	1/18/2010	NECRD2-20100118	7.0E-15	3.5E-15	1.7E-15	1.7E-15	1.4E-15	1.8E-12	9.0E-13	9.0E-13	2.0E-14	6.0E-13	0.4%	0.4%	0.2%	8.7%	0.2%	Grade NECR-1 side slopes
Upwind 1		NECRU1-20100118	1.1E-14	5.4E-15	2.7E-15	2.7E-15	2.1E-15						0.6%	0.6%	0.3%	13.4%	0.4%	
			3.7E-15	**1.9E-15**	**9.4E-16**	**9.4E-16**	**7.5E-16**						**-0.2%**	**-0.2%**	**-0.1%**	**-4.7%**	**-0.1%**	

Note:

(1) U-nat, Ra-226 and Th-230 activity calculated from measured gross alpha activity @ faction of 0.5 for U-nat, 0.25 for Ra-226 and 0.25 for Th-230 of gross alpha activity, Pb-210 activity calculated at 80% Ra-226 based on assumption that 20% of radon (Pb-210 parent nuclides) emanates out of soil.

(2) DACs from 10CFR20, Appendix B, Table 2 for control and assessment of dose to the public

(3) Gross Alpha measurments recorded after 72 hours. Approximately 90% of radon daughters have decayed at time of record. If Gross Alpha monitoring criteria are not met, additional reading are taken at longer time intervals to identify radon contribution to results. Latest reading is reported.

(4) Calculated DAC for gross alpha activity by summing U-nat, Ra-226, Th-230 and Th-230 DACs for control measures, not a regulatory DAC.

ENVIRONMENTAL DOSIMETRY REPORT

Location ID Number	Location Identifier	Exposure Period Date	Monitoring Period		Dosimeter Reading (mrem)	Average Exposure Rate @ Station (uR/Hr)	Date Returned For Analysis	Year To Date (mrem)	Comment
			Placement Date & Time	Retrieval Date & Time					
OOOO1	NECR-U1	8/1/2009	8/20/2009 1345	10/8/2009 1042	2.1	15	10/8/2009	2.1	NECR-U1 (Upwind & SW portion of NECR mine Site)
OOOO2	NECR-D1	8/1/2009	8/20/2009 1325	10/8/2009 1015	12.2	41	10/8/2009	12.2	NECR-D1 (Downwind N. & nearby the nearest resident)
OOOO3	NECR-D2	9/1/2009	9/8/2009 1330	10/8/2009 O955	4.0	16	10/8/2009	4.0	NECR-D2 (Downwind N. about 300' W. of Quivira mine pile) 00004 & 00005 were not used for 9-1-09
OOOO3	NECR-U1	10/1/2009	10/8/2009 1042	11/9/2009 1112	3.2	15	11/9/2009	5.3	NECR-D1 is moved closer to the nearby resident
OOOO2	NECR-D1	10/1/2009	10/8/2009 1015	11/9/2009 1132	3.3	13	11/9/2009	15.5	(about 18' from SW Corner of home) on 9-8-09
OOOO1	NECR-D2	10/1/2009	10/8/2009 O955	11/9/2009 1150	2.3	13	11/9/2009	6.3	and out of the construction zone area. Also note that 00003 was placed at NECR-U1 and 00001 at NECR-D2 on 10-8-09
OOOO1	NECR-U1	11/1/2009	11/9/2009 1112	12/15/2009 1618	3.4	15	12/16/2009	8.7	NECR-D2 is moved closer to construction activity, (downwind
OOOO2	NECR-D1	11/1/2009	11/9/2009 1132	12/15/2009 1640	1.8	13	12/16/2009	17.3	N. about 500' SW of Quivira Mine pile) on 11-16-09
OOOO3	NECR-D2	11/1/2009	11/9/2009 1150	12/15/2009 1630	2.7	14	12/16/2009	9.0	
OOOO1	NECR-U1	12/1/2009	12/15/2009 1618	1/19/2010 1145	2.6	15	1/20/2010	11.3	
OOOO2	NECR-D1	12/1/2009	12/15/2009 1640	1/19/2010 1200	1.9	14	1/20/2010	19.2	
OOOO3	NECR-D2	12/1/2009	12/15/2009 1630	1/19/2010 1215	2.0	12	1/20/2010	11.0	

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ATTN: MIKE MCDONALD
1051 STATE HWY #566
CHURCH ROCK, NM
87305

YOUR STATE AGENCY:
NM ENVIRONMENT DEPT
(505) 827-1093

RADON MONITORING REPORT

Detector Number	Detector Type	Starting Date	Ending Date	Days	Location	Exposure pCi/l-days	Avg. Radon Conc. pCi/l	Note
4798145	OUTDOOR AIR	08/18/09	01/19/10	154			1.2 ±0.08	
4798147	OUTDOOR AIR	08/18/09	01/19/10	154			1.7 ±0.10	
1	2	3	4	5	6	7	8	9

RESULTS RELATED ONLY TO MONITORS AS RECEIVED BY LANDAUER.

	Process No.	Date Rec'd.	Report Date	Acct. No.
DRB	A21822	01/22/10	02/10/10	0400000

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Telephone: (800) 528-8327 Facsimile: (708) 755-7048

Acct. No. 0410316

Detector Number	Detector Type	Starting Date	Ending Date	Field Data / Comments	Exposure pCi/l-days	Avg. Radon Conc. pCi/l	
4798140	DRNF	08-SEP-09	19-JAN-10	NECR-D2	176.1 ±11.9	1.3 ±0.09	
①	②	③	④	⑤	⑥	⑦	⑧

RESULTS RELATED ONLY TO MONITORS AS RECEIVED BY LANDAUER.

Q.C. Release	Process No.	Report Date	Date Received
DRB	A21822	10-FEB-10	22-JAN-10

APPENDIX G

POST-IRA STATUS SURVEY RESULTS

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NORTHEAST CHURCH ROCK MINE
INTERIM REMOVAL ACTION

POST-IRA STATUS SURVEY
INTERIM REMOVAL ACTION
NORTHEAST CHURCH ROCK MINE SITE

June 29, 2010

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1.0 INTRODUCTION

This report presents the results of the Interim Removal Action (IRA) status surveys (Post-IRA Status Survey of step-out area and Final Status Survey of the unnamed arroyo) conducted at the conclusion of IRA removal activities at the Northeast Church Rock Mine Site (NECR) in Church Rock, New Mexico (the Site) pursuant to the Administrative Order on Consent with EPA Region 9, CERCLA Docket 2009-11. The status surveys consisted of gamma surveying, soil sampling and analysis, and development of a revised correlation between gamma measurements and equivalent Ra-226 concentrations in soil. The Post-IRA Status Survey of the step-out area was conducted in accordance with the *Interim Removal Action Work Plan* (MWH, 2009), as well as the letter to EPA, *IRA Status Survey Sampling Grid and Excavation Schedule for Step-out Areas*, dated October 22, 2009 (MWH), which provided an updated figure showing the gamma surveying and soil sampling locations for the status survey. The Final Status Survey of the unnamed arroyo was conducted in accordance with the *Work Plan for Final Status Survey of the Unnamed Arroyo* (MWH, October 2009) approved by EPA. These status surveys were implemented consistent with MARSSIM guidance (EPA, 2000) and were addressed as Class 1 areas. The objective of the status surveys was to confirm that soils with mean concentrations of Ra-226 in excess of the IRA action level (2.24 pCi/g) were removed from the IRA areas and that the IRA areas have met the MARSSIM release criterion.

2.0 FIELD INVESTIGATION METHODS

2.1 GAMMA SURVEYING

The IRA included excavation of soils from the NECR-1 step-out area and from the unnamed arroyo. The step-out area is relatively flat and soils were typically excavated to not more than approximately one foot, except in certain isolated locations where soils were excavated to greater depths over small confined areas. Conversely, the unnamed arroyo excavation was much deeper (up to 28 feet bgs) and narrow. Therefore, different procedures were used to conduct the Post-IRA Status Survey in the step-out area than those used in the Final Status Survey in the unnamed arroyo, as described in the following sections.

2.1.1 Gamma Correlation Analysis Methods and Instrumentation

A site-specific correlation study for the Post-IRA Status Survey in the step-out area was conducted between gamma radiation levels and Ra-226 concentrations in surface soil using direct gamma radiation measurements. The purpose of the study was to evaluate how well the post-IRA gamma scan results correlate to actual soil sampling results and develop an updated correlation (regression model) for use in future gamma scans to more accurately predict surface soil concentrations.

Previous correlations were developed in September 2007 for the Supplemental Removal Site Evaluation (SRSE dataset) and in July 2009 for the IRA excavation control survey (WP EXC dataset). The 2007 correlation was developed because the SRSE evaluated areas with much lower activity levels than from the mine permit area used in the RSE correlation (2006b). The 2009 correlation was developed to provide a correlation for an alternative laboratory and because the excavation activities could result in changes to the concentration and distribution of Ra-226 in soil, which could change the site-specific correlation between direct gamma radiation levels and Ra-226 concentrations in soil. The IRA Work Plan included developing a revised correlation from the post-IRA excavation sampling data (IRA dataset) to apply to the post-IRA Status Survey.

An Eberline SPA-3 2”x2” NaI Scintillation detector and a Ludlum Model 2221 scaler/ratemeter instrument configuration was used for direct gamma radiation level measurements in accordance with SOP-3 included in the IRA Work Plan. Only the collimated SPA-3 #30 detector and Ludlum 2221 #68782 scaler/ratemeters were used for the Post-IRA Status Survey and correlation data collection. Therefore, the revised correlation was developed only for that specific equipment.

The Ludlum 2221 scaler/ratemeter was calibrated using SOP-1. Optimum operating high voltage for the 2”x2” NaI detector was established by performing a high voltage plateau. The detector efficiencies were determined as described in the SOP-1 using a DOE uranium ore calibration pad near Grants, New Mexico. Following efficiency calibration of the detector, the Minimum Detectable Concentration (MDC) was determined as shown in

the SOP-1. The MDC for one minute static measurement for the SPA-3 2"x2" detectors #408522-30, and the Ludlum 44-10 2"x2" detector #276626 was calculated to be less than 0.60 pCi/gm for the collimated detector. The instrumentation calibration documentation is included in Attachment A. Daily function checks of the instrument were performed during the field gamma radiation level measurements. A Differentially Corrected Global Positioning System (DGPS), Magellan MobileMapper CX with TDS SOLO software, was used for determining sampling point location coordinates.

Soil sampling was conducted consistent with the soil sampling procedures in SOP-2. Soil samples were analyzed for Ra-226 by Energy Laboratories, Inc. (ELI) using EPA Method 901.1

The locations of the co-located gamma measurements and collected soil samples used in the correlation analysis (SRSE and the IRA datasets) are shown on Figure 1, *Correlation Soil Sample Locations.* A detailed description of the results of the correlation analysis is included in Section 3.1.

2.1.2 Step-out Area

Subsequent to completion of the excavation within the step-out areas, the Post-IRA Status Survey was conducted. The excavation control survey that was conducted during the IRA construction (see the *Interim Removal Action Completion Report, MWH, 2010*) covered nearly all of the Step-out area; although some areas within the bermed area did not pass this initial survey, as discussed in Section 3. Excavation of soils was conducted in six inch-lifts. After each lift, a radiation scan survey was performed to identify locations that exceeded the action level (2.24 pCi/g). If no points exceeding the action level were measured by the initial excavation scan, one-minute static radiation measurements were collected at regular intervals (approximate grid spacing of 10 by 10 feet) and areas with no exceedances of the action level were deemed complete. Areas above the action level were marked for further excavation. In several small areas gamma measurements remained above the action level even after excavating over two feet deep. At this depth, the elevated gamma measurements could have been due to the geometry of the excavation and shine from the excavation walls, which increases with depth, even where the bottom of the excavation is below the action level. Excavations greater than two feet were required in 17 limited areas, as shown on Figures 2 and 3. In some deeper excavations, the walls of the excavation were wide (low angle) such that the shine from the walls was not significant, and scanning results were below the action level.

Radiation shine was significant in 11 of the deeper excavations, and so excavation was suspended in these areas and additional static gamma radiation measurements were performed at several locations within the excavation, followed by collection of a soil sample (in some cases more than one per excavation) at locations with the highest static gamma radiation measurements. These soil samples were analyzed for Ra-226 using the on-site gamma spectroscopy expedited (few days) analysis, as in the unnamed arroyo. If the on-site gamma spectroscopy results showed Ra-226 below the action level (2.24 pCi/g), a split of the sample was sent to the chemical laboratory (Energy Laboratory) for confirmatory analysis. If the on-site gamma spectroscopy sample showed Ra-226 above

the 2.24 pCi/g, additional excavation and rescanning was repeated until activities below the action level were reached.

Once the excavation control survey confirmed that soil exceeding the IRA action level had been removed, static gamma radiation surveying was conducted within the excavated areas as part of the Post-IRA Status Survey. The survey was conducted in accordance with the survey design presented in the *Removal Site Evaluation Work Plan* (MWH, 2006a). The number of survey points was determined using the non-parametric Wilcoxin-Mann-Whitney (WMW) test, in accordance with MARSSIM (this is the terminology used in ProUCL for the same test as the Wilcoxin Rank Sum [WRS] test, which is the terminology used in MARSSIM) to support Data Quality Objectives (DQOs) for Class 1 areas with statistical parameters selected to achieve a low error rate. Consequently, the Post-IRA Status Survey gamma measurements were collected on an 80-foot triangular grid within the IRA excavation limits and cast on a random origin, which resulted in 281 data points. Excavations deeper than approximately two feet required alternate survey methods (e.g., confirmation soil sampling at highest gamma), as presented in Section 2.2.1.

The instrumentation that was used for the Post-IRA Status Survey consisted of a lead collimated 2x2 NaI scintillation detector (such as Eberline SPA-3) for detection of gamma radiation, connected to a portable ratemeter/scaler (such as Ludlum 2221). The gamma radiation levels in count rates (counts per minute) were converted to equivalent Ra-226 concentrations using the regression equation developed from the correlation between gamma measurements and Ra-226 concentrations in soil, as discussed in Section 2.3.

2.1.3 Unnamed Arroyo

Gamma surveying was not used in the unnamed arroyo to conduct the Final Status Survey due to the effect of shine from the geometry of the deep excavation, and the inherent difficulty of conducting gamma surveying within the excavation in a safe and effective manner. Instead, gamma radiation scanning was conducted periodically during construction activities to guide excavation, as described in the *IRA Construction Plan* (MWH, 2009), with additional details provided in the letter to EPA, *Work Plan for Final Status Survey of the Unnamed Arroyo*, dated October 7, 2009 (MWH). The Final Status Survey of the unnamed arroyo included an expanded soil sampling and analysis plan, as described in Section 2.2.2.

To confirm that the excavation had reached the required depth, once the initial field screening indicated that the soils at the bottom of the excavation were at or near the action level (2.24 pCi/g), a sample was collected at a minimum of every 50 feet along the length of the arroyo excavation and from 12 locations along the banks and analyzed by gamma spectroscopy using a Canberra System 100 Gamma Spectroscopy System. The system was set-up in the UNC offices near the mine site, which allowed an estimation of the Ra-226 activity level to be made in one to three days based on the Decay Product In-growth Factor presented in the Gamma Spectroscopy Operating Procedure included in the October 7, 2009 letter to EPA. Once these results indicated excavation in a given area was complete, soil samples were collected for laboratory analysis for the Final Status Survey in the unnamed arroyo, as described in Section 2.2.1.

2.2 SURFACE SOIL SAMPLING AND ANALYSIS

2.2.1 Step-out Area

Surface soil samples were collected for laboratory analysis of Ra-226 at 22 locations within the IRA excavation areas. The soil samples were collected manually as grab samples from 0 to 0.5 feet below ground surface (bgs) within the excavated areas on a regular grid and co-located with the static gamma measurement points that were collected on an 80-ft triangular grid. The surface soil grab samples were collected by carefully removing the top layer of soil or debris to the desired sample depth with a decontaminated spade, shovel, or equivalent. The soil samples were placed into new, appropriately sized stainless steel bowls or aluminum pie tins. In order to ensure proper representation of the material being sampled, homogenization and fractional splitting were used where replicate samples were collected. After homogenization, both the primary and fractional split samples were placed into plastic bags (e.g., ZipLoc® bags), double bagged, and then placed in a cooler for shipment to the laboratory.

As discussed in Section 2.1.2, deeper excavation occurred in some localized areas (up to 8 feet bgs) within the step-out area, as described in the *IRA Completion Report* (MWH, 2010), as shown on Figure 2, *Post-IRA Gamma Survey Results*. In these areas, it was not possible to conduct static gamma surveying for the Post-IRA Status Survey due to the effect of shine from the sidewalls of the excavation. In order to confirm that the IRA was complete in these areas, gamma scanning was performed to identify the location within each excavation with the highest reading and additional soil samples (in addition to the 22 surface soil samples discussed above) were collected. These soil samples were then submitted to the laboratory for analysis of Ra-226.

2.2.2 Unnamed Arroyo

In order to ensure sufficient soil samples to conduct a Final Status Survey, additional soil samples were collected for laboratory analysis along the unnamed arroyo. Soil samples were collected along a transverse transect every 50 feet along the length of the arroyo excavation at the low points of the excavation. Additional samples were collected from the banks of the arroyo along every third transect, on alternating sides of the arroyo, approximately half way up the height of the bank. The excavation was approximately 1,650 feet long and so 45 soil samples were collected for the Final Status Survey (34 bottom samples and 11 bank samples). The soil samples were analyzed for Ra-226 as described in Section 2.2.3.

2.2.3 Chemical Analysis of Soil Samples

The soil samples were submitted to Energy Labs, Inc. (ELI) in Casper, Wyoming and analyzed for Ra-226 using EPA Method 901.1. The reporting limit for all analytical results was 0.1 pCi/g, less than the requested Minimum Detection Limit (MDC) of 0.5 pCi/g. Quality analysis and quality control procedures (QA/QC) are described in the Quality Assurance Project Plan (QAPP), which is included in Appendix A of the *Removal Site Evaluation Work Plan* (MWH, 2006a). The data were verified and validated as per

the QAPP, and underwent Level III (90%) and Level IV (10%) data validation (analytical and validation results are included in Section 3.0).

3.0 FINDINGS AND DISCUSSION

3.1 CORRELATION SAMPLING RESULTS AND REGRESSION ANALYSIS

This section presents the results of the correlation sampling and the regression analysis that was subsequently conducted. Results of the correlation and regression are shown in Appendix A. Field forms showing direct gamma radiation level measurements collected during IRA excavation control and IRA status survey for this correlation are included in Appendix B. The direct gamma radiation level measurements and corresponding Ra-226 results for the SRSE correlation from 58 locations (SRSE dataset) are summarized in Table A1 (Appendix A) and shown on Figure 1. The direct gamma radiation level measurements and corresponding Ra-226 results for the April 2009 IRA Work Plan excavation control correlation from 11 locations (WP EXC dataset) are shown in Table A2. Finally, the direct gamma radiation level measurements and corresponding Ra-226 results for the IRA sampling data from 27 locations (IRA dataset) are shown in Table A3.

The revised correlation for the post-IRA status survey was updated consistent with SOP-2 by performing a regression analysis on the soil sample Ra-226 concentration (pCi/g at Y) and the corresponding gamma radiation level (count rate at X) for sampling data from previous correlations and the IRA sampling data using a least-square linear regression and plotting the results.

A regression analysis of the combined data (96 locations) for all three datasets (SRSE, WP EXC and IRA datasets) resulted in an R^2 value of 0.63, lower than the specified value of at least 0.8, as shown in Figure A2. Therefore, this regression analysis consisting of SRSE dataset, WP EXC dataset and the IRA dataset was rejected. A regression analysis of the SRSE correlation dataset (Table A1) updated with the data from IRA dataset (Table A3) resulted in an acceptable R^2 value of 0.92 and a regression analysis equation (model) of Ra-226 = (0.0013×cpm)-4.4967 as shown in Figure A3. A regression analysis data of the WP EXC dataset (Table A2) updated with the data from IRA dataset (Table A3) also resulted in an acceptable R^2 value of 0.93 with a model equation of Ra-226 = (0.0041×cpm)-17.543 as shown in Figure 4. The second regression predicted concentrations of Ra-226 in soil that were biased high.

Since both of these regression analyses (models) produced acceptable R^2 values, they were examined for precision in predicting values by evaluating the residuals. Residuals are estimates of experimental error obtained by subtracting the observed values from the predicted values. The predicted values are calculated from the appropriate regression equation (model) after all the unknown model parameters have been estimated from the measured data. Examining residuals is a key part of all statistical modeling. Carefully examining the residuals can facilitate in evaluating whether assumptions are reasonable and a choice of model is appropriate. Residuals of the 27 post-IRA sampling points (IRA dataset) were calculated for both correlation models as shown in Table A4. Examination of residual behavior is discussed below.

As shown in Table A4, residuals resulting from the SRSE plus the IRA dataset model (Figure A3) are much smaller (ranging from -1.5 to 0.9 with a σ of 0.6) compared to the residuals (ranging from -2.8 to 3.0 with a σ of 1.2) resulting from the WP EXC dataset plus the IRA dataset model (Figure A4).

A histogram plot of residual frequency distribution for the SRSE plus the IRA datasets model (Figure A5) shows these residuals are more normally distributed than the residuals resulted from the WP EXC plus the IRA datasets model (see Figure A6. The SRSE plus the IRA dataset model predicts values with residuals above ±1.0 for only seven percent of the samples, while the WP EXC plus the IRA dataset model predicts vales with residuals above ±1.0 for about 35% of the samples.

The residual examination indicates that the SRSE and the IRA datasets correlation model Ra-226 = (0.0013×cpm)-4.4967 is more accurate than the model resulting from the WP EXC and the IRA datasets. Also, the SRSE and IRA dataset model with a slope of 0.0013 predicts Ra-226 concentrations with lower uncertainties (mean of 0.17 pCi/g) associated with radiation counting as shown in Table A4 compared to the uncertainties (mean of 0.55 pCi/g) predicted by the WP EXC and IRA data set model with a slope of 0.0041.

It appears that any regression analysis which includes the WP EXC dataset results in either an unacceptable R^2 (<0.8) or a model slope that predicts values with larger residuals and uncertainties.
A correlation with regression analysis of just the WP EXC dataset (soil samples analyzed by ALS) resulted in a much lower correlation of gamma scan to soil results; specifically, the gamma scan cpm correlating to the 2.24 pCi/g action level was much lower (by over 500 cpm) than the correlation developed using the RSE dataset(i.e., the correlation developed using this dataset yielded Ra-226 results that were biased high). Nevertheless, the correlation resulting from the WP EXC dataset was used for the excavation control survey in the step-out area as a conservative approach during the IRA construction.

Based on the correlation discussed above, the following regression model equation resulting from the SRSE dataset updated with the IRA dataset (Figure A3) is more accurate for converting the direct gamma radiation level measurement (CPM for the collimated SPA-3 detector) to equivalent Ra-226 concentration in soil:

$$\text{Ra-226 (pCi/g)} = (0.0013 \times \text{cpm}) - 4.4967$$

The results of this correlation analysis can be used to more accurately predict surface soil concentrations which exceed the action level using gamma radiation level measurements.

3.2 STATIC GAMMA SURVEY RESULTS

A total of 281 static gamma radiation level measurements were collected between October 22, 2009 and January 6, 2010 within the IRA excavation areas, not including the unnamed arroyo, as shown on Figure 2. The static gamma radiation measurements and equivalent Ra-226 concentrations are listed in Table 2, *Post-IRA Static Gamma Radiation*

Measurements. A statistical summary of the results of these measurements as equivalent Ra-226 concentrations in pCi/g follows:

- Mean 1.6
- Median 1.5
- Standard Deviation 0.7
- Minimum <0.6
- Maximum 6.6
- 25^{th} percentile 1.3
- 75^{th} percentile 1.6

As discussed in the *Removal Site Evaluation Report* (MWH, 2007a), the gamma radiation survey data collected for the IRA provides data of a quality sufficient for field screening. Data collected with field instruments have the potential for error and low accuracy, particularly at low concentrations and are considered to be an estimated value.

The results of the gamma measurements showed that only about 10% of the locations (32) exceeded 2.24 pCi/g and less than 5% of the locations (11) exceeded 3.0 pCi/g, the $DCGL_{EMC}$. The $DCGL_{EMC}$ was specified by EPA for the RSE and is greater than the action level ($DCGL_W$) by approximately four times (0.76) the standard deviation (0.18) of the background reference area dataset from the RSE (MWH, 2006b). All of the locations exceeding 2.24 pCi/g were from the southern portion of the IRA area on the hillside and the southeastern corner of the IRA area (see Figure 2). Those locations exceeding 3.0 pCi/g were clustered on the southwestern portion of the hillside immediately adjacent to the NECR-1 pad, plus three locations in the southeastern corner of the IRA area.

In order to evaluate whether the mean concentration in the IRA area is statistically different than the mean of the background area, the two datasets were compared to each other using the WMW test, in accordance with MARSSIM. The WMW test was used with the following parameters:

- Null Hypothesis (Ho): IRA Area Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)

- Alternative Hypothesis (HA): IRA Area Mean/Median < Background Mean/Median Plus Substantial Difference, S

- Substantial Difference (S): $DCGL_W$ (1.14 pCi/g)

- Confidence Level: 95 percent

Static gamma measurements from the IRA area were statistically analyzed in two groups:

1. gamma measurements from the entire IRA excavation area (excluding the unnamed arroyo) consisting of 281 measurements; and

2. gamma measurements only from the excluded area within the berm constructed during the IRA around the hillside consisting of 112 measurements.

Each of these groups of data was compared to the background reference area laboratory analyzed Ra-226 concentrations using the WMW test. The outputs from ProUCL showing the results of the tests are included in Appendix C. In both cases, the p-value was less than 0.001, and so at a 95% confidence level ($\alpha = 0.05$), the null hypothesis is rejected. The conclusion from the test is that the means of the IRA static gamma datasets (entire area and excluded area) are less than the mean of the background reference area and, therefore, the IRA area (both datasets) passes the MARSSIM release criterion based on the correlated gamma measurements.

Consistent with MARSSIM, the gamma measurements were evaluated to assess if there were potentially any areas of elevated residual radioactivity (i.e., those exceeding the $DCGL_{EMC}$) that might result in a dose or risk exceeding the release criterion. The results of the gamma surveys confirmed some measurements along the southern edge of the IRA area did exceed the $DCGL_{EMC}$, but only in a few small areas. Statistical analysis of all the gamma survey results confirm that these few areas do not result in a dose or risk exceeding the release criterion and that the MARSSIM release criterion has been achieved for the step-out area.

3.3 SURFACE SOIL ANALYTICAL RESULTS

Surface soil samples were collected from 70 locations within the IRA areas, including the unnamed arroyo, subsequent to completion of the IRA excavation activities, and were analyzed for Ra-226. The locations of each of the soil samples and analytical results are shown on Figure 3, *Surface Soil Analytical Results*. The analytical results are tabulated in Table 3, *Post-IRA Soil Sample Analytical Results*. The laboratory analytical reports and the results of the data validation are included in Appendix D, *Laboratory Analytical Reports and Data Validation Results*. A statistical summary of the results of the Ra-226 analyses in pCi/g follows:

Group	Count	Mean	Median	Std Dev	Minimum	Maximum	25th %	75th %
Unnamed Arroyo	46	1.0	1.0	0.5	0.4	2.2	0.5	1.3
Step-out Area	24	1.5	1.5	0.6	0.5	3.5	1.1	1.8

The results of the deeper excavation samples (those with location IDs starting with "Z") from the step-out area ranged from 0.4 to 2.2 pCi/g with a mean of 1.1 pCi/g, as summarized in Table 3 and shown on Figure 3.

These data show that within the unnamed arroyo, Ra-226 concentrations were less than 2.24 pCi/g at 100% of the sample locations (see Figure 3). The dataset from the unnamed arroyo was statistically compared to Ra-226 concentrations from the background reference area using the WMW (see Appendix C) for completeness, even though it is not necessary to do so, since all concentrations were below 2.24 pCi/g. The conclusion from these results and the WMW test is that the removal action of the unnamed arroyo was completed and the area passes the MARSSIM release criterion.

Within the step-out area, Ra-226 concentrations were less than 2.24 pCi/g at all but two surface soil locations (all those from the deeper excavations were less than 2.24 pCi/g). One sample collected from the southeast portion of the IRA area was reported at 2.3 pCi/g and a second sample located in the central portion of the area was reported at 3.5 pCi/g, as shown on Figure 3. At the location of the sample that contained 3.5 pCi/g (SSPT-213) the static gamma measurement conducted for the status survey correlated value was 2.1 pCi/g. So to confirm the laboratory result of 3.5 pCi/g the sample was recounted twice, all three results obtained were 3.5 to 3.6 pCi/g.

In order to confirm that the mean soil concentration of Ra-226 in the IRA step-out area (excludes the unnamed arroyo) is statistically different than the mean of the background area, the results (n=24) of the soil analyses (Table 3) were statistically compared using the WMW test, in the same manner and using the same test parameters as for the static gamma measurements (see Section 3.1). The outputs from ProUCL showing the results of the tests are included in C. The results of the test showed that the p-value was less than 0.001, and so at a 95% confidence level ($\alpha = 0.05$), the null hypothesis is rejected. The conclusion from the test is that the means of the Post-IRA Status Survey soil analytical results is less than the mean of Ra-226 concentrations in the background reference area. Therefore, the IRA step-out area passes the MARSSIM release criterion.

4.0 CONCLUSIONS

This report presents the results of the Post-IRA Status Survey of the step-out area and Final Status Survey of the Arroyo conducted at the conclusion of IRA removal activities at the Northeast Church Rock Mine Site in Church Rock, New Mexico pursuant to the Administrative Order on Consent CERLCA, Docket 2009-11. The status survey consisted of gamma surveying, soil sampling and analysis, and development of a revised correlation between gamma measurements and equivalent Ra-226 concentrations. The Post-IRA Status Survey of the step-out area was conducted in accordance with the *Interim Removal Action Work Plan* (MWH, 2009), and the Final Status Survey of the arroyo was conducted in accordance with the *Work Plan for Final Status Survey of the Unnamed Arroyo* (MWH, October 2009). The objective of the surveys was to confirm that soils with mean Ra-226 concentrations in excess of the IRA action level (2.24 pCi/g) were removed from the IRA areas and that the IRA areas meet the MARSSIM release criterion.

The results of the gamma surveying and the soil analyses from the step-out area and unnamed arroyo show that the IRA of the unnamed arroyo and the step-out area meets the MARSSIM release criterion post-removal. The results of the gamma surveys and soil sampling confirmed that only a few small areas exceed the $DCGL_{EMC}$ and statistical analysis of all the survey and soil sampling results confirm that the MARSSIM release criterion has been achieved for the step-out area and the unnamed arroyo.

5.0 REFERENCES

Environmental Protection Agency (EPA), 2000. *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM), EPA 402-R-97-016, Rev. 1.

MWH, 2010. *Interim Removal Action Completion Report*, Northeast Church Rock Mine Site.

MWH, 2009, *Interim Removal Action Work Plan*, Northeast Church Rock Mine Site.

MWH, 2007a. *Removal Site Evaluation Report*, Northeast Church Rock Mine Site, October.

MWH, 2007b. *Supplemental Removal Site Evaluation Work Plan,* Northeast Church Rock Mine Site, October.

MWH, 2006a. *Removal Site Evaluation Work Plan*, Northeast Church Rock Mine Site.

MWH, 2006b. Technical Memorandum, *Results of Background and Radium-226 Correlation Sampling*, Northeast Churc Rock Mine Site.

TABLES

Table 1 Correlation Sample Results								
Location ID	Survey Date	Gamma Radiation Level		Soil Sample Laboratory Results Ra-226		Correlated Equivalent Ra-226		Residual
		CPM	Uncertainty, 95%CL	pCi/g	Uncertainty, 95%CL	pCi/g	Uncertainty, 95%CL	(lab minus predicted)
Post-IRA Correlation Samples								
pt-189	11/03/09	4,518	132	0.5	0.2	1.4	0.17	0.88
pt-147	12/11/09	4,131	126	0.7	0.3	0.9	0.16	0.17
pt-049	12/18/09	4,644	134	1.0	0.5	1.5	0.17	0.54
pt-264	10/26/09	4,562	132	1.0	0.4	1.4	0.17	0.43
pt-132	11/20/09	4,617	133	1.1	0.1	1.5	0.17	0.41
pt-172	10/27/09	4,924	138	1.1	0.4	1.9	0.18	0.80
pt-181	12/11/09	4,660	134	1.1	0.4	1.6	0.17	0.46
pt-185	12/11/09	4,473	131	1.2	0.4	1.3	0.17	0.12
pt-235	10/26/09	4,190	127	1.2	0.4	1.0	0.16	-0.25
pt-243	10/26/09	4,317	129	1.3	0.4	1.1	0.17	-0.18
pt-053	12/21/09	5,155	141	1.5	0.6	2.2	0.18	0.70
pt-136	12/11/09	4,730	135	1.5	0.5	1.7	0.18	0.15
pt-215	11/20/09	4,222	127	1.5	0.4	1.0	0.17	-0.51
pt-046	12/16/09	4,523	132	1.7	0.5	1.4	0.17	-0.32
pt-057	12/21/09	4,829	136	1.7	0.7	1.8	0.18	0.08
pt-239	10/26/09	4,634	133	1.7	0.5	1.5	0.17	-0.17
pt-140	12/16/09	4,651	134	1.8	0.7	1.5	0.17	-0.25
pt-269	10/26/09	4,630	133	2.0	0.5	1.5	0.17	-0.48
pt-064	01/04/10	5,070	140	2.1	0.5	2.1	0.18	-0.01
pt-144	12/11/09	4,131	126	2.2	0.6	0.9	0.16	-1.33
pt-061	12/21/09	5,565	146	2.3	0.5	2.7	0.19	0.44
pt-213	10/27/09	5,077	140	3.6	0.7	2.1	0.18	-1.50
Supplemental RSE Correlation Samples								
home-014	11/07/07	10,488	201	9.2	0.4	9.1	0.26	-0.06
home-057	11/07/07	7,577	171	4.6	0.3	5.4	0.22	0.75
home-086	11/07/07	6,206	154	2.9	0.3	3.6	0.20	0.67
home-105	11/07/07	20,401	280	18.7	0.6	22.0	0.36	3.32
home-112	11/07/07	5,606	147	3.4	0.3	2.8	0.19	-0.61
home-130	11/07/07	24,105	304	28.5	0.7	26.8	0.40	-1.66
home-146	11/07/07	8,176	177	5.3	0.4	6.1	0.23	0.83
home-148	11/07/07	5,697	148	2.5	0.2	2.9	0.19	0.41
home-149	11/07/07	4,846	136	2.0	0.2	1.8	0.18	-0.20
home-151	11/07/07	5,169	141	5.4	0.3	2.2	0.18	-3.18
home-153	11/07/07	5,522	146	0.9	0.2	2.7	0.19	1.78
home-154	11/07/07	5,186	141	2.5	0.2	2.2	0.18	-0.25
home-155	11/07/07	4,649	134	0.7	0.1	1.5	0.17	0.85
home-156	11/07/07	5,064	139	1.5	0.2	2.1	0.18	0.59
home-157	11/07/07	5,678	148	2.0	0.2	2.9	0.19	0.88
home-158	11/07/07	5,794	149	2.9	0.3	3.0	0.19	0.14
home-159	11/07/07	4,860	137	1.3	0.2	1.8	0.18	0.52
home-160	11/07/07	5,121	140	1.7	0.2	2.2	0.18	0.46
home-161	11/07/07	5,551	146	2.5	0.2	2.7	0.19	0.22
home-162	11/07/07	14,628	237	17.1	0.5	14.5	0.31	-2.58
home-163	11/07/07	4,692	134	1.1	0.2	1.6	0.17	0.50
home-164	11/07/07	4,461	131	0.9	0.2	1.3	0.17	0.40
home-165	11/07/07	4,650	134	1.1	0.2	1.5	0.17	0.45

Table 1
Correlation Sample Results

Location ID	Survey Date	Gamma Radiation Level		Soil Sample Laboratory Results Ra-226		Correlated Equivalent Ra-226		Residual
		CPM	Uncertainty, 95%CL	pCi/g	Uncertainty, 95%CL	pCi/g	Uncertainty, 95%CL	(lab minus predicted)
home-167	11/07/07	5,588	147	4.1	0.3	2.8	0.19	-1.33
home-168	11/06/07	5,563	146	3.2	0.3	2.7	0.19	-0.46
home-170	11/06/07	7,166	166	9.5	0.4	4.8	0.22	-4.68
home-171	11/06/07	4,810	136	1.8	0.2	1.8	0.18	-0.04
home-172	11/06/07	6,388	157	4.4	0.3	3.8	0.20	-0.59
home-173	11/06/07	5,355	143	1.4	0.2	2.5	0.19	1.06
home-174	11/06/07	6,374	156	2.5	0.2	3.8	0.20	1.29
home-175	11/06/07	4,939	138	1.9	0.2	1.9	0.18	0.02
home-176	11/06/07	5,291	143	1.2	0.2	2.4	0.19	1.18
home-177	11/06/07	5,821	150	1.7	0.2	3.1	0.19	1.37
home-182	11/07/07	7,526	170	4.8	0.3	5.3	0.22	0.49
tp-103	11/06/07	7,650	171	3.2	0.3	5.4	0.22	2.25
tp-107	11/06/07	4,781	136	0.9	0.2	1.7	0.18	0.82
tp-115	11/06/07	5,663	147	0.9	0.2	2.9	0.19	1.97
tp-125	11/06/07	5,628	147	2.9	0.2	2.8	0.19	-0.08
tp-127	11/06/07	6,995	164	4.1	0.3	4.6	0.21	0.50
tp-129	11/06/07	6,246	155	2.1	0.2	3.6	0.20	1.52
tp-133	11/06/07	8,706	183	3.8	0.3	6.8	0.24	3.02
tp-137	11/06/07	11,143	207	8.9	0.4	10.0	0.27	1.09
vent-103	11/05/07	3,915	123	0.6	0.2	0.6	0.16	-0.01
vent-104	11/05/07	3,565	117	0.9	0.2	0.1	0.15	-0.76
vent-112	11/05/07	4,884	137	2.9	0.2	1.9	0.18	-1.05
vent-113	11/05/07	3,791	121	0.8	0.1	0.4	0.16	-0.37
vent-124	11/05/07	4,432	130	1.2	0.2	1.3	0.17	0.06
vent-136	11/05/07	4,155	126	0.3	0.1	0.9	0.16	0.60
vent-147	11/05/07	5,661	147	1.1	0.2	2.9	0.19	1.76
vent-148	11/05/07	3,195	111	0.6	0.1	-0.3	0.14	-0.94
vent-160	11/05/07	4,222	127	1.9	0.2	1.0	0.17	-0.91
vent-166	11/05/07	5,758	149	3.1	0.3	3.0	0.19	-0.11
vent-170	11/05/07	3,384	114	0.5	0.2	-0.1	0.15	-0.60
vent-179	11/05/07	4,901	137	1.4	0.2	1.9	0.18	0.47
vent-180	11/05/07	4,315	129	1.8	0.2	1.1	0.17	-0.69
vent-185	11/05/07	3,800	121	0.8	0.1	0.4	0.16	-0.36
vent-192	11/05/07	3,546	117	0.6	0.2	0.1	0.15	-0.49
vent-196	11/05/07	4,039	125	1.1	0.2	0.8	0.16	-0.35

Notes:

1. Gamma radiation levels measured with a 2x2 NaI Collimated detector (SPA-3 #30) and reported as CPM + Uncertainty (95% confidence level)
2. Revised correlation based on Supplemental RSE+Post IRA Samples: y=0.0013cpm-4.4967, R^2=0.92, 2.24 pCi/g=5,182 cpm.

Table 2
Post-IRA Static Gamma Radiation Measurements

Point ID	Survey Date	Static Gamma Radiation Measurement		Soil Sample Laboratory Results Ra-226 Concentration		Revised Correlation Predicted Ra-226 Concentration	
		CPM	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL
pt-001	12/16/09	4,612	133	--	--	1.50	0.17
pt-002	12/16/09	4,623	133	--	--	1.51	0.17
pt-003	12/16/09	4,496	131	--	--	1.35	0.17
pt-004	12/18/09	4,655	134	--	--	1.55	0.17
pt-005	01/06/10	4,702	134	--	--	1.62	0.17
pt-006	01/06/10	5,042	139	--	--	2.06	0.18
pt-007	12/21/09	7,505	170	--	--	**5.26**	0.22
pt-008	12/21/09	6,011	152	--	--	**3.32**	0.20
pt-009	12/21/09	5,565	146	--	--	2.74	0.19
pt-010	12/21/09	6,698	160	--	--	**4.21**	0.21
pt-011	12/21/09	7,106	165	--	--	**4.74**	0.21
pt-012	12/21/09	5,528	146	--	--	2.69	0.19
pt-013	12/21/09	4,615	133	--	--	1.50	0.17
pt-014	12/21/09	5,321	143	--	--	2.42	0.19
pt-015	12/21/09	5,487	145	--	--	2.64	0.19
pt-016	12/21/09	5,137	140	--	--	2.18	0.18
pt-017	12/21/09	5,341	143	--	--	2.45	0.19
pt-018	12/21/09	5,220	142	--	--	2.29	0.18
pt-019	12/21/09	5,085	140	--	--	2.11	0.18
pt-020	01/04/10	4,408	130	--	--	1.23	0.17
pt-021	01/04/10	4,536	132	--	--	1.40	0.17
pt-022	01/04/10	4,433	130	--	--	1.27	0.17
pt-023	12/16/09	4,522	132	--	--	1.38	0.17
pt-024	12/16/09	4,685	134	--	--	1.59	0.17
pt-025	12/16/09	4,623	133	--	--	1.51	0.17
pt-026	12/18/09	4,705	134	--	--	1.62	0.17
pt-027	12/18/09	4,598	133	--	--	1.48	0.17
pt-028	01/05/10	4,649	134	--	--	1.55	0.17
pt-029	12/21/09	4,912	137	--	--	1.89	0.18
pt-030	12/21/09	8,510	181	--	--	**6.57**	0.24
pt-031	12/21/09	5,281	142	--	--	2.37	0.19
pt-032	12/21/09	5,968	151	--	--	**3.26**	0.20
pt-033	12/21/09	4,519	132	--	--	1.38	0.17
pt-034	12/21/09	4,474	131	--	--	1.32	0.17
pt-035	12/21/09	4,424	130	--	--	1.25	0.17
pt-036	12/21/09	4,483	131	--	--	1.33	0.17
pt-037	12/21/09	5,395	144	--	--	2.52	0.19
pt-038	12/21/09	4,362	129	--	--	1.17	0.17
pt-039	12/21/09	5,480	145	--	--	2.63	0.19
pt-040	12/21/09	4,701	134	--	--	1.61	0.17
pt-041	12/21/09	4,946	138	--	--	1.93	0.18
pt-042	01/04/10	4,838	136	--	--	1.79	0.18
pt-043	01/04/10	4,606	133	--	--	1.49	0.17
pt-044	01/04/10	4,330	129	--	--	1.13	0.17
pt-045	12/16/09	4,635	133	--	--	1.53	0.17
pt-046	12/16/09	4,523	132	1.70	0.5	1.38	0.17
pt-047	12/16/09	4,649	134	--	--	1.55	0.17
pt-048	12/16/09	4,668	134	--	--	1.57	0.17
pt-049	12/18/09	4,644	134	1.00	0.5	1.54	0.17
pt-050	01/06/10	4,918	137	--	--	1.90	0.18
pt-051	01/06/10	5,714	148	--	--	2.93	0.19
pt-052	12/21/09	4,707	134	--	--	1.62	0.17

Table 2
Post-IRA Static Gamma Radiation Measurements

Point ID	Survey Date	Static Gamma Radiation Measurement		Soil Sample Laboratory Results Ra-226 Concentration		Revised Correlation Predicted Ra-226 Concentration	
		CPM	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL
pt-053	12/21/09	5,155	141	1.50	0.6	2.20	0.18
pt-054	12/21/09	5,400	144	--	--	2.52	0.19
pt-055	12/21/09	4,070	125	--	--	0.79	0.16
pt-056	12/21/09	4,854	137	--	--	1.81	0.18
pt-057	12/21/09	4,829	136	1.70	0.7	1.78	0.18
pt-058	12/21/09	4,288	128	--	--	1.08	0.17
pt-059	12/21/09	4,307	129	--	--	1.10	0.17
pt-060	12/21/09	4,488	131	--	--	1.34	0.17
pt-061	12/21/09	5,565	146	2.30	0.5	2.74	0.19
pt-062	12/21/09	7,682	172	--	--	**5.49**	0.22
pt-063	12/21/09	4,483	131	--	--	1.33	0.17
pt-064	01/04/10	5,070	140	2.10	0.5	2.09	0.18
pt-065	01/04/10	4,487	131	--	--	1.34	0.17
pt-066	01/04/10	4,459	131	--	--	1.30	0.17
pt-067	12/16/09	4,439	131	--	--	1.27	0.17
pt-068	12/16/09	4,277	128	--	--	1.06	0.17
pt-069	12/16/09	4,551	132	--	--	1.42	0.17
pt-070	12/16/09	4,699	134	--	--	1.61	0.17
pt-071	12/16/09	4,616	133	--	--	1.50	0.17
pt-072	01/05/10	4,627	133	--	--	1.52	0.17
pt-073	12/21/09	5,114	140	--	--	2.15	0.18
pt-074	12/21/09	4,942	138	--	--	1.93	0.18
pt-075	12/21/09	4,932	138	--	--	1.91	0.18
pt-076	12/11/09	4,725	135	--	--	1.65	0.18
pt-077	12/11/09	4,958	138	--	--	1.95	0.18
pt-078	12/21/09	4,630	133	--	--	1.52	0.17
pt-079	12/21/09	4,640	134	--	--	1.54	0.17
pt-080	12/21/09	4,805	136	--	--	1.75	0.18
pt-081	12/21/09	4,955	138	--	--	1.94	0.18
pt-082	12/21/09	4,698	134	--	--	1.61	0.17
pt-083	12/21/09	4,832	136	--	--	1.78	0.18
pt-084	12/21/09	6,686	160	--	--	**4.20**	0.21
pt-085	12/21/09	4,729	135	--	--	1.65	0.18
pt-086	01/04/10	4,850	136	--	--	1.81	0.18
pt-087	01/04/10	4,701	134	--	--	1.61	0.17
pt-088	01/04/10	4,518	132	--	--	1.38	0.17
pt-089	12/16/09	4,228	127	--	--	1.00	0.17
pt-090	11/06/09	4,170	127	--	--	0.92	0.16
pt-091	12/16/09	4,612	133	--	--	1.50	0.17
pt-092	12/16/09	4,634	133	--	--	1.53	0.17
pt-093	12/16/09	4,727	135	--	--	1.65	0.18
pt-094	01/06/10	5,000	139	--	--	2.00	0.18
pt-095	12/18/09	4,927	138	--	--	1.91	0.18
pt-096	12/18/09	5,268	142	--	--	2.35	0.18
pt-097	12/11/09	4,649	134	--	--	1.55	0.17
pt-098	12/11/09	5,277	142	--	--	2.36	0.19
pt-099	01/04/10	4,889	137	--	--	1.86	0.18
pt-100	12/11/09	4,634	133	--	--	1.53	0.17
pt-101	12/18/09	4,484	131	--	--	1.33	0.17
pt-102	12/18/09	4,194	127	--	--	0.96	0.17
pt-103	12/18/09	4,460	131	--	--	1.30	0.17
pt-104	12/18/09	4,544	132	--	--	1.41	0.17

Table 2
Post-IRA Static Gamma Radiation Measurements

Point ID	Survey Date	Static Gamma Radiation Measurement		Soil Sample Laboratory Results Ra-226 Concentration		Revised Correlation Predicted Ra-226 Concentration	
		CPM	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL
pt-105	12/18/09	4,760	135	--	--	1.69	0.18
pt-106	12/18/09	5,521	146	--	--	2.68	0.19
pt-107	12/18/09	5,033	139	--	--	2.05	0.18
pt-108	01/04/10	6,849	162	--	--	4.41	0.21
pt-109	01/04/10	4,971	138	--	--	1.97	0.18
pt-110	12/16/09	4,617	133	--	--	1.51	0.17
pt-111	11/06/09	4,390	130	--	--	1.21	0.17
pt-112	12/16/09	4,540	132	--	--	1.41	0.17
pt-113	12/18/09	4,650	134	--	--	1.55	0.17
pt-114	01/05/10	4,633	133	--	--	1.53	0.17
pt-115	12/18/09	5,207	141	--	--	2.27	0.18
pt-116	12/11/09	4,633	133	--	--	1.53	0.17
pt-117	12/11/09	5,276	142	--	--	2.36	0.19
pt-118	12/11/09	4,626	133	--	--	1.52	0.17
pt-119	12/11/09	5,212	142	--	--	2.28	0.18
pt-120	12/11/09	4,644	134	--	--	1.54	0.17
pt-121	12/18/09	4,708	134	--	--	1.62	0.17
pt-122	12/18/09	4,667	134	--	--	1.57	0.17
pt-123	12/18/09	4,553	132	--	--	1.42	0.17
pt-124	12/18/09	4,441	131	--	--	1.28	0.17
pt-125	12/18/09	5,141	141	--	--	2.19	0.18
pt-126	12/18/09	5,241	142	--	--	2.32	0.18
pt-127	12/18/09	4,518	132	--	--	1.38	0.17
pt-128	12/18/09	5,378	144	--	--	2.49	0.19
pt-129	01/04/10	5,610	147	--	--	2.80	0.19
pt-130	11/06/09	4,448	131	--	--	1.29	0.17
pt-131	12/18/09	4,721	135	--	--	1.64	0.18
pt-132	11/20/09	4,617	133	1.10	0.1	1.51	0.17
pt-133	12/21/09	4,590	133	--	--	1.47	0.17
pt-134	12/21/09	4,606	133	--	--	1.49	0.17
pt-135	12/16/09	4,639	133	--	--	1.53	0.17
pt-136	12/11/09	4,730	135	1.50	0.5	1.65	0.18
pt-137	12/11/09	4,641	134	--	--	1.54	0.17
pt-138	12/11/09	4,635	133	--	--	1.53	0.17
pt-139	12/16/09	4,633	133	--	--	1.53	0.17
pt-140	12/16/09	4,651	134	1.80	0.7	1.55	0.17
pt-141	12/18/09	4,354	129	--	--	1.16	0.17
pt-142	12/18/09	4,920	137	--	--	1.90	0.18
pt-143	12/11/09	4,918	137	--	--	1.90	0.18
pt-144	12/11/09	4,131	126	2.20	0.6	0.87	0.16
pt-145	12/11/09	3,988	124	--	--	0.69	0.16
pt-146	12/11/09	4,659	134	--	--	1.56	0.17
pt-147	12/11/09	4,131	126	0.70	0.3	0.87	0.16
pt-148	11/06/09	4,297	128	--	--	1.09	0.17
pt-149	12/11/09	4,436	131	--	--	1.27	0.17
pt-150	12/11/09	4,063	125	--	--	0.79	0.16
pt-151	12/11/09	4,076	125	--	--	0.80	0.16
pt-152	12/21/09	4,640	134	--	--	1.54	0.17
pt-153	12/11/09	4,647	134	--	--	1.54	0.17
pt-154	12/11/09	4,459	131	--	--	1.30	0.17
pt-155	12/11/09	4,547	132	--	--	1.41	0.17
pt-156	12/16/09	4,431	130	--	--	1.26	0.17

Table 2 Post-IRA Static Gamma Radiation Measurements							
Point ID	Survey Date	Static Gamma Radiation Measurement		Soil Sample Laboratory Results Ra-226 Concentration		Revised Correlation Predicted Ra-226 Concentration	
		CPM	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL
pt-157	12/16/09	4,654	134	--	--	1.55	0.17
pt-158	12/11/09	4,121	126	--	--	0.86	0.16
pt-159	12/11/09	4,599	133	--	--	1.48	0.17
pt-160	12/11/09	4,433	130	--	--	1.27	0.17
pt-161	12/11/09	4,095	125	--	--	0.83	0.16
pt-162	12/11/09	4,042	125	--	--	0.76	0.16
pt-163	12/11/09	4,636	133	--	--	1.53	0.17
pt-164	12/11/09	4,635	133	--	--	1.53	0.17
pt-165	12/18/09	4,650	134	--	--	1.55	0.17
pt-166	12/11/09	4,479	131	--	--	1.33	0.17
pt-167	12/11/09	4,693	134	--	--	1.60	0.17
pt-168	12/11/09	4,640	134	--	--	1.54	0.17
pt-169	12/11/09	3,964	123	--	--	0.66	0.16
pt-170	12/11/09	4,105	126	--	--	0.84	0.16
pt-171	12/11/09	4,515	132	--	--	1.37	0.17
pt-172	10/27/09	4,924	138	1.10	0.4	1.90	0.18
pt-173	12/11/09	4,375	130	--	--	1.19	0.17
pt-174	12/11/09	3,928	123	--	--	0.61	0.16
pt-175	12/11/09	4,642	134	--	--	1.54	0.17
pt-176	12/11/09	4,339	129	--	--	1.14	0.17
pt-177	12/21/09	4,620	133	--	--	1.51	0.17
pt-178	12/11/09	4,400	130	--	--	1.22	0.17
pt-179	12/16/09	4,153	126	--	--	0.90	0.16
pt-180	12/11/09	4,368	130	--	--	1.18	0.17
pt-181	12/11/09	4,660	134	1.10	0.4	1.56	0.17
pt-182	12/11/09	4,577	133	--	--	1.45	0.17
pt-183	12/11/09	4,254	128	--	--	1.03	0.17
pt-184	12/11/09	4,647	134	--	--	1.54	0.17
pt-185	12/11/09	4,473	131	1.20	0.4	1.32	0.17
pt-186	12/11/09	4,648	134	--	--	1.55	0.17
pt-187	12/11/09	4,345	129	--	--	1.15	0.17
pt-188	11/20/09	4,136	126	--	--	0.88	0.16
pt-189	11/03/09	4,518	132	0.50	0.2	1.38	0.17
pt-190	12/16/09	4,586	133	--	--	1.47	0.17
pt-191	12/11/09	4,580	133	--	--	1.46	0.17
pt-192	12/11/09	4,380	130	--	--	1.20	0.17
pt-193	12/11/09	4,359	129	--	--	1.17	0.17
pt-194	12/11/09	4,629	133	--	--	1.52	0.17
pt-195	12/11/09	4,630	133	--	--	1.52	0.17
pt-196	12/11/09	4,529	132	--	--	1.39	0.17
pt-197	12/11/09	4,663	134	--	--	1.57	0.17
pt-198	10/27/09	4,594	133	--	--	1.48	0.17
pt-199	11/20/09	4,319	129	--	--	1.12	0.17
pt-200	11/03/09	3,964	123	--	--	0.66	0.16
pt-201	11/16/09	4,507	132	--	--	1.36	0.17
pt-202	10/27/09	4,363	129	--	--	1.18	0.17
pt-203	10/27/09	4,660	134	--	--	1.56	0.17
pt-204	10/27/09	4,630	133	--	--	1.52	0.17
pt-205	10/27/09	4,683	134	--	--	1.59	0.17
pt-206	10/27/09	4,736	135	--	--	1.66	0.18
pt-207	10/27/09	4,446	131	--	--	1.28	0.17
pt-208	10/27/09	4,393	130	--	--	1.21	0.17

Table 2
Post-IRA Static Gamma Radiation Measurements

Point ID	Survey Date	Static Gamma Radiation Measurement		Soil Sample Laboratory Results Ra-226 Concentration		Revised Correlation Predicted Ra-226 Concentration	
		CPM	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL
pt-209	10/27/09	4,552	132	--	--	1.42	0.17
pt-210	10/27/09	4,675	134	--	--	1.58	0.17
pt-211	11/03/09	3,953	123	--	--	0.64	0.16
pt-212	11/03/09	3,952	123	--	--	0.64	0.16
pt-213	10/27/09	5,077	140	3.60	0.7	2.10	0.18
pt-214	10/27/09	4,388	130	--	--	1.21	0.17
pt-215	11/20/09	4,222	127	1.50	0.4	0.99	0.17
pt-216	11/03/09	4,026	124	--	--	0.74	0.16
pt-217	10/27/09	4,192	127	--	--	0.95	0.16
pt-218	10/27/09	4,623	133	--	--	1.51	0.17
pt-219	11/20/09	4,642	134	--	--	1.54	0.17
pt-220	11/03/09	2,723	102	--	--	<0.60	
pt-221	10/27/09	4,628	133	--	--	1.52	0.17
pt-222	10/27/09	4,607	133	--	--	1.49	0.17
pt-223	10/27/09	4,438	131	--	--	1.27	0.17
pt-224	10/26/09	4,656	134	--	--	1.56	0.17
pt-225	11/03/09	2,684	102	--	--	<0.60	
pt-226	10/27/09	4,612	133	--	--	1.50	0.17
pt-227	10/27/09	4,658	134	--	--	1.56	0.17
pt-228	10/26/09	4,576	133	--	--	1.45	0.17
pt-229	10/26/09	4,488	131	--	--	1.34	0.17
pt-230	10/26/09	4,659	134	--	--	1.56	0.17
pt-231	10/26/09	4,134	126	--	--	0.88	0.16
pt-232	10/26/09	4,491	131	--	--	1.34	0.17
pt-233	10/22/09	4,189	127	--	--	0.95	0.16
pt-234	10/22/09	4,680	134	--	--	1.59	0.17
pt-235	10/26/09	4,190	127	1.20	0.4	0.95	0.16
pt-236	10/26/09	4,508	132	--	--	1.36	0.17
pt-237	10/26/09	4,602	133	--	--	1.49	0.17
pt-238	10/26/09	4,701	134	--	--	1.61	0.17
pt-239	10/26/09	4,634	133	1.70	0.5	1.53	0.17
pt-240	10/26/09	4,764	135	--	--	1.70	0.18
pt-241	10/22/09	4,192	127	--	--	0.95	0.16
pt-242	10/22/09	4,556	132	--	--	1.43	0.17
pt-243	10/26/09	4,317	129	1.30	0.4	1.12	0.17
pt-244	12/16/09	4,629	133	--	--	1.52	0.17
pt-245	11/03/09	4,544	132	--	--	1.41	0.17
pt-246	11/03/09	4,358	129	--	--	1.17	0.17
pt-247	10/26/09	4,589	133	--	--	1.47	0.17
pt-248	10/22/09	4,678	134	--	--	1.58	0.17
pt-249	10/22/09	4,190	127	--	--	0.95	0.16
pt-250	10/26/09	4,461	131	--	--	1.30	0.17
pt-251	10/26/09	4,332	129	--	--	1.13	0.17
pt-252	10/26/09	4,605	133	--	--	1.49	0.17
pt-253	10/22/09	4,719	135	--	--	1.64	0.18
pt-254	10/22/09	4,257	128	--	--	1.04	0.17
pt-255	10/22/09	4,632	133	--	--	1.52	0.17
pt-256	10/26/09	4,253	128	--	--	1.03	0.17
pt-257	10/26/09	4,547	132	--	--	1.41	0.17
pt-258	10/26/09	4,324	129	--	--	1.12	0.17
pt-259	10/26/09	4,156	126	--	--	0.91	0.16
pt-260	10/26/09	4,479	131	--	--	1.33	0.17

Table 2
Post-IRA Static Gamma Radiation Measurements

Point ID	Survey Date	Static Gamma Radiation Measurement		Soil Sample Laboratory Results Ra-226 Concentration		Revised Correlation Predicted Ra-226 Concentration	
		CPM	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL	pCi/g	Uncertainty 95%CL
pt-261	10/26/09	4,641	134	--	--	1.54	0.17
pt-262	10/26/09	4,539	132	--	--	1.40	0.17
pt-263	10/26/09	4,377	130	--	--	1.19	0.17
pt-264	10/26/09	4,562	132	1.00	0.4	1.43	0.17
pt-265	10/26/09	4,676	134	--	--	1.58	0.17
pt-266	10/26/09	4,659	134	--	--	1.56	0.17
pt-267	11/03/09	4,674	134	--	--	1.58	0.17
pt-268	11/03/09	4,270	128	--	--	1.05	0.17
pt-269	10/26/09	4,630	133	2.00	0.5	1.52	0.17
pt-270	10/26/09	4,374	130	--	--	1.19	0.17
pt-271	10/26/09	4,558	132	--	--	1.43	0.17
pt-272	11/03/09	4,664	134	--	--	1.57	0.17
pt-273	10/26/09	4,387	130	--	--	1.21	0.17
pt-274	10/26/09	4,259	128	--	--	1.04	0.17
pt-275	10/26/09	4,448	131	--	--	1.29	0.17
pt-276	10/26/09	4,786	136	--	--	1.73	0.18
pt-277	11/06/09	4,655	134	--	--	1.55	0.17
pt-278	10/26/09	4,632	133	--	--	1.52	0.17
pt-279	10/26/09	4,393	130	--	--	1.21	0.17
pt-280	10/26/09	4,114	126	--	--	0.85	0.16
pt-281	12/11/09	4,211	127	--	--	0.98	0.17
			Mean	**1.54**		**1.60**	
			Std Dev	**0.66**		**0.71**	
			Maximum	**3.60**		**6.57**	

Notes:
-- = not sampled
1. Gamma with
2. Shaded cells exceed 2.24 pCi/g; bolded cells exceed 3.0 pCi/g equivalent Ra-226.

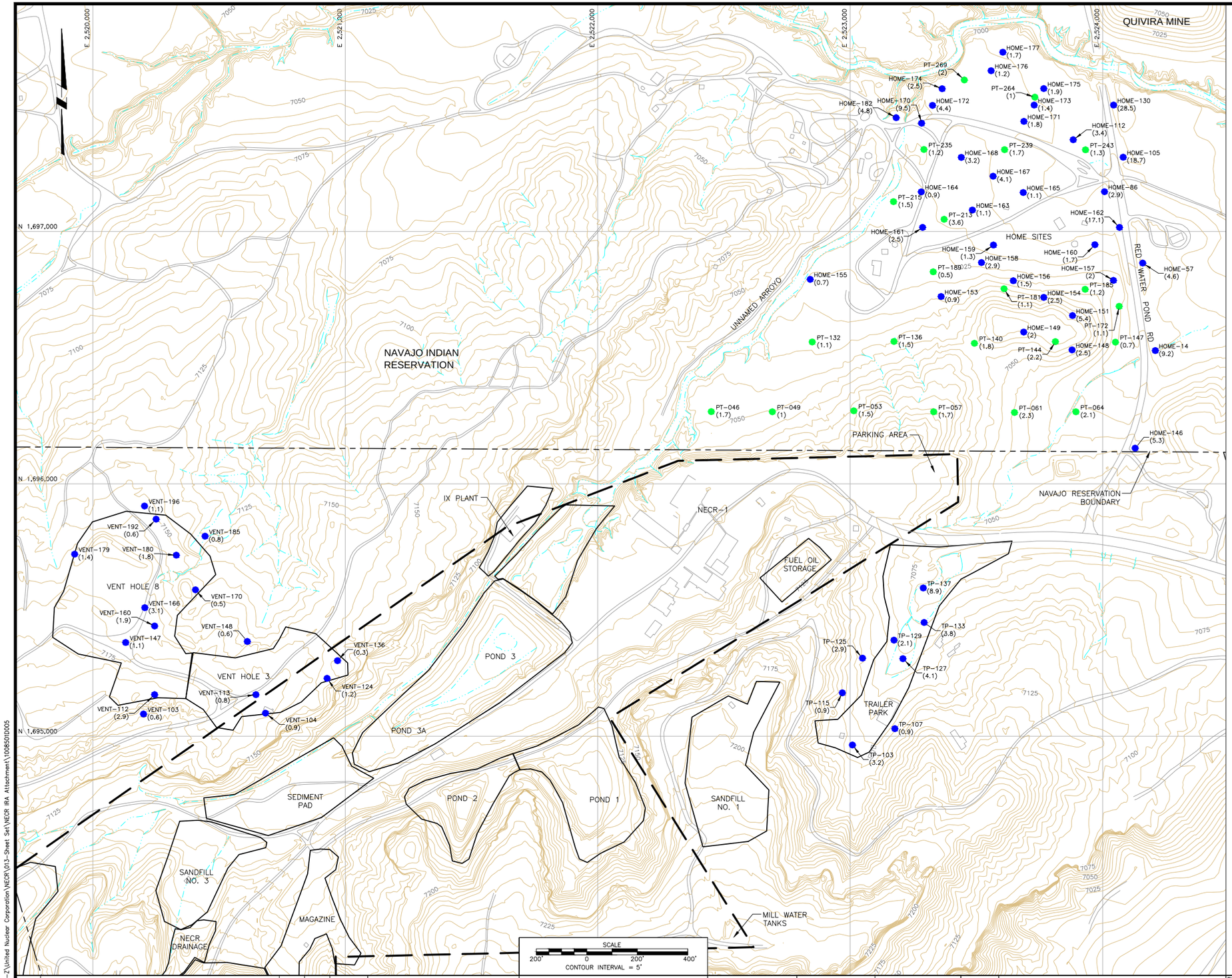
Table 3
Post-IRA Soil Sample Analytical Results

Location ID	Ra-226 (pCi/g)	Uncertainty (95% CL)
Arroyo Bottom Samples		
AS01b	0.8	0.2
AS02b	1.0	0.2
AS03a	1.0	0.2
AS04c	0.5	0.1
AS05a	1.2	0.4
AS06a	1.3	0.5
AS07c	0.5	0.1
AS08a	1.8	0.5
AS09a	1.3	0.5
AS10a	1.8	0.5
AS11a	1.3	0.5
AS12a	1.8	0.6
AS13a	1.8	0.4
AS14a	1.2	0.3
AS15a	0.8	0.2
AS16a	0.9	0.2
AS17a	2.2	0.5
AS18a	1.7	0.6
AS19a	1.2	0.5
AS20a	1.2	0.5
AS21b	1.0	0.5
AS22b	0.5	0.2
AS23b	0.5	0.1
AS24b	0.5	0.1
AS25a	1.5	0.5
AS25a	1.1	0.3
AS26b	0.4	0.2
AS27b	0.6	0.1
AS28b	0.4	0.1
AS29b	0.5	0.1
AS30a	0.5	0.1
AS31C	2.1	0.6
AS32C	1.1	0.4
AS33b	0.4	0.1
AS34b	0.5	0.1
Maximum	**2.2**	**0.6**
Mean	**1.1**	**0.3**
Std Dev	**0.5**	**n/a**
Arroyo Side-Slope Samples		
B01b	1.0	0.4
B02	1.6	0.6
B03a	0.6	0.1
B04a	1.2	0.5
B05b	0.5	0.1
B06a	1.0	0.5
B07a	1.3	0.5
B08a	1.2	0.6
B09a	0.9	0.3
B10a	<0.9	n/a
B11a	0.4	0.2
Maximum	**1.6**	**0.6**
Mean	**1.0**	**0.4**
Std Dev	**0.4**	**n/a**

Location ID	Ra-226 (pCi/g)	Uncertainty (95% CL)
Surface Step-out Area Samples		
SSPT-046	1.7	0.5
SSPT-049	1.0	0.5
SSPT-053	1.5	0.6
SSPT-057	1.5	0.7
SSPT-061	2.3	0.5
SSPT-064	2.1	0.5
SSPT-132	1.1	0.4
SSPT-136	1.5	0.5
SSPT-140	1.8	0.7
SSPT-144	2.2	0.6
SSPT-147	0.7	0.3
SSPT-172	1.1	0.4
SSPT-181	1.1	0.4
SSPT-185	1.2	0.4
SSPT-189	0.5	0.2
SSPT-213	**3.5**	0.5
SSPT-215	1.5	0.4
SSPT-235	1.2	0.4
SSPT-239	1.7	0.5
SSPT-243	1.3	0.4
SSPT-264	1.0	0.4
SSPT-269	2.0	0.5
P197	1.4	0.2
P204	1.7	0.3
Maximum	**3.5**	**0.7**
Mean	**1.5**	**0.5**
Std Dev	**0.6**	**n/a**
Deeper Step-out Area Excavation Samples		
Z1-03b-ss	0.5	0.1
Z1-12-SS	0.4	0.1
Z1-25b-SS	0.5	0.5
Z1-30-SS	2.2	0.1
Z155-07	0.6	0.1
Z4NSS01	1.2	0.1
Z4NSS02	0.9	0.1
Z4NSS03	1.5	0.1
Z4NSS04	1.5	0.1
Z4NSS05	1.2	0.1
Z4NSS08	1.2	0.1
Z4NSS09	0.9	0.1
Z4NSS14	1.2	0.1
Z4SSS07	2.0	0.1
Maximum	**2.2**	**0.5**
Mean	**1.1**	**0.1**
Std Dev	**0.5**	**n/a**

Notes:
1. All samples analyzed by Energy Labs, Inc. using EPA Method 901.1.
2. Shaded cells exceed 2.24 pCi/g and bolded cells exceed 3.0 pCi/g.
3. CL = Confidence Level, 95% CL equivalent to ±2σ.

FIGURES



LEGEND:

- 7040 — PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- SUPPLEMENTAL RSE SAMPLE (2007)
- POST-IRA SAMPLE (2009)
- (0.6) Ra-226 RESULT (pCi/g)

NOTE:

ALL SAMPLES ANALYZED BY ENERGY LABS, INC. USING EPA METHOD 901.1.

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	FINAL	CHF	RTL	06/17/10

DISCLAIMER:
THIS DRAWING WAS DEVELOPED THROUGH THE APPLICATION OF PROFESSIONAL ENGINEERING SKILL AND PROPRIETARY METHODOLOGIES, PROCESSES, AND KNOW HOW OF MWH AS AUTHOR, ALL PURSUANT TO THE TERMS OF A CONTRACTUAL SCOPE OF WORK GOVERNING ITS PREPARATION. THIS DRAWING MAY NOT BE USED OR MODIFIED OTHER THAN IN STRICT ACCORDANCE WITH THE TERMS OF THE GOVERNING CONTRACT AND SCOPE OF WORK OR OTHERWISE ABSENT THE INVOLVEMENT AND CONSENT OF THE AUTHOR. ANY ALTERATION OR ADAPTATION OF THIS DRAWING SHALL BE CONSISTENT WITH THE AUTHOR'S CONTRACTUAL AND PROPRIETARY RIGHTS AND BE AT USER'S SOLE RISK AND WITHOUT ANY LIABILITY OR LEGAL RESPONSIBILITY OF MWH.

DRAWING REFERENCE(S):
1. ORIGINAL SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. AND USGS 10m DIGITAL ELEVATION MODELS (DEM).
2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.
ORIGINAL FILES LOCATED AT: \\USSBS1S01\CAD_ENGINEERING_SUPPORT\DESIGN-DRAFTING\CLIENTS_Q-Z\UNITED NUCLEAR CORPORATION\NECR\009-DRAWINGS FROM SUBCONTRACTORS\NECR IRA ASBUILT SURVEY\96012TOPO3-MAY 24.DWG

PROJECTION: STATE PLANE COORDINATES
ZONE: NEW MEXICO WEST
DATUM: NAD 83
UNITS: US FEET

DESIGNED BY	T LEESON	06/17/10
DRAWN BY	C FOWLER	06/17/10
CHECKED BY	E MARKS	06/17/10
APPROVED BY	T LEESON	06/17/10
PROJECT MANAGER	T LEESON	06/17/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

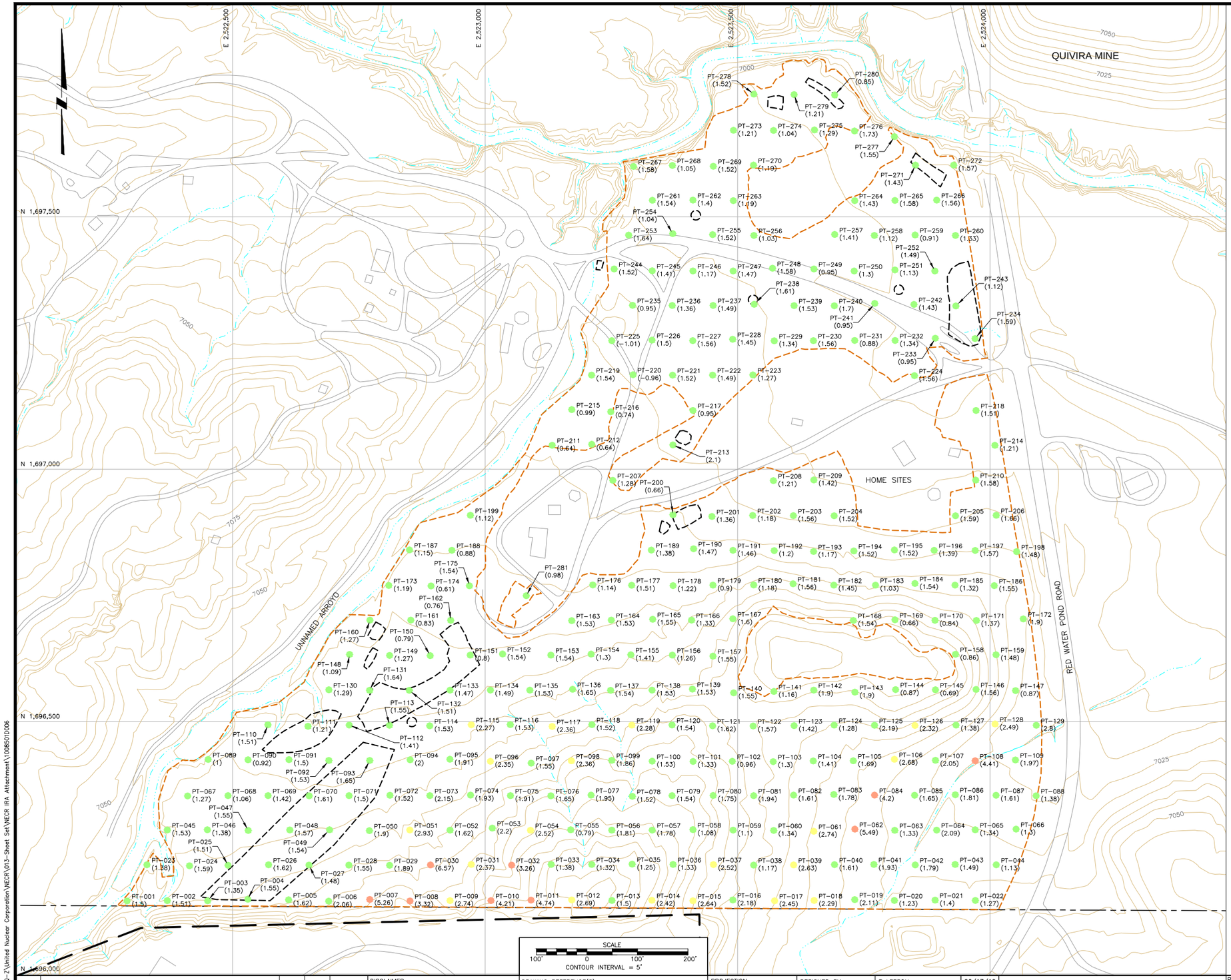
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: INTERIM REMOVAL ACTION
TITLE: CORRELATION SOIL SAMPLE LOCATIONS

MWH

FIGURE: 1 of 3
REVISION: 0
FILE NAME: 1008501D005

N:\Design-Drafting\Clients_Q-Z\United Nuclear Corporation\NECR\013-Sheet Set\NECR IRA Attachment\1008501D005



LEGEND:

- PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- IRA EXCAVATION AREAS
- DEEP EXCAVATION BOUNDARY
- PHYSICAL STRUCTURE

STATIC GAMMA MEASUREMENT LOCATIONS SHOWING EQUIVALENT Ra-226 (pCi/g) CONCENTRATION

- <2.24
- 2.24 ~ 3.0
- >3.0

(1.5) Ra-226 (pCi/g) BASED ON GAMMA MEASUREMENTS (CPM)

NOTE:

EQUIVALENT RADIUM CONCENTRATIONS CALCULATED USING REVISED IRA CORRELATION REGRESSION EQUATION: Ra-226=(0.013XGAMMA)-4.4967.

SCALE
100' 0 100' 200'
CONTOUR INTERVAL = 5'

DISCLAIMER:
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DRAWING REFERENCE(S):
1. ORIGINAL SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. AND USGS 10m DIGITAL ELEVATION MODELS (DEM).
2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.
ORIGINAL FILES LOCATED AT: \\USSBS1S01\CAD_ENGINEERING_SUPPORT\DESIGN-DRAFTING\CLIENTS_Q-Z\UNITED NUCLEAR CORPORATION\NECR\009-DRAWINGS FROM SUBCONTRACTORS\NECR IRA ASBUILT SURVEY\96012TOP03-MAY 24.DWG

PROJECTION: STATE PLANE COORADINATES
ZONE: NEW MEXICO WEST
DATUM: NAD 83
UNITS: US FEET

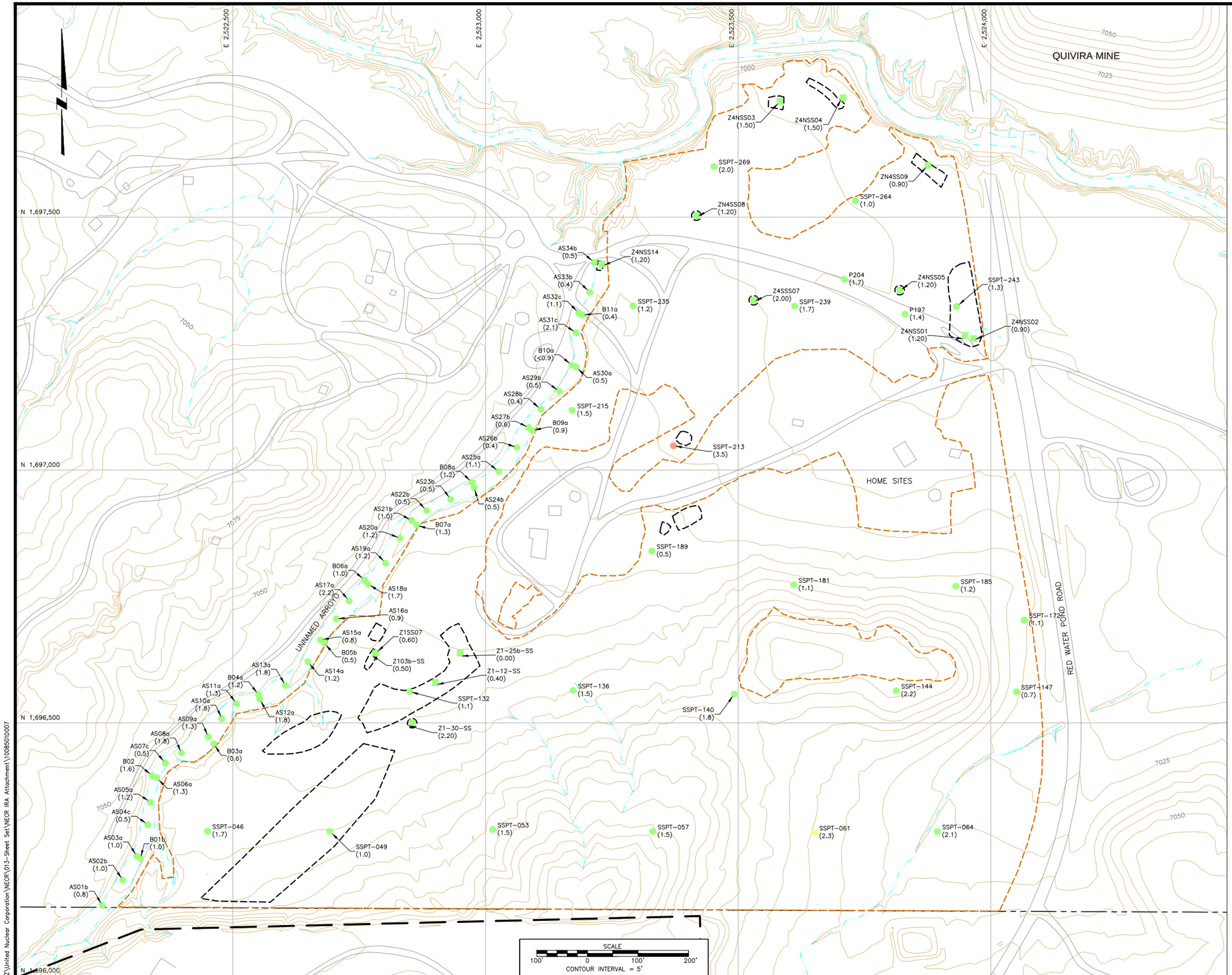
ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	FINAL	CHF	RTL	06/17/10

DESIGNED BY	T LEESON	06/17/10
DRAWN BY	C FOWLER	06/17/10
CHECKED BY	E MARKS	06/17/10
APPROVED BY	T LEESON	06/17/10
PROJECT MANAGER	T LEESON	06/17/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

unc
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: INTERIM REMOVAL ACTION
TITLE: POST IRA GAMMA SURVEY RESULTS
MWH
FIGURE: 2 of 3
REVISION: 0
FILE NAME: 1008501D006

N:\Design-Drafting\Clients_Q-Z\United Nuclear Corporation\NECR\013-Sheet Set\NECR IRA Attachment\1008501D006



LEGEND:

- PRE-IRA GROUND SURFACE CONTOUR & ELEVATION, FEET
- PERMIT BOUNDARY
- FACILITY BOUNDARY
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- IRA EXCAVATION AREAS
- DEEP EXCAVATION BOUNDARY
- PHYSICAL STRUCTURE
- STATUS SURVEY SOIL SAMPLE
- EXCAVATION CONTROL SOIL SAMPLE

STATUS SURVEY SOIL SAMPLE LOCATIONS SHOWING EQUIVALENT Ra-226 (pCi/g) CONCENTRATION

- <2.24
- 2.24 ~ 3.0
- >3.0

(1.5) Ra-226 (pCi/g)

NOTE:

ALL SAMPLES COLLECTED SUBSEQUENT TO COMPLETION OF IRA EXCAVATION ACTIVITIES, AND ANALYZED BY ENERGY LABS, INC..

N:\Design-Drafting\Clients_Q-Z\United Nuclear Corporation\NECR\013-Sheet Set\NECR IRA Attachment\1008501D007

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	FINAL	CHF	RTL	06/17/10

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DRAWING REFERENCE(S):
1. ORIGINAL SURFACE TOPOGRAPHY GENERATED FROM AERIAL PHOTOGRAPHS DATED MAY 2007 BY COOPER AERIAL SURVEYS CO. AND USGS 10m DIGITAL ELEVATION MODELS (DEM).
2. FINAL SURFACE TOPOGRAPHY SURVEY DATA PROVIDED BY MORRIS SURVEYING ENGINEERING, LLC, DATED MAY. 2010.
ORIGINAL FILES LOCATED AT:
\\USSBS1S01\CAD_ENGINEERING_SUPPORT\DESIGN-DRAFTING\CLIENTS_Q-Z\UNITED NUCLEAR CORPORATION\NECR\009-DRAWINGS FROM SUBCONTRACTORS\NECR IRA ASBUILT SURVEY\96012TOPO3-MAY 24.DWG

PROJECTION:
STATE PLANE COORADINATES
ZONE:
NEW MEXICO WEST
DATUM:
NAD 83
UNITS:
US FEET

DESIGNED BY	T LEESON	06/17/10
DRAWN BY	C FOWLER	06/17/10
CHECKED BY	E MARKS	06/17/10
APPROVED BY	T LEESON	06/17/10
PROJECT MANAGER	T LEESON	06/17/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: INTERIM REMOVAL ACTION
TITLE: IRA VERIFICATION SOIL SURVEY RESULTS
FIGURE: 3 of 3
REVISION: 0
FILE NAME: 1008501D007

APPENDICES

APPENDIX A

REVISED IRA CORRELATION ANALYSIS TABLES AND FIGURES

Table A1: November 2007 Supplemental RSE Correlation Sampling Data

Correlation Sampling Program	Sample/Survey Point ID	Survey Date	Location Coordinate (NAD83, NMWest)		Direct Gamma Radiation Level (cpm)		Soil Sample Results Ra-226 (pCi/g)
			Northing (ft)	Easting (ft)	Direct Gamma Radiation Measurement	Measurement Uncertainty (95%CL)	
Supplemental RSE	home-014	11/07/07	1,696,527.72	2,524,208.81	10,488	201	9.2
	home-105	11/07/07	1,696,874.22	2,524,158.99	20,401	280	18.7
	home-112	11/07/07	1,697,157.38	2,524,007.88	5,606	147	3.4
	home-130	11/07/07	1,697,293.80	2,524,081.70	24,105	304	28.5
	home-146	11/07/07	1,697,362.91	2,523,883.66	8,176	177	5.3
	home-148	11/07/07	1,697,500.49	2,524,043.71	5,697	148	2.5
	home-149	11/07/07	1,696,141.22	2,524,129.25	4,846	136	2.0
	home-151	11/07/07	1,696,530.50	2,523,879.20	5,169	141	5.4
	home-153	11/07/07	1,696,601.10	2,523,687.36	5,522	146	0.9
	home-154	11/07/07	1,696,666.24	2,523,880.66	5,186	141	2.5
	home-155	11/07/07	1,696,741.96	2,523,360.33	4,649	134	0.7
	home-156	11/07/07	1,696,738.50	2,523,767.25	5,064	139	1.5
	home-157	11/07/07	1,696,810.11	2,522,842.07	5,678	148	2.0
	home-158	11/07/07	1,696,804.32	2,523,646.38	5,794	149	2.9
	home-159	11/07/07	1,696,805.70	2,524,043.10	4,860	137	1.3
	home-160	11/07/07	1,696,876.29	2,523,520.13	5,121	140	1.7
	home-161	11/07/07	1,696,945.87	2,523,567.57	5,551	146	2.5
	home-162	11/07/07	1,696,947.01	2,523,969.35	14,628	237	17.1
	home-163	11/07/07	1,697,015.64	2,523,287.21	4,692	134	1.1
	home-164	11/07/07	1,697,015.95	2,524,066.83	4,461	131	0.9
	home-165	11/07/07	1,697,084.73	2,523,484.40	4,650	134	1.1
	home-167	11/07/07	1,697,156.72	2,523,281.94	5,588	147	4.1
	home-168	11/07/07	1,697,154.06	2,523,685.56	5,563	146	3.2
	home-170	11/07/07	1,697,218.81	2,523,566.45	7,166	166	9.5
	home-171	11/06/07	1,697,293.30	2,523,440.37	4,810	136	1.8
	home-172	11/06/07	1,697,428.75	2,523,282.99	6,388	157	4.4
	home-173	11/06/07	1,697,435.93	2,523,688.25	5,355	143	1.4
	home-174	11/06/07	1,697,499.40	2,523,326.43	6,374	156	2.5
	home-175	11/06/07	1,697,500.34	2,523,729.04	4,939	138	1.9
	home-176	11/06/07	1,697,565.30	2,523,364.61	5,291	143	1.2
	home-177	11/06/07	1,697,565.51	2,523,767.02	5,821	150	1.7
	home-182	11/06/07	1,697,636.63	2,523,558.63	7,526	170	4.8
	home-57	11/06/07	1,697,709.92	2,523,604.79	7,577	171	4.6
	home-86	11/07/07	1,697,450.19	2,523,182.14	6,206	154	2.9
	tp-103	11/06/07	1,694,964.93	2,523,009.02	7,650	171	3.2
	tp-107	11/06/07	1,695,029.75	2,523,177.15	4,781	136	0.9
	tp-115	11/06/07	1,695,171.67	2,522,969.35	5,663	147	0.9
	tp-125	11/06/07	1,695,309.21	2,523,048.82	5,628	147	2.9
	tp-127	11/06/07	1,695,307.08	2,523,209.23	6,995	164	4.1
	tp-129	11/06/07	1,695,380.38	2,523,173.54	6,246	155	2.1
	tp-133	11/06/07	1,695,450.51	2,523,293.37	8,706	183	3.8
	tp-137	11/06/07	1,695,587.22	2,523,289.61	11,143	207	8.9
	vent-103	11/05/07	1,695,087.68	2,520,201.02	3,915	123	0.6
	vent-104	11/05/07	1,695,091.44	2,520,684.33	3,565	117	0.9
	vent-112	11/05/07	1,695,164.73	2,520,244.85	4,884	137	2.9
	vent-113	11/05/07	1,695,164.76	2,520,646.09	3,791	121	0.8
	vent-124	11/05/07	1,695,228.97	2,520,928.40	4,432	130	1.2
	vent-136	11/05/07	1,695,298.84	2,520,969.31	4,155	126	0.3
	vent-147	11/05/07	1,695,371.24	2,520,130.20	5,661	147	1.1
	vent-148	11/05/07	1,695,375.23	2,520,612.17	3,195	111	0.6
	vent-160	11/05/07	1,695,436.74	2,520,245.01	4,222	127	1.9
	vent-166	11/05/07	1,695,509.07	2,520,206.00	5,758	149	3.1
	vent-170	11/05/07	1,695,580.11	2,520,406.64	3,384	114	0.5
	vent-179	11/05/07	1,695,721.41	2,519,927.90	4,901	137	1.4
	vent-180	11/05/07	1,695,717.00	2,520,330.82	4,315	129	1.8
	vent-185	11/05/07	1,695,792.31	2,520,444.67	3,800	121	0.8
	vent-192	11/05/07	1,695,859.53	2,520,251.15	3,546	117	0.6
	vent-196	11/05/07	1,695,912.03	2,520,205.07	4,039	125	1.1

Table A2: April 2009 IRA Excavation Control Correlation Sampling Data

Correlation Sampling Program	Sample/Survey Point ID	Survey Date	Location Coordinate (NAD83, NMWest)		Direct Gamma Radiation Level (cpm)		Soil Sample Results Ra-226 (pCi/g)
			Northing (ft)	Easting (ft)	Direct Gamma Radiation Measurement	Measurement Uncertainty (95%CL)	
WP EXC	IRA COR -01	04/28/09	1,697,269.90	2,523,645.77	4,295	128	2.1
	IRA COR -02	04/28/09	1,697,227.03	2,523,412.57	5,092	140	1.99
	IRA COR -03	04/28/09	1,697,085.90	2,523,402.06	5,379	144	6.55
	IRA COR -04	04/28/09	1,696,822.87	2,523,721.48	4,918	137	1.96
	IRA COR -05	04/28/09	1,697,064.04	2,524,049.65	17,174	257	51.7
	IRA COR -06	04/28/09	1,697,291.20	2,523,958.66	6,738	161	9.4
	IRA COR -07	04/28/09	1,697,629.70	2,523,520.70	7,465	169	21.4
	IRA COR -08	04/28/09	1,697,575.70	2,523,447.14	7,703	172	9.9
	IRA COR -09	04/28/09	1,696,744.60	2,522,970.20	9,210	188	29.8
	IRA COR -10	04/28/09	1,696,580.03	2,522,698.04	6,140	154	3.31
	IRA COR -12	04/28/09	1,696,247.20	2,523,808.11	9,224	188	17.3

Table A3: IRA Sampling Data for Post-IRA Correlation Update

Correlation Sampling Program	Sample/Survey Point ID	Survey Date	Location Coordinate (NAD83, NMWest)		Direct Gamma Radiation Level (cpm)		Soil Sample Results Ra-226 (pCi/g)
			Northing (ft)	Easting (ft)	Direct Gamma Radiation Measurement	Measurement Uncertainty (95%CL)	
IRA Dataset	SSPT-046	12/16/09	1,696,285.73	2,522,450.11	4,523	132	1.7
	SSPT-049	12/18/09	1,696,285.43	2,522,691.93	4,644	134	1.0
	SSPT-053	12/21/09	1,696,288.92	2,523,014.43	5,155	141	1.5
	SSPT-057	12/21/09	1,696,285.01	2,523,331.11	4,829	136	1.5
	SSPT-061	12/21/09	1,696,282.74	2,523,650.99	5,565	146	2.3
	SSPT-064	01/04/10	1,696,285.08	2,523,894.20	5,070	140	2.1
	SSPT-132	11/20/09	1,696,561.82	2,522,849.87	4,617	133	1.1
	SSPT-136	12/11/09	1,696,563.76	2,523,173.46	4,730	135	1.5
	SSPT-140	12/16/09	1,696,556.79	2,523,492.46	4,651	134	1.8
	SSPT-144	12/11/09	1,696,563.39	2,523,813.08	4,131	126	2.2
	SSPT-147	12/11/09	1,696,561.33	2,524,050.69	4,131	126	0.7
	SSPT-172	10/27/09	1,696,703.18	2,524,065.85	4,924	138	1.1
	SSPT-181	12/11/09	1,696,772.82	2,523,609.95	4,660	134	1.1
	SSPT-185	12/11/09	1,696,770.37	2,523,930.73	4,473	131	1.2
	SSPT-189	11/03/09	1,696,839.68	2,523,329.20	4,518	132	0.5
	SSPT-213	10/27/09	1,697,047.89	2,523,372.08	5,077	140	3.6
	SSPT-215	11/20/09	1,697,117.91	2,523,171.74	4,222	127	1.5
	SSPT-235	10/26/09	1,697,324.60	2,523,292.07	4,190	127	1.2
	SSPT-239	10/26/09	1,697,323.91	2,523,611.81	4,634	133	1.7
	SSPT-243	10/26/09	1,697,323.24	2,523,932.16	4,317	129	1.3
	SSPT-264	10/26/09	1,697,531.98	2,523,731.92	4,562	132	1.0
	SSPT-269	10/26/09	1,697,600.04	2,523,452.13	4,630	133	2.0
	Z4NSS01	10/08/09	1,697,260.00	2,523,943.00	4,491	131	1.2
	Z4NSS02	10/08/09	1,697,254.00	2,523,960.00	4,680	134	0.9
	Z4NSS07	10/14/09	1,697,330.00	2,523,525.00	4,838	136	2.0
	Z4NSS08	10/19/09	1,697,497.00	2,523,412.00	4,567	132	1.2
	Z4NSS09	10/19/09	1,697,597.00	2,523,870.00	4,769	135	0.9

Table A4: IRA Dataset Model Residual Analysis

Sample Program	Sample/Survey Point ID	Direct Gamma Radiation Level (cpm)		Soil Sample Results Ra-226 (pCi/g)	RSE plus IRA Dataset Ra-226 = (0.0013×cpm)-4.4967			WP EXC plus IRA Dataset Ra-226 = (0.0041×cpm)-17.543		
					Predicted Soil Ra-226 (pCi/g)			Predicted Soil Ra-226 (pCi/g)		
		Direct Gamma Radiation Measurement	Measurement Uncertainty, 95%CL		Predicted Ra-226	Predicted Ra-226 Uncertainty 95%CL	Residuals (predited minus observed)	Predicted Ra-226	Predicted Ra-226 Uncertainty 95%CL	Residuals (predited minus observed)
IRA Dataset	SSPT-046	4523	132	1.7	1.38	0.17	-0.32	1.00	0.54	-0.70
	SSPT-049	4644	134	1.0	1.54	0.17	0.54	1.50	0.55	0.50
	SSPT-053	5155	141	1.5	2.20	0.18	0.70	3.59	0.58	2.09
	SSPT-057	4829	136	1.5	1.78	0.18	0.28	2.26	0.56	0.76
	SSPT-061	5565	146	2.3	2.74	0.19	0.44	5.27	0.60	2.97
	SSPT-064	5070	140	2.1	2.09	0.18	-0.01	3.24	0.57	1.14
	SSPT-132	4617	133	1.1	1.51	0.17	0.41	1.39	0.55	0.29
	SSPT-136	4730	135	1.5	1.65	0.18	0.15	1.85	0.55	0.35
	SSPT-140	4651	134	1.8	1.55	0.17	-0.25	1.53	0.55	-0.27
	SSPT-144	4131	126	2.2	0.87	0.16	-1.33	-0.61	0.52	-2.81
	SSPT-147	4131	126	0.7	0.87	0.16	0.17	-0.61	0.52	-1.31
	SSPT-172	4924	138	1.1	1.90	0.18	0.80	2.65	0.56	1.55
	SSPT-181	4660	134	1.1	1.56	0.17	0.46	1.56	0.55	0.46
	SSPT-185	4473	131	1.2	1.32	0.17	0.12	0.80	0.54	-0.40
	SSPT-189	4518	132	0.5	1.38	0.17	0.88	0.98	0.54	0.48
	SSPT-213	5077	140	3.6	2.10	0.18	-1.50	3.27	0.57	-0.33
	SSPT-215	4222	127	1.5	0.99	0.17	-0.51	-0.23	0.52	-1.73
	SSPT-235	4190	127	1.2	0.95	0.16	-0.25	-0.36	0.52	-1.56
	SSPT-239	4634	133	1.7	1.53	0.17	-0.17	1.46	0.55	-0.24
	SSPT-243	4317	129	1.3	1.12	0.17	-0.18	0.16	0.53	-1.14
	SSPT-264	4562	132	1.0	1.43	0.17	0.43	1.16	0.54	0.16
	SSPT-269	4630	133	2.0	1.52	0.17	-0.48	1.44	0.55	-0.56
	Z4NSS01	4491	131	1.2	1.34	0.17	0.14	0.87	0.54	-0.33
	Z4NSS02	4680	134	0.9	1.59	0.17	0.69	1.65	0.55	0.75
	Z4NSS07	4838	136	2.0	1.79	0.18	-0.21	2.29	0.56	0.29
	Z4NSS08	4567	132	1.2	1.44	0.17	0.24	1.18	0.54	-0.02
	Z4NSS09	4769	135	0.9	1.70	0.18	0.80	2.01	0.55	1.11
Mean				1.5	1.55	0.17	0.08	1.53	0.55	0.06
σ				0.6	0.42	0.01	0.59	1.34	0.02	1.21
Minimum				0.5	0.87	0.16	-1.50	-0.61	0.52	-2.81
Maximum				3.6	2.74	0.19	0.88	5.27	0.60	2.97

Figure A1: Revised Correlation Sampling Locations

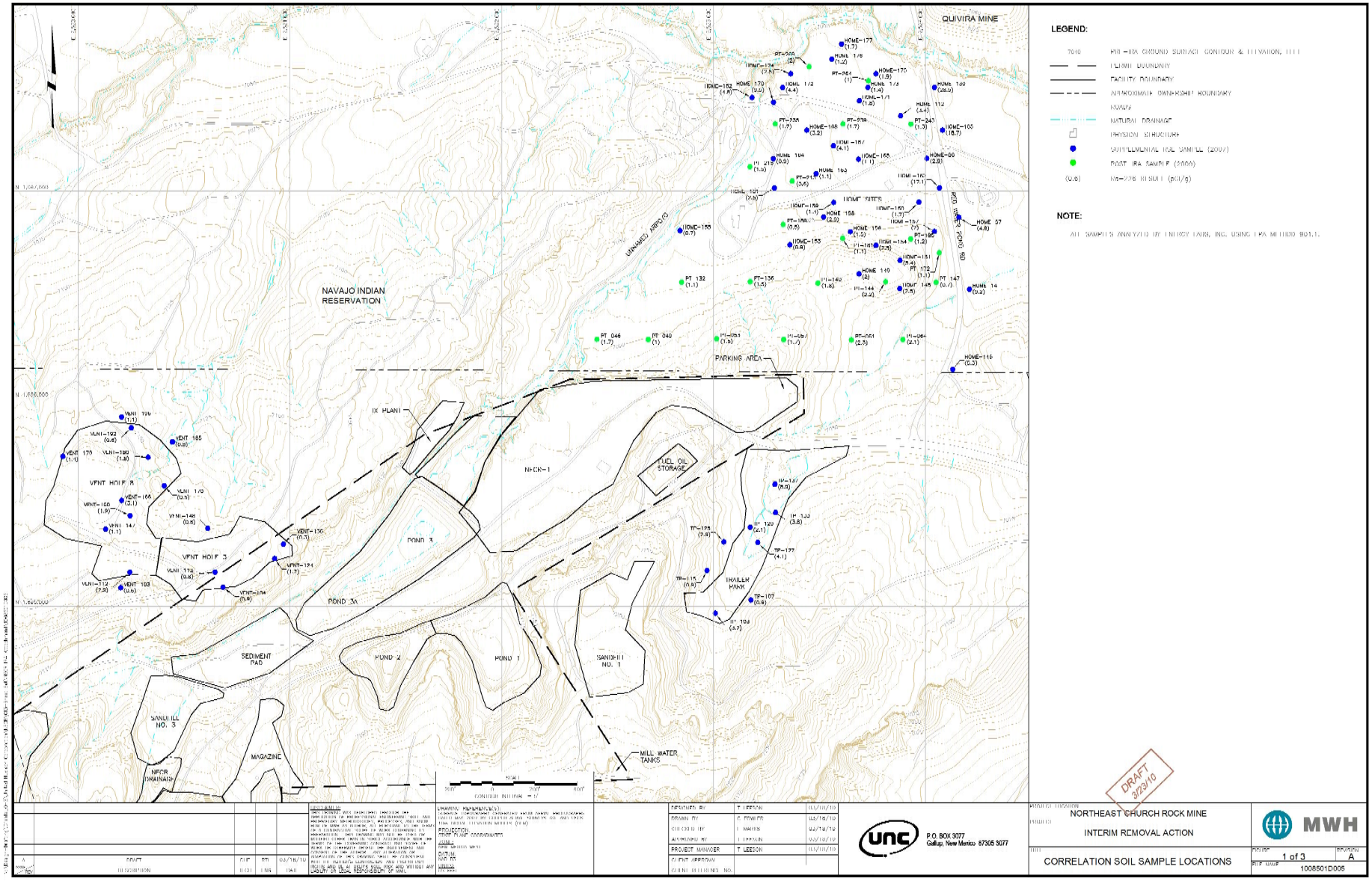


Figure A2: RSE, WP EXC plus IRA Dataset Regression Analysis

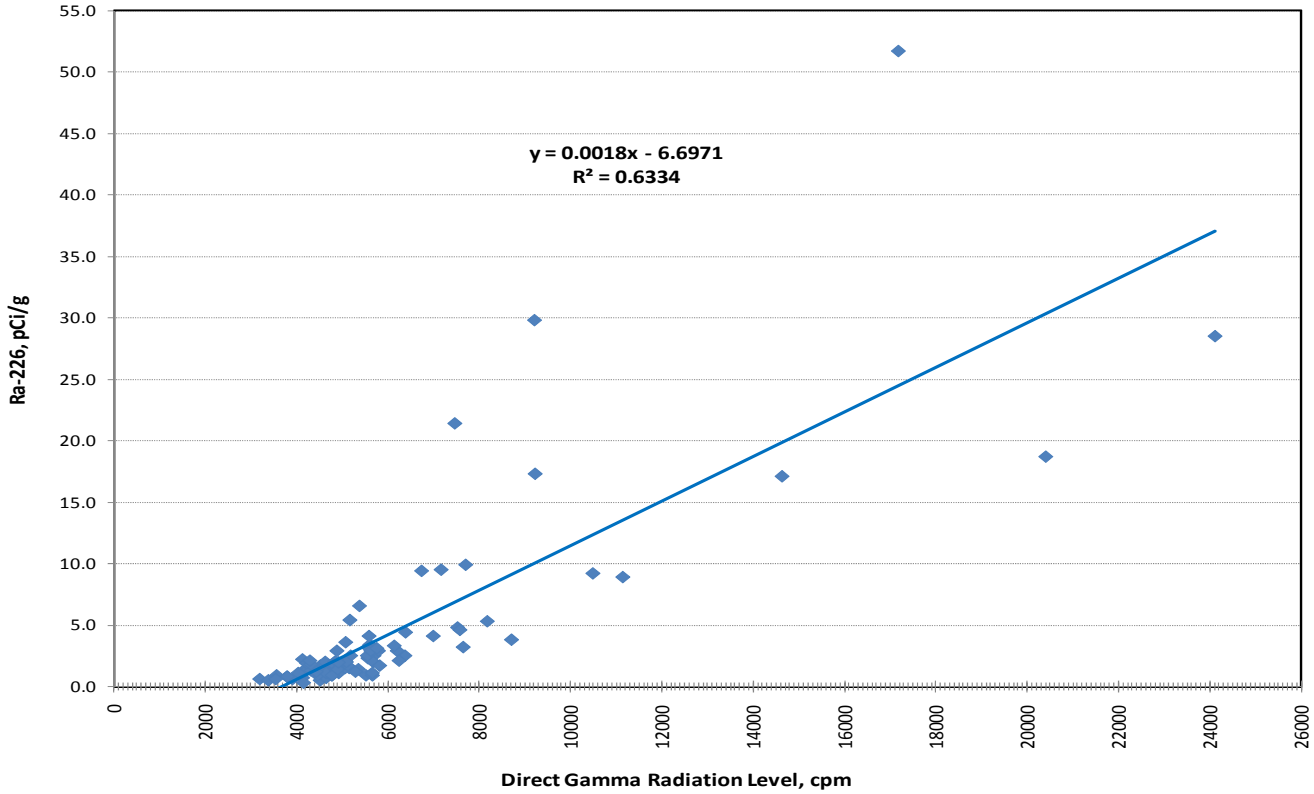


Figure A3: RSE plus IRA Dataset Regression Analysis

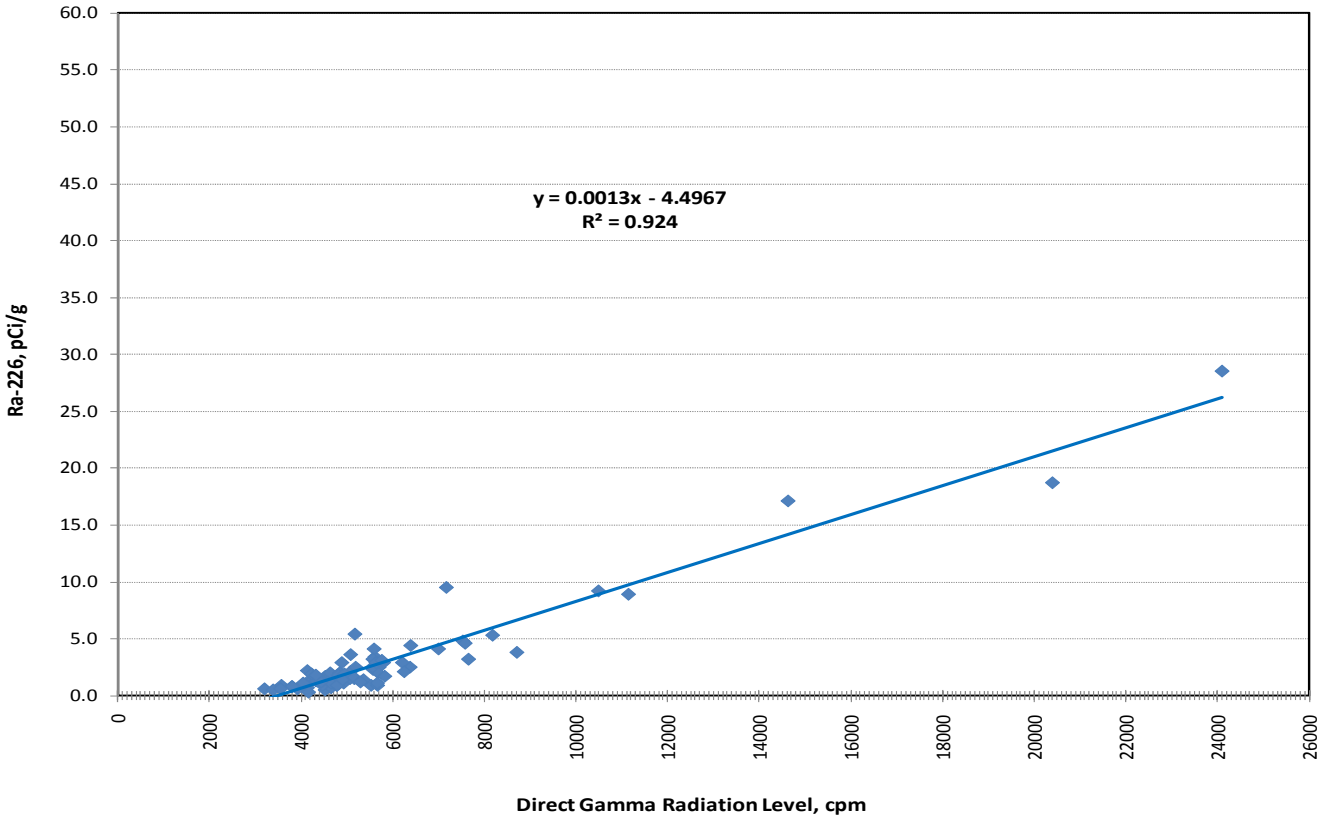


Figure A4: WP EXC plus IRA Dataset Regression Analysis

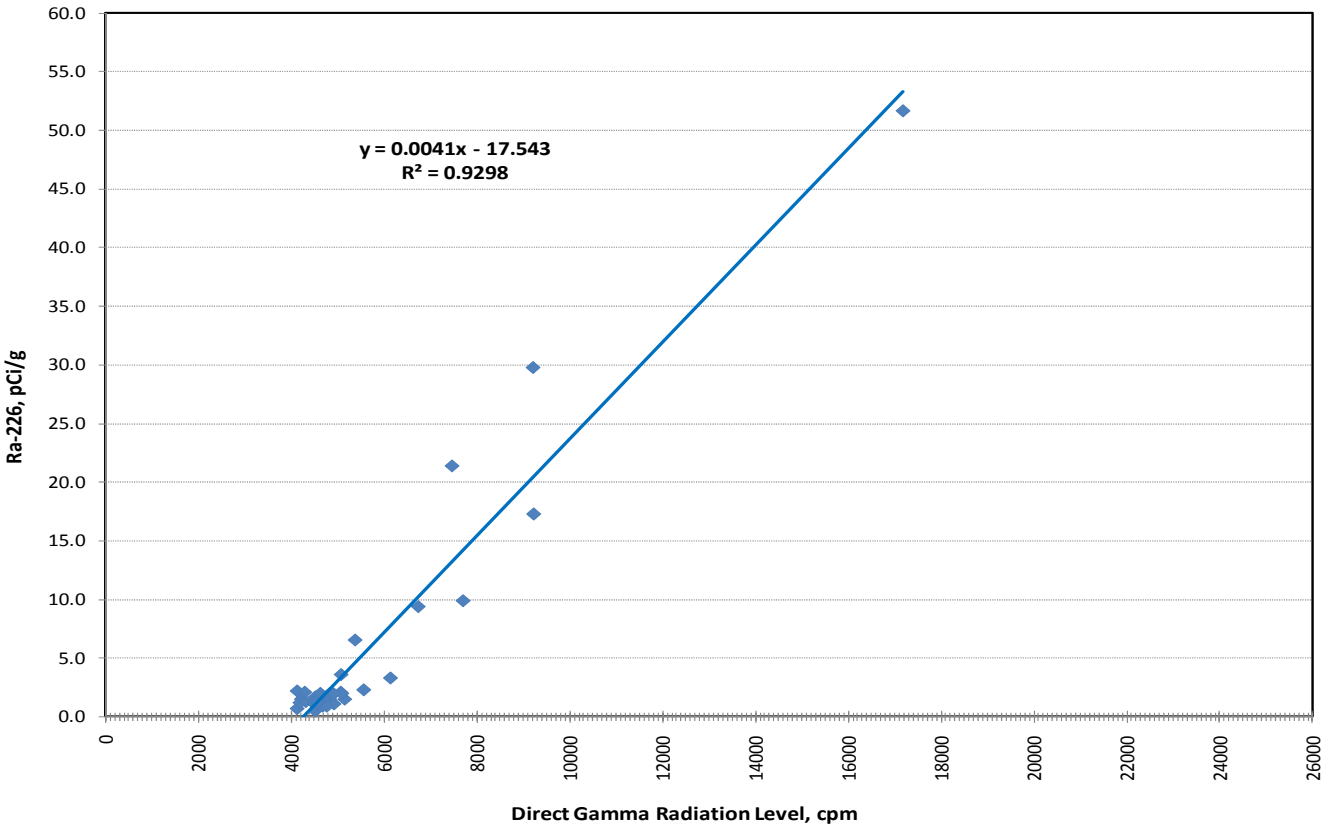


Figure A5: RSE plus IRA Dataset Model Residual Distribution Histogram Plot

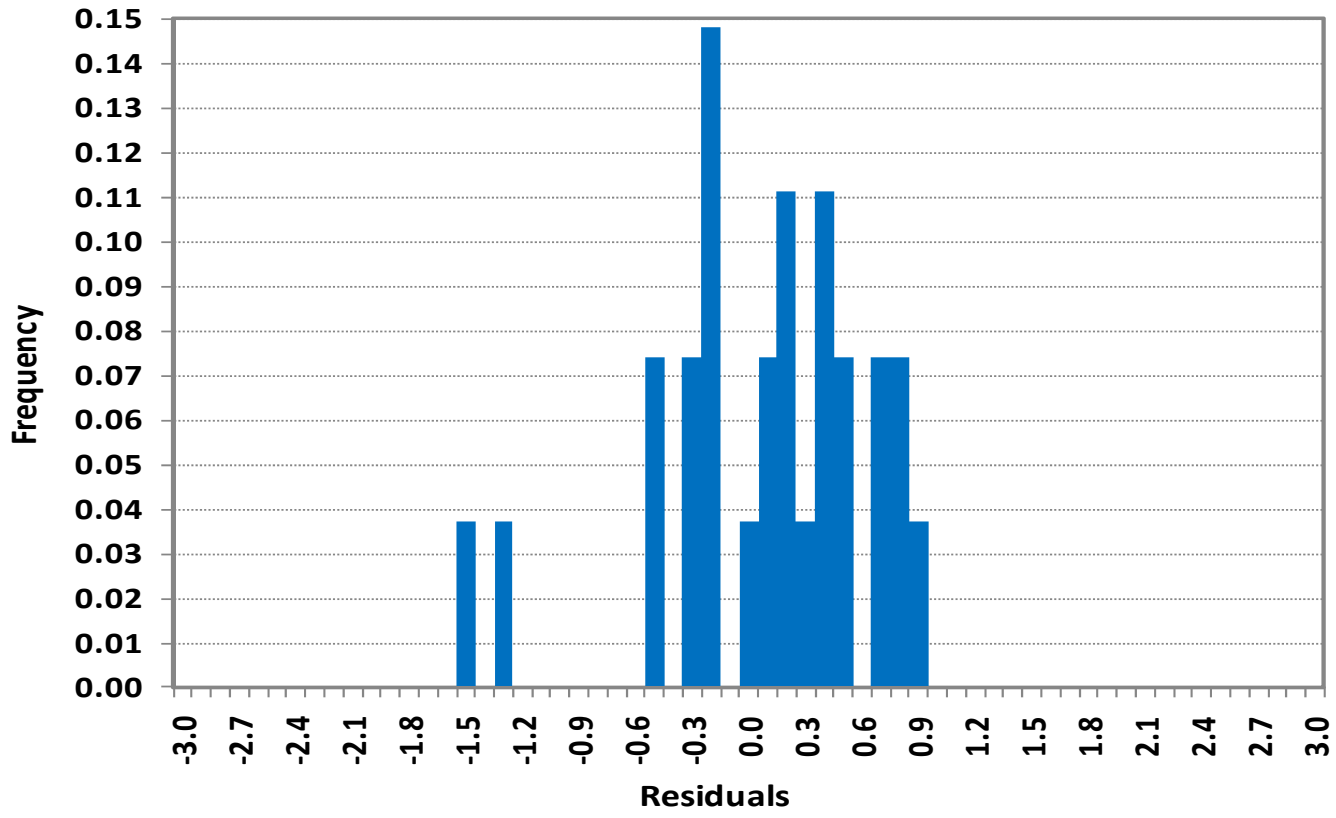
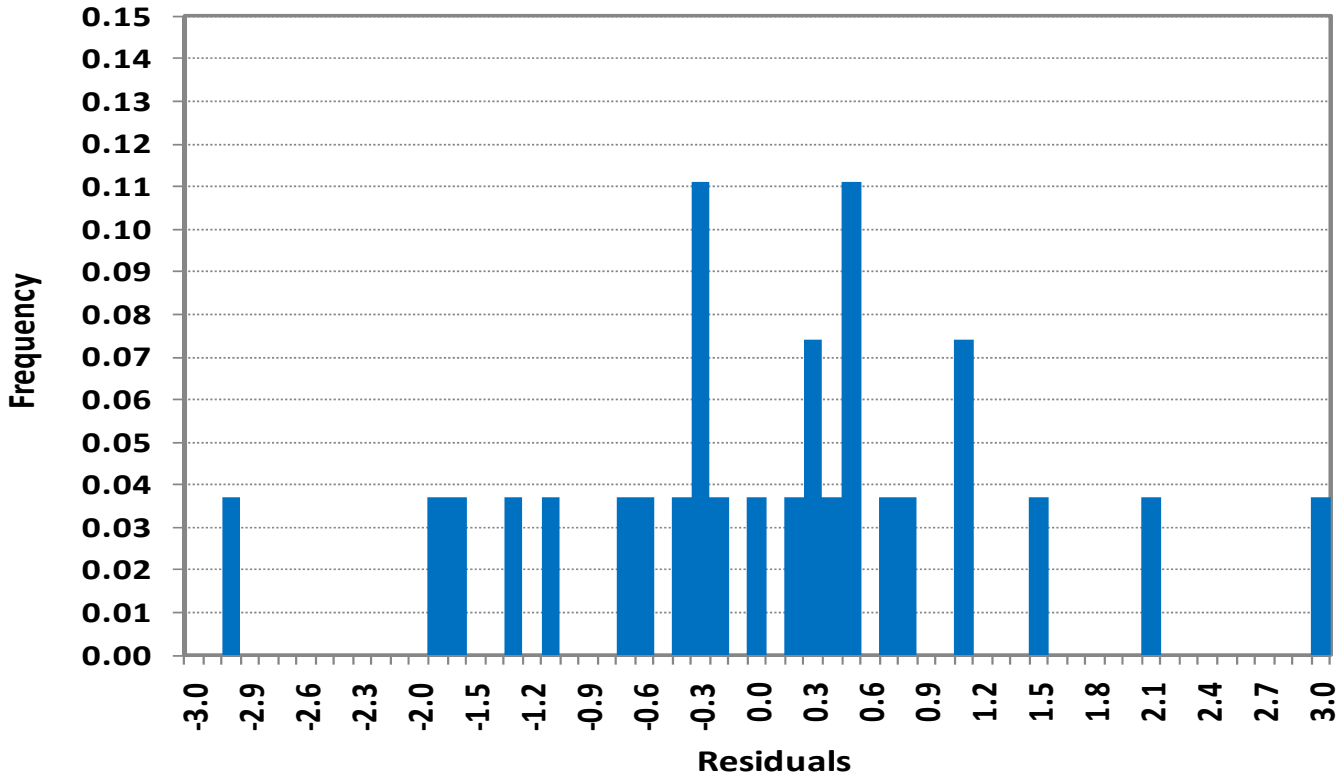


Figure A6: WP EXC plus IRA Dataset Model Residual Distribution Histogram Plot



APPENDIX B

GAMMA SURVEY CALIBRATION DATA AND SURVEY FIELD FORMS

B-1

INSTRUMENT CALIBRATION L2221-SPA

Attachment B, SOP #RAD-01
AVM Environmental Services Inc.
Scaler/Ratemeter - Detector Calibration Form

Scaler/Ratemeter Ludlum 2221 S/n 68782
Detector SPA-3 S/n 408522-30

Source: Uranium Ore in Can Strength: 1%

Scaler/Ratemeter Threshhold set @ 100 mV, Window IN/OUT out, Window — mV

HV	Reading, CPM (Source)	Reading, CPM (Background)
500	16129	366
550	30270	572
600	53570	935
650	69061	1352
700	84837	1611
750	91559	1802
800	92574	2017
850	94315	2129
900	94578	2156
950	94782	2157
1000	96476	2198
1050	101230	2361
1100	125970	2850
1150	160086	3655
1200	194110	4540
1250	246450	6003
1300		
1350		
1400		

HV Set @ 900 VDC (Instrument)

Background reading at designated function check location in office.

Count #	Reading (CPM) Bare	Coll.
1	7378	2793
2	7347	2818
3	7333	2687
4	7417	2750
5	7664	2705
Average	7428	2750

20% Range 5940-8910 2200-3300

Count Readings with 1 percent U_3O_8 can directly under shielded probe on designated function check location in office. Cs-137

Count #	Reading (CPM)	
1	94578	293113
2	95164	292,049
3	94555	294170
4	94801	293708
5	95132	293014
Average	94,846	293211

20% Range 75870-113810 234570-351850

900 VDC (DVM Fluke 8020B)

Input Sensitivity (THR), mV 100 (10mV)

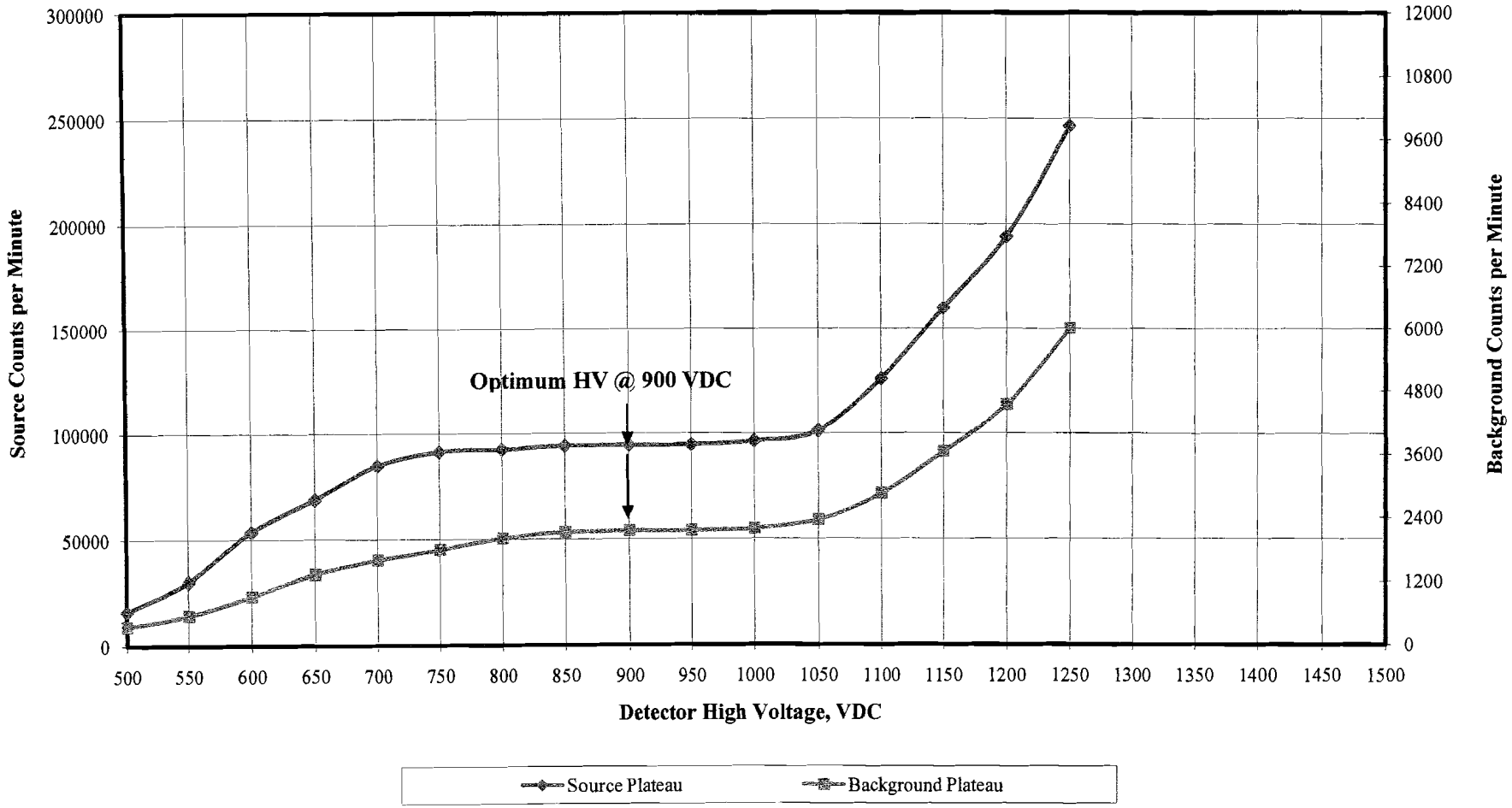
Function Check with 1 percent U_3O_8 ore in can. Can Directly under the detector.
Acceptable Function check range is: 75,870 to 113,810 CPM

Count Readings for Calibration Pad GPL (87.78 pCi/gm Ra-226)

	Bare (Uncollimated)		Collimated	
#1	98358	cpm	50047	cpm
#2	97928	cpm	51802	cpm
#3	98562	cpm	50412	cpm
#4	97901	cpm	51729	cpm
#5	98416	cpm	51318	cpm
Average	98233	cpm	51062	cpm
Eff(avg cpm/87.78 pCi/gm	1119	cpm/pCi/gm	Eff 582	cpm/pCi/gm

Date Apr 16, 2009 By

Detector High Voltage Plateau
SPA-3 #408522-30 with Ludlum 2221 #68782
1% Uranium Ore in Sealed Can
April 16, 2007



Attachment A, SOP #RAD-01
AVM Environmental Services Inc.

Scaler/Ratemeter Calibration Form

Model Ludlum 2221 S/N 68782

Calibration Source Ludlum Pulsar 500 S/n # 114513 (cal 09-Apr-09)

Threshold (input sensitivity), Found at 100 Left or Set at 100

Window, In/Out out Window N/A

Pulser Amplitude Set @ 20 mV

Range/Mode	Calibration Point (Pulser Setting) cpm x multiplier	As Found Reading	Left or Set Reading
Rate Meter	40 x 1	40	40
	40x10	400	400
	40x 100	4,000	4,000
	40x 1k	40,000	40,000
	40x 10k	400,000	400,000
Scaler	40x1	39	39
	40x10	399	399
	40x100	3,998	3,998
	40x 1k	39,994	39,994
	40x 10k	399,970	399,970

HV Set @ 900 VDC HV on Pulsar Read @ 901

Checked Threshold/Gain Calibration
Ludlum 2221 set @: Thr 100, Win out, started count @ 10 mv pulsar amplitude. Set thr @ 100, win in @ 100 Registered counts @ VP @ Pulsar amplitude of 10-20 mV

Date Apr 15, 2009 Calibrated By

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Model No. / Serial No. 500 / 114513

CUSTOMER AVM ENVIRONMENTAL SERVICES CUSTOMER PO 20090406A ORDER NO. 20131827/336779

Date 10-Apr-09 Cal Due Date 10-Apr-10 Cal. Interval 1 Year Procedure M500, Rev. 5

☐ New Instrument Instrument Received ☑ Within Tolerance ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See Comments

T. 75 °F RH 20 % Alt 699.8 mm Hg ☑ Meter Zeroed ☑ Mechanical Check

PULSE WIDTH			
	As Found	As Left	Acceptable Range (µs) ± 10%
NEG PULSE	1.7	1.7	1.5 - 1.9
POS PULSE	1.7	1.7	< 2.25

PULSE AMPLITUDE							
Reference Amplitude	As Found Amplitude Reading	As Left Amplitude Reading	Acceptable Range ± 10%	Reference Amplitude	As Found Amplitude Reading	As Left Amplitude Reading	Acceptable Range ± 10%
1 V	1 V	1 V	0.9 - 1.1	4 V	4.3 V	4.3 V	3.6 - 4.4
100 mV	100 mV	100 mV	90 - 110	400 mV	430 mV	430 mV	360 - 440
10 mV	10 mV	10 mV	9 - 11	40 mV	43 mV	43 mV	36 - 44
1 mV	1 mV	1 mV	0.9 - 1.1	4 mV	4.3 mV	4.3 mV	3.6 - 4.4

PULSE FREQUENCY (PERIOD)			
Pulser Range	As Found Period	As Left Period	Acceptable Range ± 2%
x 10K	6.676	6.666	6.534 - 6.8
x 1K	66.75	66.68	65.34 - 68
x 100	667.6	667.0	653.4 - 680
x 10	6676	6669	6534 - 6800
x 1	66.77	66.69	65.34 - 68
x 0.1	90	90	88.2 - 91.8 Counts

Reference Voltage	As Found Voltage Reading	As Left Voltage Reading	Acceptable Range ± 5%
500 V	500	500	475 - 525
2000 V	1990	1990	1900 - 2100

CPM Reading	As Found cpm Reading	As Left cpm Reading	Acceptable Range ± 10%
MAX	990	990	981 - 999
MIN	1	1	0 - 1*

* READING OF 0-99 IS ACCEPTABLE FOR INSTRUMENTS WITH A S/N 100000 AND BELOW AND MAIN BOARD = 5208-066

COMMENTS:

Cal'd w/ 39" cable.

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978.

Reference Instruments:

Frequency Counter	Model 1856 D	S/N 185641245060600 63	Cal Date 9-JAN-09
Oscilloscope	Model V 1560	S/N 9084101	Cal Date 9-JAN-09
Voltmeter	Model Fluke 83V	S/N 94000441	Cal Date 24-Oct-08

Calibrated By: William Tinsley Date 10-April-09

Reviewed By: Rhonda Hann Date 10 APR 09

AC Inst. Only ☑ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed:

MDC Calculation

Detector: SPA-3, SR #408522-30 (2X2" NaI Scintillator), with Ludlum 2221, 04-16-2009

Unshielded 2x2 NaI Detector Background counts (cpm) =**7428**	Bare Detector effiency (cpm/pCi/gm) for Ra-226 (DOE Cal Pad GPL at Grants Site, 87.78 pCi/gm) = **1119**
Shielded 2x2 NaI Detector Background counts (cpm) =**2750**	Collimated Detector effiency (cpm/pCi/gm) for Ra-226 (DOE Cal Pad GPL at Grants Site, 87.78 pCi/gm) = **582**

One Minute Static Measurement MDC

$L_D = 3 + 4.65 (B^{0.5})$ Equation 6-6 MARSSIM) for 0.05 for both alpha and beta, K = 1.645

Where B is number of background counts that are expected to occur while performing actual measyrement

Bare 2x2 NaI Detector	L_D=	404	cpm	MDC (L_D/Eff)=	**0.36** pCi/gm
Collimated 2x2 NaI Detector	L_D=	247	cpm	MDC (L_D/Eff)=	**0.42** pCi/gm

Minimum Detectable Count Rate (MDCR) for Land Area Scan Survey

$MDCR = (d' \times b_i^{0.5}) \times (60/i)$ Equation 6-8, 6-9 MARSSIM

Where d' is value for true positive (alpha) and false positive(beta) proportion (Table 6.5 MARSSIM)
bi is number background counts in the interval
$_i$ is interval

if b is in cpm, then b_i counts= cpm x 1 sec x 1 min/60 sec (1 sec is measurement time within the detector 3 ft dia area, therefore time is 1

scan rate **3.0 ft/sec** ft/scan rate, fps, for 1 fps t=1, for 2 fps t=1.5, for 1.5 fps t=2

Unshielded 2x2 NaI Detector Background counts=	7428	cpm	bi =	123.8	counts	d' =	**1.38**	MDCR =	921 cpm
Shielded 2x2 NaI Detector Background counts=	2750	cpm	bi =	45.8	counts	d' =	**1.38**	MDCR =	561 cpm

$MDCR_{surveyor}$ = $MDCR/(p^{0.5})$ where p is a surveyor efficiency

	(active D)	p		
surveyor efficiency (p) unshielded detector =	36	**0.5**	$MDCR_{surveyor}$ =	1303 cpm
surveyor efficiency (p) shielded detector =	36	**0.5**	$MDCR_{surveyor}$ =	793 cpm

Land Area Scan Minimum Detectable Concentration (MDC)

Scan MDC pCi/gm = MDCR (cpm)/eff (cpm/pCi/gm) Equation 6-11 MARSSIM

Bare detector efficiency=	**1119**	cpm/pCi/gm (0.00027 pCi/gm/cpm)	**Scan MDC =**	**1.16 pCi/gm**
Collimated detector efficiency=	**582**	cpm/pCi/gm (0.00080 pCi/gm/cpm)	**Scan MDC =**	**1.36 pCi/gm**

Designer and Manufacturer of Scientific and Industrial Instruments

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CERTIFICATE OF CALIBRATION

CUSTOMER AVM ENVIRONMENTAL SERVICES ORDER NO. 20131826/336778

Mfgr. Ludlum Measurements, Inc. Model 19 Serial No. 76248

Mfgr. _____ Model _____ Serial No. _____

Cal. Date 9-Apr-09 Cal Due Date 9-Apr-10 Cal. Interval 1 Year Meterface 202-016

Check mark ☑ applies to applicable instr. and/or detector IAW mfg. spec. T. 74 °F RH 20 % Alt 688.8 mm Hg

☐ New Instrument Instrument Received ☑ Within Toler. +-10% ☐ 10-20% ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See comments

☑ Mechanical ck. ☑ Meter Zeroed ☐ Background Subtract ☐ Input Sens. Linearity
☑ F/S Resp. ck ☑ Reset ck. ☐ Window Operation ☐ Geotropism
☑ Audio ck. ☐ Alarm Setting ck. ☑ Batt. ck. (Min. Volt) 2.2 VDC
☐ Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. ☑ Calibrated in accordance with LMI SOP 14.9 rev 02/07/97.

Instrument Volt Set 850 V Input Sens. 38 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

☑ HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Performed function check with 1% U_3O_8 in a sealed can source, >98 uR/hr
acceptable Range 80-120 uR/hr
Mtd 4/10/09

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
5000	4000 uR/hr	4300	4000
5000	1000 uR/hr	1100	1000
500	400 uR/hr = 77000 cpm	430	400
500	100 uR/hr	110	100
250	200 uR/hr = 37700 cpm	200	200
250	100 uR/hr	100	100
50	9700 cpm	43	40
50	1925 cpm	11	10
25	3770 cpm	20	20
25	942 cpm	5	5

*Uncertainty within ± 10% C.F. within ± 20% 50, 25 **Range(s) Calibrated Electronically**

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Digital Readout			

	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
Log Scale			

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978 State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources: ☐ S-394/1122 ☐ 1131 ☐ 781 ☐ 059 ☐ 280 ☐ 60646
Cs-137 Gamma S/N ☐ 1162 ☐ G112 ☑ M565 ☐ 5105 ☐ T1008 ☐ T879 ☐ E552 ☐ E551 ☐ 720 ☐ 734 ☐ 1616 ☐ Neutron Am-241 Be S/N T-304

☐ Alpha S/N _____ ☐ Beta S/N _____ ☐ Other _____

☐ 500 S/N 189509 ☐ Oscilloscope S/N _____ ☑ Multimeter S/N 71300492

Calibrated By: Wendell Williams Date 9-APR-09

Reviewed By: Rhonda Hein Date 9Apr09

FORM C22A 10/15/2008

AC Inst. Only ☐ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed: _____

Attachment B, SOP #RAD-01
AVM Environmental Services Inc.
Scaler/Ratemeter - Detector Calibration Form

Scaler/Ratemeter Ludlum 2221 S/n 68782
Detector SPA-3 S/n 408522-33

Source: Uranium Ore in Can Strength: 1%

Scaler/Ratemeter Threshhold set @ 100 mV, Window IN/OUT out, Window — mV

HV	Reading, CPM (Source)	Reading, CPM (Background)
500	5873	246
550	14549	392
600	31777	723
650	47016	952
700	63475	1235
750	78292	1401
800	87485	1636
850	90168	1740
900	90598	1785
950	90656	1802
1000	90736	1965
1050	91628	2088
1100	93796	2175
1150	102480	2254
1200	123875	2697
1250	171786	4211
1300	264042	6608
1350		
1400		

HV Set @ 900 VDC (Instrument)

Background reading at designated function check location in office.

Count #	Reading (CPM) Bare	Coll.
1	7367	2600
2	7448	2505
3	7392	2575
4	7318	2606
5	7422	2493
Average	7389	2556

20% Range 5911-8867 2045-3067

Count Readings with 1 percent U_3O_8 can directly under shielded probe on designated function check location in office.

Count #	Reading (CPM)	Cs-137
1	90239	273517
2	90841	275027
3	91015	274098
4	90163	273992
5	90437	274453
Average	90539	274217

20% Range 72430-108650 219380-329060

900 VDC (DVM Fluke 8020B)

Input Sensitivity (THR), mV 100 (10mV)

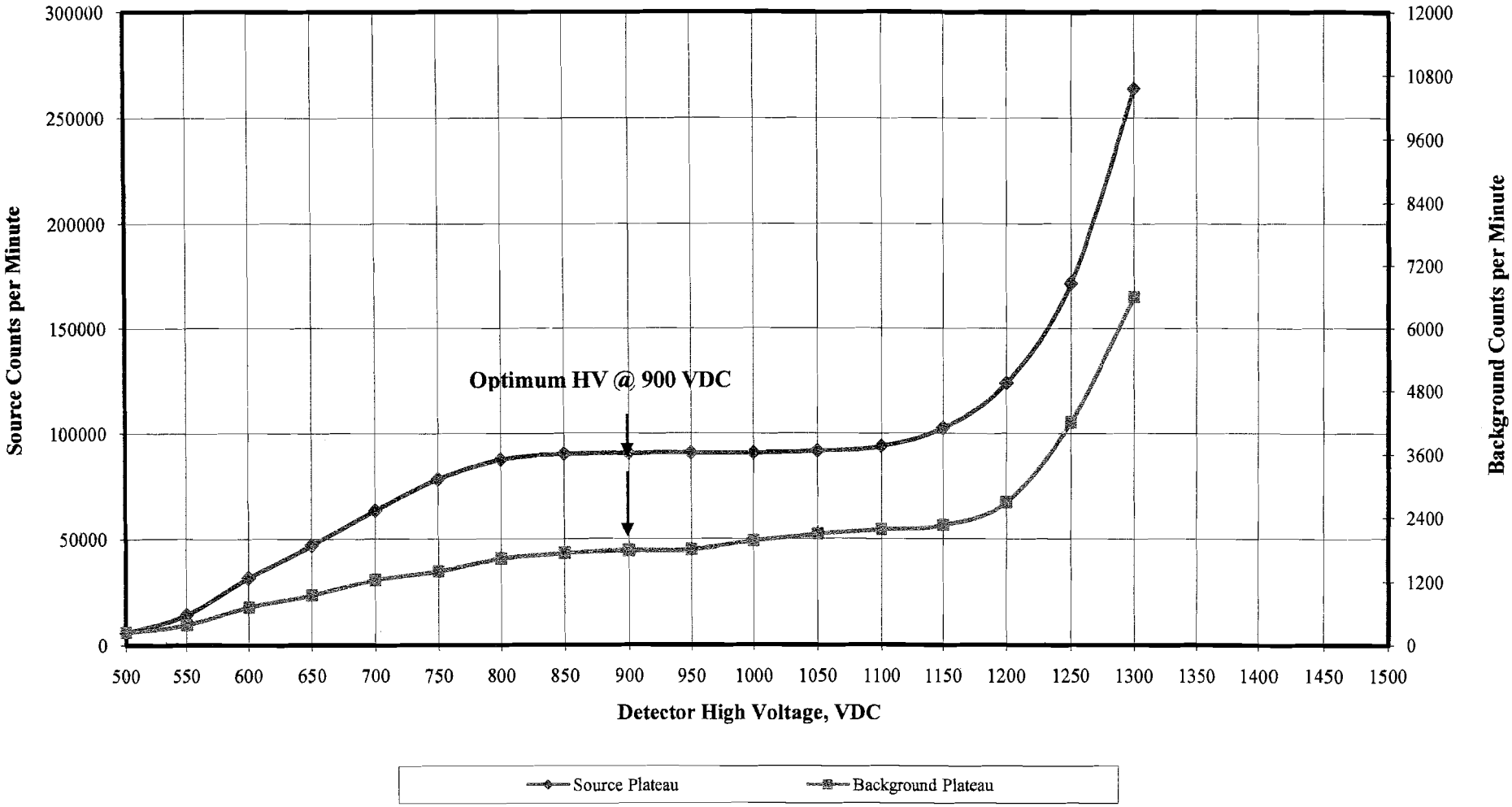
Function Check with 1 percent U_3O_8 ore in can. Can Directly under the detector.
Acceptable Function check range is: 72430 to 108650 CPM

Count Readings for Calibration Pad GPL (87.78 pCi/gm Ra-226)

	Bare (Uncollimated)		Collimated	
#1	96920	cpm	46298	cpm
#2	96232	cpm	46876	cpm
#3	97211	cpm	46159	cpm
#4	96482	cpm	47008	cpm
#5	97341	cpm	46455	cpm
Average	96,837	cpm	46559	cpm
Eff(avg cpm/87.78 pCi/gm	1103	cpm/pCi/gm	530	cpm/pCi/gm

Date Apr 16, 2009 By

Detector High Voltage Plateau
SPA-3 #408522-33 with Ludlum 2221 #68782
1% Uranium Ore in Sealed Can
April 16, 2007



Attachment A, SOP #RAD-01
AVM Environmental Services Inc.

Scaler/Ratemeter Calibration Form

Model Ludlum 2221 S/N 68782

Calibration Source Ludlum Pulsar 500 S/n # 114513 (cal 09-Apr-09)

Threshold (input sensitivity), Found at 100 Left or Set at 100

Window, In/Out out Window N/A

Pulser Amplitude Set @ 20 mV

Range/Mode	Calibration Point (Pulser Setting) cpm x multiplier	As Found Reading	Left or Set Reading
Rate Meter	40x1	40	40
	40x10	400	400
	40x100	4,000	4,000
	40x 1K	40,000	40,000
	40x 10K	400,000	400,000
Scaler	40x1	39	39
	40x10	399	399
	40x100	3,998	3,998
	40x 1K	39,994	39,994
	40x 10K	399,970	399,970

HV Set @ 900 VDC HV on Pulsar Read @ 901

Checked Threshold/Gain Calibration
Ludlum 2221 set @: Thr 100, Win out, started count @ 10 mv pulsar amplitude. Set thr @ 100, win in @ 100 Registered counts @ up @ Pulsar amplitude of 10-20 mV

Date Apr 15, 2009 Calibrated By

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
POST OFFICE BOX 810 PH. 325-235-5494
501 OAK STREET FAX NO. 325-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

Model No. / Serial No. 500 / 114513

CUSTOMER AVM ENVIRONMENTAL SERVICES CUSTOMER PO 20090406A ORDER NO. 20131827/336779

Date 10-Apr-09 Cal Due Date 10-Apr-10 Cal. Interval 1 Year Procedure M500, Rev. 5

☐ New Instrument Instrument Received ☑ Within Tolerance ☐ Out of Tol. ☐ Requiring Repair ☐ Other-See Comments

T. 75 °F RH 20 % Alt 699.8 mm Hg ☑ Meter Zeroed ☑ Mechanical Check

PULSE WIDTH			
	As Found	As Left	Acceptable Range (µs) ± 10%
NEG PULSE	1.7	1.7	1.5 - 1.9
POS PULSE	1.7	1.7	< 2.25

PULSE AMPLITUDE							
Reference Amplitude	As Found Amplitude Reading	As Left Amplitude Reading	Acceptable Range ± 10%	Reference Amplitude	As Found Amplitude Reading	As Left Amplitude Reading	Acceptable Range ± 10%
1 V	1 V	1 V	0.9 - 1.1	4 V	4.3 V	4.3 V	3.6 - 4.4
100 mV	100 mV	100 mV	90 - 110	400 mV	430 mV	430 mV	360 - 440
10 mV	10 mV	10 mV	9 - 11	40 mV	43 mV	43 mV	36 - 44
1 mV	1 mV	1 mV	0.9 - 1.1	4 mV	4.3 mV	4.3 mV	3.6 - 4.4

PULSE FREQUENCY (PERIOD)			
Pulser Range	As Found Period	As Left Period	Acceptable Range ± 2%
x 10K	6.676	6.666	6.534 - 6.8
x 1K	66.75	66.68	65.34 - 68
x 100	667.6	667.0	653.4 - 680
x 10	6676	6669	6534 - 6800
x 1	66.77	66.69	65.34 - 68
x 0.1	90	90	88.2 - 91.8 Counts

Reference Voltage	As Found Voltage Reading	As Left Voltage Reading	Acceptable Range ± 5%
500 V	500	500	475 - 525
2000 V	1990	1990	1900 - 2100

CPM Reading	As Found cpm Reading	As Left cpm Reading	Acceptable Range ± 10%
MAX	990	990	981 - 999
MIN	1	1	0 - 1*

* READING OF 0-99 IS ACCEPTABLE FOR INSTRUMENTS WITH A S/N 100000 AND BELOW AND MAIN BOARD = 5208-066

COMMENTS:

Cal'd w/ 39" cable.

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology. The calibration system conforms to the requirements of ANSI/NCSL Z540-1-1994 and ANSI N323-1978.

Reference Instruments:

Frequency Counter	Model 1856 D	S/N 1856A12450606063	Cal Date 9-JAN-09
Oscilloscope	Model V 1560	S/N 9084101	Cal Date 9-JAN-09
Voltmeter	Model Fluke 83V	S/N 94000441	Cal Date 24-Oct-08

Calibrated By: William Tinsley Date 10-April-09

Reviewed By: Rhonda Hern Date 10 APR 09

AC Inst. Only ☑ Passed Dielectric (Hi-Pot) and Continuity Test ☐ Failed:

MDC Calculation

Detector: SPA-3, SR #408522-33 (2X2" NaI Scintillator), with Ludlum 2221, 04-16-2009

Unshielded 2x2 NaI Detector Background counts (cpm) =**7389**	Bare Detector effiency (cpm/pCi/gm) for Ra-226 (DOE Cal Pad GPL at Grants Site, 87.78 pCi/gm) = **1103**
Shielded 2x2 NaI Detector Background counts (cpm) =**2556**	Collimated Detector effiency (cpm/pCi/gm) for Ra-226 (DOE Cal Pad GPL at Grants Site, 87.78 pCi/gm) = **530**

One Minute Static Measurement MDC

$L_D = 3 + 4.65 (B^{0.5})$ Equation 6-6 MARSSIM) for 0.05 for both alpha and beta, K = 1.645

Where B is number of background counts that are expected to occur while performing actual measyrement

Bare 2x2 NaI Detector	L_D=	403	cpm	MDC (LD/Eff)=	**0.37** pCi/gm
Collimated 2x2 NaI Detector	L_D=	238	cpm	MDC (LD/Eff)=	**0.45** pCi/gm

Minimum Detectable Count Rate (MDCR) for Land Area Scan Survey

MDCR = (d' x $b_i^{0.5}$) x (60/i) Equation 6-8, 6-9 MARSSIM

Where d' is value for true positive (alpha) and false positive(beta) proportion (Table 6.5 MARSSIM)
bi is number background counts in the interval
$_i$ is interval

if b is in cpm, then b_i counts= cpm x 1 sec x 1 min/60 sec (1 sec is measurement time within the detector 3 ft dia area, therefore time is 1

scan rate 3.0 ft/sec ft/scan rate, fps, for 1 fps t=1, for 2 fps t=1.5, for 1.5 fps t=2

Unshielded 2x2 NaI Detector Background counts=	7389	cpm	bi =	123.2	counts	d' =	**1.38**	MDCR =	919 cpm
Shielded 2x2 NaI Detector Background counts=	2556	cpm	bi =	42.6	counts	d' =	**1.38**	MDCR =	540 cpm

$MDCR_{surveyor}$ = MDCR/($p^{0.5}$) where p is a surveyor efficiency

	(active D)	p		
surveyor efficiency (p) unshielded detector =	36	**0.5**	$MDCR_{surveyor}$ =	1299 cpm
surveyor efficiency (p) shielded detector =	36	**0.5**	$MDCR_{surveyor}$ =	764 cpm

Land Area Scan Minimum Detectable Concentration (MDC)

Scan MDC pCi/gm = MDCR (cpm)/eff (cpm/pCi/gm) Equation 6-11 MARSSIM

Bare detector efficiency=	**1103**	cpm/pCi/gm (0.00027 pCi/gm/cpm)	**Scan MDC =**	**1.18 pCi/gm**
Collimated detector efficiency=	**530**	cpm/pCi/gm (0.00080 pCi/gm/cpm)	**Scan MDC =**	**1.44 pCi/gm**

B-2

INSTRUMENT DAILY FUNCTION CHECK LOG

AVM Environmental Services, Inc.
Scaler/Ratemeter - 2" x 2" NaI Detector Function Check
UNC's NECR Mine Site

Scaler/Ratemeter ID: Ludlum 2221 S/n 168782

2" x 2" Detector ID: SPA-3 S/n 408522-30

Function Check Source ID: 1% U_3O_8 Ore in Sealed can

Acceptable background Count (cpm) Range (20%) 5940 2200 to 8910 Bare 3300 coil

Acceptable Source Count (cpm) Range (20%) 75870 to 113810

Date	Physical Check	Cal Due	Battery(1) Volts or OK	HV Volts	Threshhold mV (2)	Window In or OUT(3)	C.C.(4)	BKG Counts cpm	Source Counrts cpm	Within Acceptable Range Y or N	MDC pCi/gm	Tech
4-28-09	O/K	04-15-10	6.0	901	100	out	1	7036 Bare 2669 Coil	94934	Y	<0.6	MP VP
11/29-09	ok	4-15-10	6.0	901	100	out	1	7112 Bare 2655 coil	92579	Y	<0.6	MP VP
8-24-09	ok	4-15-10	5.9	900	100	out	1	7565 Bare 2542 coil	93728	Y	<0.6	VP
8-25-09	ok	4-15-10	5.8	900	100	out	1	7553 2722 coil	94289	Y	<0.6	VP
8-26-09	ok	4-15-10	5.8	900	100	out	1	7387 2632	94660	Y	<0.6	VP
8-27-09	ok	4-15-10	5.7	900	100	out	1	7452 2466	95459	Y	<0.6	VP
9-8-09	ok	4-15-10	5.7	899	100	out	1	7604 2581 coil	95316	Y	<0.6	VP
9-9-09	ok	4-15-10	5.7	900	100	out	1	7777 2798 coil	95178	Y	<0.6	VP
9-10-09	ok	4-15-10	5.6	900	99	out	1	7722 2706 coil	94856	Y	<0.6	VP
9-14-09	ok	4-15-10	5.6	900	100	out	1	7502 2665 coil	94655	Y	<0.6	VP
9-23-09	ok	4-15-10	5.7	902	100	out	1	7834 2653 coil	95302	Y	<0.6	VP
9-24-09	ok	4-15-10	5.6	901	100	out	1	7536 2591 coil	95173	Y	<0.6	VP
10-5-09	ok	4-15-10	5.7	900	100	out	1	7219 2615	95211	Y	<0.6	VP
10-6-09	ok	4-15-10	5.6	900	100	out	1	7385 2587	95550	Y	<0.6	VP
10-7-09	ok	4-15-10	5.5	900	100	out	1	7535 2644 coil	95626	Y	<0.6	VP
10-8-09	OK	4-15-10	5.6	901	100	out	1	7491 2601 coil	95198	Y	<0.6	VP
10-9-09	ok	4-15-10	5.6	901	100	out	1	7387 2598 coil	95494	Y	<0.6	VP
10-12-09	OK	4-15-10	5.6	900	100	out	1	7301 2651 coil	95225	Y	<0.6	VP

Note: (1) Battery Voltage for Ludlum 2221 must be >5.3 volts; (2) Threshhold must be at 100 mV; (3) Window Position must be OUT; (4) C.C. for Eberline ESP scaler must be 1.0+00

Scaler/Ratemeter - 2" x 2" NaI Detector Function Check
UNC's NECR Mine Site

Scaler/Ratemeter ID: Ludlum 2221 SR 68782

2" x 2" Detector ID: SPA-3 SR 40852230

Function Check Source ID: 1% U_3O_8 Ore in Sealed can 5940

Acceptable background Count (cpm) Range (20%) 2200 to 3300 cpm (8910 Base)

Acceptable Source Count (cpm) Range (20%) 7587c to 113810

Date	Physical Check	Cal Due	Battery[1] Volts or OK	HV Volts	Threshhold mV[2]	Window In or OUT[3]	C.C.[4]	BKG Counts cpm	Source Counrts cpm	Within Acceptable Range Y or N	MDC pCi/gm	Tech
10-13-09	ok	4-15-10	5.6	901	100	out	1	7083 2526 coll	95764	Y	<1.6	VP
10-14-09	ok	4-15-10	5.6	901	100	out	1	7208 2581 coll	95316	Y	<1.6	VP
10-16-09	ok	4-15-10	5.6	901	100	out	1	7486 2538	95395	Y	<1.6	VP
10-19-09	ok	4-15-10	5.6	901	100	out	1	7500 2681 coll	95248	Y	<1.6	VP
10-20-09	ok	4-15-10	5.6	901	100	out	1	7120 2567 coll	94974	Y	<1.6	VP
10-21-09	ok	4-15-10	5.6	901	100	out	1	7360 2454 coll	95581	Y	<1.6	VP
10-22-09	ok	4-15-10	5.6	901	100	out	1	3040 2762 coll	95432	Y	<1.6	VP
10-26-09	ok	4-15-10	5.6	900	100	out	1	7249 2475 coll	95649	Y	<1.6	VP
10-27-09	ok	4-15-10	5.5	900	100	out	1	7836 2540	95211	Y	<1.6	VP
10-29-09	ok	4-15-10	5.5	900	100	out	1	7467 2690	95499	Y	<1.6	VP
11-3-09	ok	4-15-10	5.5	900	100	out	1	7323 2588	95864	Y	<1.6	VP
11-6-09	ok	4-15-10	5.5	901	100	out	1	7681 2602	95419	Y	<1.6	VP
11-10-09	ok	4-15-10	5.5	900	100	out	1	7172 2454	95667	Y	<1.6	VP
11-13-09	OK	4-15-10	5.5	900	100	out	1	7345 2535	95427	Y	<1.6	VP
11-16-09	ok	4-15-10	5.5	900	100	out	1	7465 2664	95593	Y	<1.6	VP
11-17-09	ok	4-15-10	5.5	900	100	out	1	7578 2643	95972	Y	<1.6	VP
11-20-09	ok	4-15-10	5.5	900	100	out	1	7390 2741	95173	Y	<1.6	VP
11-24-09	ok	4-15-10	5.5	900	100	out	1	7330 2660	95141	Y	<1.6	VP

Note: (1) Battery Voltage for Ludlum 2221 must be >5.3 volts; (2) Threshhold must be at 100 mV; (3) Window Position must be OUT; (4) C.C. for Eberline ESP scaler must be 1.0+00

Scaler/Ratemeter - 2" x 2" NaI Detector Function Check
UNC's NECR Mine Site

Scaler/Ratemeter ID: Ludlum 2221, SR 68782

2" x 2" Detector ID: SPA-3, SR 408522-30

Function Check Source ID: 1% U_3O_8 Ore in Sealed can

Acceptable background Count (cpm) Range (20%) 5940 to 8910 Bare / 2200 to 3300 Collimated

Acceptable Source Count (cpm) Range (20%) 75570 to 113,810

Date	Physical Check	Cal Due	Battery[1] Volts or OK	HV Volts	Threshhold mV[2]	Window In or OUT[3]	C.C.[4]	BKG Counts cpm	Source Counrts cpm	Within Acceptable Range Y or N	MDC pCi/gm	Tech
11-30-09	OK	4-15-10	5.5	900	100	out	1.0	2701 Cal 7298 Bare	95348	Y	<0.6	MP
12-3-09	ok	4-15-10	5.5	900	100	out	1.0	2324 9683 Bare	96096	Y	<.6	MP
12-4-09	ok	4-15-10	5.5	900	100	out	1.0	2630 7402 Bare	95193	Y	<.6	MP
12-11-09	ok	4-15-10	5.5	900	100	out	1.0	2516 7711	95209	Y	<.6	MP
12-14-09	OK	4-15-10	5.4	900	100	out	1.0	2644 7599	96495	Y	<.6	MP
12-16-09	ok	4-15-10	6.2	900	100	out	1.0	2623 7540	95883	Y	<.6	MP
12-18-09	OK	4-15-10	6.1	900	100	out	1.0	2673 7715	95685	Y	<.6	MP
12-21-09	ok	4-15-10	6.0	900	100	out	1.0	2566 7495	95819	Y	<.6	MP
12-23-09	ok	4-15-10	5.9	900	100	out	1.0	2620 7496	94932	Y	<.6	MP
1-4-10	ok	4-15-10	5.9	900	100	out	1.0	2589 7379	96484	Y	<.6	MP
1-5-10	ok	4-15-10	5.9	900	100	out	1.0	2772 7509	96050	Y	<.6	MP
1-6-10	ok	4-15-10	5.9	900	100	out	1.0	2709 7516	95548	Y	<.6	MP

Note: (1) Battery Voltage for Ludlum 2221 must be >5.3 volts; (2) Threshhold must be at 100 mV; (3) Window Position must be OUT; (4) C.C. for Eberline ESP scaler must be 1.0+00

B-3

EXC CONTROL STATIC GAMMA SURVEY FIELD LOG

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Excavation Control
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter L2221, Detector SPA #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: Yes

2"x2" NaI Detector Collimated ✓ Yes or _____ No.

Survey Area/Unit Decsription Step Out area IRA

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
10-8-09	Z4NSS01	1697260	2523943	4492 4490	Soil Sample Z4NSS01
"	Z4NSS02	1697254	2523960	4694 4666	Soil Sample Z4NSS02
10-12-09	Z4NSS03	1697723	2523577	5704	Soil Sample Z4NSS03
"	Z4NSS04	1697730	2523702	5940	Soil Sample Z4NSS04
"	Z4NSS05	1697354	2523814	5460	Soil Sample Z4NSS05
10-14-09	Z4NSS06	1697497	2523412	9706	Sample Z4NSS06
"	Z4NSS07	1697330	2523525	4838	Sample Z4NSS07
10-19-09	Z4NSS08	1697497	2523412	4567	Soil Sample @ same location Z4NSS06 after cleanup
"	Z4NSS09	1697597	2523870	4769	Soil Sample Z4NSS09
11-2-09	Z4S10	1697062	2523396	3839	25'x30'-1.5 deep Exc
"	Z4S11	1696913	2523402	3929	40x50' x 20' deep excavation
"	Z4S12	1696890	2523388	3959	
"	Z4S13	1696587	2523355	4251	15'x20'-4' deep Excavation
11-6-09	Z1-001	1696678	2522786	4598	25'x25'-3 feet deep
"	Z1-02	1696680	2522792	4630	Excavation
"	Z1-03-SS	1696632	2522777	6983	40'x10' x 4' deep exc. Soil sample Z1-03-SS from highest Reading
"	Z1-04	1696620	2522772	5547	
"	Z1-05	1696613	2522767	5597	
"	Z1-06	1696511	2522693	4344	150'x50' wide
"	Z1-07-SS	1696499	2522672	5096, 4948	1/2 circle excavation
"	Z1-08	1696475	2522606	4483	up to 5' deep
"	Z1-09	1696469	2522625	4495	Collected Soil Sample
"	Z1-10	1696462	2522600	4440	@ highest Rdg point
"	Z1-11	1696451	2522587	4610	Z10-SS

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Excavation Control
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: Yes

2"x2" NaI Detector Collimated ✓ Yes or ______ No.

Survey Area/Unit Decsription Zone 3 Zone 1 IRA Step out area

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate Northing	Easting	Gamma Radiation Reading, CPM	Comments/Notes
11-13-09	Z1-036-SS	1696632	2522777	5360	Soil Sample Z1-036-SS
"	Z1-04b	1696620	2522772	5348	Some excavation after further excavation
"	Z1-05b	1696613	2522761	5206	
11-16-09	Z1-12 SS	1696574	2522845	5229 Cpm	Soil Sample Z1-12-SS
"	Z1-13	1696577	2522837	5210 cpm	
"	Z1-14	1696570	2522931	4620	
"	Z1-15	1696620	2522963	3910	3.5' deep
"	Z1-16	1696648	2522952	4480	3.5' deep
"	Z1-17	1696556	2522856	4135	
"	Z1-18	1696534	2522836	4231	
"	Z1-19	1696513	2522796	4350	
"	Z1-20	1696521	2522766	4630	3.5' deep
"	Z1-21	1696541	2522772	4542	3.5' deep
"	Z1-22	1696545	2522807	4290	
11-20-09	Z4N5514 @1233	1697401	2523226	4890 cpm 4120	8' deep excavation 5164 cpm 10' x 20' x 8' deep SPA3 #30
11-24-09	Z1-23	1696659	2522461	5241	Step excav. 3' deep 10 x 30'
11-24-09	Z1-24	1696635	2522954	4984	
11-24-09	Z1-25-SS	1696632	2522944	6355	8357 after further exc. Soil Sample @ highest pt
12-16-09	Z1-26	1696340	2522609	7187/4702	4' Excavation Further excavation on 12/18
12-16-09	Z1-27	1696293	2522594	5358/4595	10' Excavation after further exc on 12/18
12-16-09	Z1-28	1696270	2522573	9465/4650	3' excavation after further exc on 12/18
12-16-09	Z1-29	1696166	2522495	5391/4664	Near Toe of Slope Re surveyed on 12/18
12-21-09	Z1-30-SS	1696494	2522849	5800 5218 Cpm.	Soil Sample due to elevated AL after further exc.

Large excavation (bracketed note beside Z1-12 SS to Z1-22)

Technician Signature [signature], Reviewed by [signature]

B-4

POST IRA STATUS GAMMA SURVEY FIELD FORM

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated x Yes or _____ No.

Survey Area/Unit Decsription Hunger site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-16-09	PT-001	1,696,146.3	2,522,290.6	4612	
12-16-09	PT-002	1,696,146.3	2,522,370.6	4623	
12-16-09	PT-003	1,696,146.3	2,522,450.6	4496	
12-18-09	PT-004	1,696,146.3	2,522,530.6	4655	
12-18-09	PT-005	1,696,146.3	2,522,610.6	5302/4702	4702 After further exc on 1-5-10
12-18-09	PT-006	1,696,146.3	2,522,690.6	5642/5042	5042 After further exc on 1-6-10
12-21-09	PT-007	1,696,146.3	2,522,770.6	7505	
12-21-09	PT-008	1,696,146.3	2,522,850.6	6011	
12-21-09	PT-009	1,696,146.3	2,522,930.6	5565	on back fill 55kcpm 20ft North
12-21-09	PT-010	1,696,146.3	2,523,010.6	6698	
12-21-09	PT-011	1,696,146.3	2,523,090.6	7106	
12-21-09	PT-012	1,696,146.3	2,523,170.6	5528	
12-21-09	PT-013	1,696,146.3	2,523,250.6	4615	near bed Rock
12-21-09	PT-014	1,696,146.3	2,523,330.6	5321	
12-21-09	PT-015	1,696,146.3	2,523,410.6	5487	
12-21-09	PT-016	1,696,146.3	2,523,490.6	5137	
12-21-09	PT-017	1,696,146.3	2,523,570.6	5341	
12-21-09	PT-018	1,696,146.3	2,523,650.6	5220	
12-21-09	PT-019	1,696,146.3	2,523,730.6	5085	
1-4-10	PT-020	1,696,146.3	2,523,810.6	4408	
1-4-10	PT-021	1,696,146.3	2,523,890.6	4536	
1-4-10	PT-022	1,696,146.3	2,523,970.6	4433	
12-16-09	PT-023	1,696,215.6	2,522,330.6	4522	
12-16-09	PT-024	1,696,215.6	2,522,410.6	4685	
12-16-09	PT-025	1,696,215.6	2,522,490.6	4623	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated X Yes or ______ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate Northing	Survey Point Coordinate Easting	Gamma Radiation Reading, CPM	Comments/Notes
12-18-09	PT-026	1,696,215.6	2,522,570.6	4705	
12-18-09	PT-027	1,696,215.6	2,522,650.6	4595	
12-21-09	PT-028	1,696,215.6	2,522,730.6	5429/4644	Resurveyed on 1/5/10 after further excavation
12-21-09	PT-029	1,696,215.6	2,522,810.6	4912	On backfill
12-21-09	PT-030	1,696,215.6	2,522,890.6	8510	
12-21-09	PT-031	1,696,215.6	2,522,970.6	5281	
12-21-09	PT-032	1,696,215.6	2,523,050.6	5968	
12-21-09	PT-033	1,696,215.6	2,523,130.6	4519	
12-21-09	PT-034	1,696,215.6	2,523,210.6	4474	
12-21-09	PT-035	1,696,215.6	2,523,290.6	4424	
12-21-09	PT-036	1,696,215.6	2,523,370.6	4483	
12-21-09	PT-037	1,696,215.6	2,523,450.6	5395	
12-21-09	PT-038	1,696,215.6	2,523,530.6	4362	
12-21-09	PT-039	1,696,215.6	2,523,610.6	5480	
12-21-09	PT-040	1,696,215.6	2,523,690.6	4701	
12-21-09	PT-041	1,696,215.6	2,523,770.6	4946	
1-4-10	PT-042	1,696,215.6	2,523,850.6	4833	
1-4-10	PT-043	1,696,215.6	2,523,930.6	4606	
1-4-10	PT-044	1,696,215.6	2,524,010.6	4330	
12-16-09	PT-045	1,696,284.9	2,522,370.6	4635	
12-16-09	PT-046*	1,696,284.9	2,522,450.6	4523	
12-16-09	PT-047	1,696,284.9	2,522,530.6	4649	
12-16-09	PT-048	1,696,284.9	2,522,610.6	4668	
12-18-09	PT-049*	1,696,284.9	2,522,690.6	4644	
12-18-09	PT-050	1,696,284.9	2,522,770.6	5204/4918	Resurveyed on 1/6/10 after further excavation around the point

Technician Signature [signature], Reviewed by [signature]

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated X Yes or ____ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-21-09	PT-051	1,696,284.9	2,522,850.6	8208/5714	Resurvd on 1/6/10 after further excavation around the point
12-21-09	PT-052	1,696,284.9	2,522,930.6	4707	
12-21-09	PT-053*	1,696,284.9	2,523,010.6	5155	
12-21-09	PT-054	1,696,284.9	2,523,090.6	5400	
12-21-09	PT-055	1,696,284.9	2,523,170.6	4870	
12-21-09	PT-056	1,696,284.9	2,523,250.6	4854	
12-21-09	PT-057*	1,696,284.9	2,523,330.6	4829	
12-21-09	PT-058	1,696,284.9	2,523,410.6	4288	on bare rock
12-21-09	PT-059	1,696,284.9	2,523,490.6	4307	
12-21-09	PT-060	1,696,284.9	2,523,570.6	4488	
12-21-09	PT-061*	1,696,284.9	2,523,650.6	5565	
12-21-09	PT-062	1,696,284.9	2,523,730.6	7682	
12-21-09	PT-063	1,696,284.9	2,523,810.6	4483	
1-4-10	PT-064*	1,696,284.9	2,523,890.6	5070	
1-4-10	PT-065	1,696,284.9	2,523,970.6	4487	
1-4-10	PT-066	1,696,284.9	2,524,050.6	4459	
12-16-09	PT-067	1,696,354.1	2,522,410.6	4439	
12-16-09	PT-068	1,696,354.1	2,522,490.6	4277	
12-16-09	PT-069	1,696,354.1	2,522,570.6	4551	
12-16-09	PT-070	1,696,354.1	2,522,650.6	4699	
12-16-09	PT-071	1,696,354.1	2,522,730.6	4616	
12-21-09	PT-072	1,696,354.1	2,522,810.6	10119/4627	Resurvd on 1/5/10 after further excavation
12-21-09	PT-073	1,696,354.1	2,522,890.6	5113	
12-21-09	PT-074	1,696,354.1	2,522,970.6	4942	
12-21-09	PT-075	1,696,354.1	2,523,050.6	4938	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated X Yes or _____ No.

Survey Area/Unit Decsription Home S.I.a

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-11-09	PT-076	1,696,354.1	2,523,130.6	4725	
12-21-09	PT-077	1,696,354.1	2,523,210.6	4958	
12-21-09	PT-078	1,696,354.1	2,523,290.6	4630	
12-21-09	PT-079	1,696,354.1	2,523,370.6	4640	
12-21-09	PT-080	1,696,354.1	2,523,450.6	4805	
12-21-09	PT-081	1,696,354.1	2,523,530.6	4955	
12-21-09	PT-082	1,696,354.1	2,523,610.6	4698	
12-21-09	PT-083	1,696,354.1	2,523,690.6	4832	
12-21-09	PT-084	1,696,354.1	2,523,770.6	6686	
12 21 09	PT-085	1,696,354.1	2,523,850.6	4729	
1-4-10	PT-086	1,696,354.1	2,523,930.6	4850	
1-4-10	PT-087	1,696,354.1	2,524,010.6	4701	
1-4-10	PT-088	1,696,354.1	2,524,090.6	4518	
12-16-09	PT-089	1,696,423.4	2,522,450.6	4228	
12-16-09	PT-090	1,696,423.4	2,522,530.6	4170	
12-16-09	PT-091	1,696,423.4	2,522,610.6	4612	
12 16 09	PT-092	1,696,423.4	2,522,690.6	4654	
12-16-09	PT-093	1,696,423.4	2,522,770.6	4727	
12-18-09	PT-094	1,696,423.4	2,522,850.6	9264/5000	Resurvd on 1/6/10 after farm exc around this point
12-18-09	PT-095	1,696,423.4	2,522,930.6	4927	
12-18-09	PT-096	1,696,423.4	2,523,010.6	5268	
12-11-09	PT-097	1,696,423.4	2,523,090.6	4649	
12-11-09	PT-098	1,696,423.4	2,523,170.6	5277	
~~1-7-10~~ ~~12-16-09~~ NP	PT-099	1,696,423.4	2,523,250.6	4889	
12-11-09	PT-100	1,696,423.4	2,523,330.6	4634	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated X Yes or _____ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-18-09	PT-101	1,696,423.4	2,523,410.6	4484	
12-18-09	PT-102	1,696,423.4	2,523,490.6	4194	
12-18-09	PT-103	1,696,423.4	2,523,570.6	4460	
12-18-09	PT-104	1,696,423.4	2,523,650.6	4544	
12-18-09	PT-105	1,696,423.4	2,523,730.6	4760	
12-18-09	PT-106	1,696,423.4	2,523,810.6	5521	
12-18-09	PT-107	1,696,423.4	2,523,890.6	5033	
1-4-10	PT-108	1,696,423.4	2,523,970.6	6849	inside Arroyo
1-4-10	PT-109	1,696,423.4	2,524,050.6	4971	southern edge of Arroyo
12-16-09	PT-110	1,696,492.7	2,522,570.6	4617	
12-16-09	PT-111	1,696,492.7	2,522,650.6	4390	
12-16-09	PT-112	1,696,492.7	2,522,730.6	4540	
12-18-09	PT-113	1,696,492.7	2,522,810.6	4650	
12-18-09	PT-114	1,696,492.7	2,522,890.6	8296/4633	Resurvey on 1/5/10 after further excavation
12-11-09	PT-115	1,696,492.7	2,522,970.6	5207	
12-11-09	PT-116	1,696,492.7	2,523,050.6	4633	
12-11-09	PT-117	1,696,492.7	2,523,130.6	5276	
12-11-09	PT-118	1,696,492.7	2,523,210.6	4626	
12-11-09	PT-119	1,696,492.7	2,523,290.6	5212	
12-11-09	PT-120	1,696,492.7	2,523,370.6	4614	
12-18-09	PT-121	1,696,492.7	2,523,450.6	4708	
12-18-09	PT-122	1,696,492.7	2,523,530.6	4667	
12-18-09	PT-123	1,696,492.7	2,523,610.6	4553	
12-18-09	PT-124	1,696,492.7	2,523,690.6	4441	
12-18-09	PT-125	1,696,492.7	2,523,770.6	5141	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated X Yes or ____ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-18-09	PT-126	1,696,492.7	2,523,850.6	5241	
12-18-09	PT-127	1,696,492.7	2,523,930.6	4518	
12-18-09	PT-128	1,696,492.7	2,524,010.6	5378	
1-4-10	PT-129	1,696,492.7	2,524,090.6	5610	
11-6-09	PT-130	1,696,562.0	2,522,690.6	4448	
12-18-09	PT-131	1,696,562.0	2,522,770.6	4721	
11-20-09	PT-132*	1,696,562.0	2,522,850.6	4617	
12-21-09	PT-133	1,696,562.0	2,522,930.6	4590	
12-21-09	PT-134	1,696,562.0	2,523,010.6	4606	
12-11-09	PT-135	1,696,562.0	2,523,090.6	5135	4639 RXC on 12-18
12-11-09	PT-136*	1,696,562.0	2,523,170.6	4730	
12-11-09	PT-137	1,696,562.0	2,523,250.6	4641	
12-11-09	PT-138	1,696,562.0	2,523,330.6	4635	
12-11-09	PT-139	1,696,562.0	2,523,410.6	5055	4633
12-11-09	PT-140*	1,696,562.0	2,523,490.6	5197	4651
12-18-09	PT-141	1,696,560.0	2,523,572.5	4354	
12-18-09	PT-142	1,696,562.0	2,523,650.6	4920	
12-11-09	PT-143	1,696,562.0	2,523,730.6	4918	
12-11-09	PT-144*	1,696,562.0	2,523,810.6	4131	
12-11-09	PT-145	1,696,562.0	2,523,890.6	3983	
12-11-09	PT-146	1,696,562.0	2,523,970.6	4659	
12-11-09	PT-147*	1,696,562.0	2,524,050.6	4131	
11-6-09	PT-148	1,696,631.3	2,522,730.6	4297	
12-11-09	PT-149	1,696,631.3	2,522,810.6	4436	
12-11-09	PT-150	1,696,631.3	2,522,890.6	4063	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #130

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated x Yes or _____ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-11-09	PT-151	1,696,631.3	2,522,970.6	4076	
12-11-09	PT-152	1,696,631.3	2,523,050.6	4640	2nd Run after etc 4447
12-11-09	PT-153	1,696,631.3	2,523,130.6	4647	
12-11-09	PT-154	1,696,631.3	2,523,210.6	4459	
12-11-09	PT-155	1,696,631.3	2,523,290.6	4547	
12-11-09	PT-156	1,696,631.3	2,523,370.6	4736	4431
12-11-09	PT-157	1,696,631.3	2,523,450.6	5287	4654
12-11-09	PT-158	1,696,631.3	2,523,930.6	4121	
12-11-09	PT-159	1,696,631.3	2,524,010.6	4599	
12-11-09	PT-160	1,696,700.5	2,522,770.6	4433	
12-11-09	PT-161	1,696,700.5	2,522,850.6	4095	
12-11-09	PT-162	1,696,700.5	2,522,930.6	4042	
12-11-09	PT-163	1,696,700.5	2,523,170.6	4636	
12-11-09	PT-164	1,696,700.5	2,523,250.6	4635	
12-11-09	PT-165	1,696,700.5	2,523,330.6	5553	5576, 4650 cpm after further
12-11-09	PT-166	1,696,700.5	2,523,410.6	4479	
12-11-09	PT-167	1,696,700.5	2,523,490.6	4693	
12-11-09	PT-168	1,696,700.5	2,523,730.6	4640	
12-11-09	PT-169	1,696,700.5	2,523,810.6	3961	
12-11-09	PT-170	1,696,700.5	2,523,890.6	4105	
12-11-09	PT-171	1,696,700.5	2,523,970.6	4515	
10-27-09	PT-172	1,696,700.5	2,524,050.6	4924	R+J Flag, Soil Sample
12-11-09	PT-173	1,696,769.8	2,522,810.6	4375	
12-11-09	PT-174	1,696,769.8	2,522,890.6	3928	
12-11-09	PT-175	1,696,769.8	2,522,970.6	4642	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221 SR 63782, Detector SPA-3 SR 30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: ✓

2"x2" NaI Detector Collimated x Yes or _____ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
12-11-09	PT-176	1,696,769.8	2,523,210.6	4334	
12-11-09	PT-177	1,696,769.8	2,523,290.6	5306/4620	Flag 4' offset & SE Re-Survey after cleanup (Final
12-11-09	PT-178	1,696,769.8	2,523,370.6	4400	
12-11-09	PT-179	1,696,769.8	2,523,450.6	5569	Re-excavated 4153
12-11-09	PT-180	1,696,769.8	2,523,530.6	4365	
12-11-09	PT-181*	1,696,769.8	2,523,610.6	4660	
12-11-09	PT-182	1,696,769.8	2,523,690.6	4577	
12-11-09	PT-183	1,696,769.8	2,523,770.6	4254	
12-11-09	PT-184	1,696,769.8	2,523,850.6	4647	
12-11-09	PT-185*	1,696,769.8	2,523,930.6	4473	
~~12-11-09~~	PT-186	1,696,769.8	2,524,010.6	4648	
12-11-09	PT-187	1,696,839.1	2,522,850.6	4345	
11-20-09	PT-188	1,696,839.1	2,522,930.6	4136	
11-3-09	PT-189*	1,696,839.1	2,523,330.6	4518	
12-11-09	PT-190	1,696,839.1	2,523,410.6	4184	4586 after further excavation
12-11-09	PT-191	1,696,839.1	2,523,490.6	4580	
12-11-09	PT-192	1,696,839.1	2,523,570.6	4380	
12-11-09	PT-193	1,696,839.1	2,523,650.6	4359	
12-11-09	PT-194	1,696,839.1	2,523,730.6	4629	
12-11-09	PT-195	1,696,839.1	2,523,810.6	4650	
12-11-09	PT-196	1,696,839.1	2,523,890.6	4529	
12-11-09	PT-197	1,696,839.1	2,523,970.6	4663	
10-27-09	PT-198	1,696,839.1	2,524,050.6	4594	
11-20-09	PT-199	1,696,908.4	2,522,970.6	4319	
11-3-09	PT-200	1,696,908.4	2,523,370.6	3964	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221 SR 68783 Detector SPA-3 SR 30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: Y

2"x2" NaI Detector Collimated X Yes or _____ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
10-27-09	PT-201	1,696,908.4	2,523,450.6	5337, 4507	Rad Flag; Soil Sample 4507 after cleanup 11/16/09
10-27-09	PT-202	1,696,908.4	2,523,530.6	4363	
10-27-09	PT-203	1,696,908.4	2,523,610.6	4660	
10-27-09	PT-204	1,696,908.4	2,523,690.6	4630	
10-27-09	PT-205	1,696,908.4	2,523,930.6	4683	
10-27-09	PT-206	1,696,908.4	2,524,010.6	4636	Rad Flag
10-27-09	PT-207	1,696,977.7	2,523,250.6	4446	
10-27-09	PT-208	1,696,977.7	2,523,570.6	4393	
10-27-09	PT-209	1,696,977.7	2,523,650.6	4552	
10-27-09	PT-210	1,696,977.7	2,523,970.6	4672	
11-3-09	PT-211	1,697,047.0	2,523,130.6	3953	
11-3-09	PT-212	1,697,047.0	2,523,210.6	3952	
10-27-09	PT-213	1,697,047.0	2,523,370.6	5077	Rad Flag; Soil Sample
10-27-09	PT-214	1,697,047.0	2,524,010.6	4388	
11-20-09	PT-215*	1,697,116.2	2,523,170.6	4220	Rad Flag; Soil Sample
11-3-09	PT-216	1,697,116.2	2,523,250.6	4026	
10-27-09	PT-217	1,697,116.2	2,523,410.6	4192	
10-27-09	PT-218	1,697,116.2	2,523,970.6	4623	
~~11-30-09~~ 11-3-09	PT-219	1,697,185.5	2,523,210.6	4642	
11-3-09	PT-220	1,697,185.5	2,523,290.6	2723	
10-27-09	PT-221	1,697,185.5	2,523,370.6	4628	
10-27-09	PT-222	1,697,185.5	2,523,450.6	4607	
10-27-09	PT-223	1,697,185.5	2,523,530.6	4438	
10-26-09	PT-224	1,697,185.5	2,523,850.6	4666	
11-3-09	PT-225	1,697,254.8	2,523,250.6	2684	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter L2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: Yes

2"x2" NaI Detector Collimated ✓ Yes or _____ No.

Survey Area/Unit Decsription Zone 4 verification. House S.te

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
10-27-09	PT-226	1,697,254.8	2,523,330.6	4612	
10-27-09	PT-227	1,697,254.8	2,523,410.6	4658	
10-26-09	PT-228	1,697,254.8	2,523,490.6	4576	
10-26-09	PT-229	1,697,254.8	2,523,570.6	4488	
10-26-09	PT-230	1,697,254.8	2,523,650.6	4659	
10-26-09	PT-231	1,697,254.8	2,523,730.6	4134	
10-26-09	PT-232	1,697,254.8	2,523,810.6	4491	
10-22-09	PT-233	1,697,254.8	2,523,890.6	4189	
10-22-09	PT-234	1,697,254.8	2,523,970.6	4680	
10-26-09	PT-235*	1,697,324.1	2,523,290.6	4190	
10-26-09	PT-236	1,697,324.1	2,523,370.6	4508	
10-26-09	PT-237	1,697,324.1	2,523,450.6	4602	
10-26-09	PT-238	1,697,324.1	2,523,530.6	4701	
10-26-09	PT-239*	1,697,324.1	2,523,610.6	4634	
10-26-09	PT-240	1,697,324.1	2,523,690.6	4564	other side of fence of Construction
10-22-09	PT-241	1,697,324.1	2,523,770.6	4765	4192 after further cleanup @ 1350
10-22-09	PT-242	1,697,324.1	2,523,850.6	4778 / 4819, 4556 after further cleanup @ 1320	
10-26-09	PT-243*	1,697,324.1	2,523,930.6	4317	
~~12-26-09~~ ~~11-3-09~~	PT-244	1,697,393.4	2,523,250.6	4296	
11-3-09	PT-245	1,697,393.4	2,523,330.6	4544	
11-3-09	PT-246	1,697,393.4	2,523,410.6	4358	
10-26-09	PT-247	1,697,393.4	2,523,490.6	4589	
10-22-09	PT-248	1,697,393.4	2,523,570.6	4678	
10-22-09	PT-249	1,697,393.4	2,523,650.6	4190	
10-26-09	PT-250	1,697,393.4	2,523,730.6	4461	

Technician Signature _____, Reviewed by _____

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221 SR 6878 Detector SPA-3 SR 30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: ✓

2"x2" NaI Detector Collimated x Yes or ____ No.

Survey Area/Unit Decsription Home Site, 24 Verification

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
10-26-09	PT-251	1,697,393.4	2,523,810.6	4332	
10-26-09	PT-252	1,697,393.4	2,523,890.6	4605	
10-22-09	PT-253	1,697,462.6	2,523,290.6	4914 /	4719 after further cleanup on 10/26/09
10-22-09	PT-254	1,697,462.6	2,523,370.6	4257	
10-22-09	PT-255	1,697,462.6	2,523,450.6	4902 / 4632	after further cleanup on 10/26/09
10-26-09	PT-256	1,697,462.6	2,523,530.6	4253	
10-26-09	PT-257	1,697,462.6	2,523,690.6	4547	
10-26-09	PT-258	1,697,462.6	2,523,770.6	4324	
10-26-09	PT-259	1,697,462.6	2,523,850.6	4156	
10-26-09	PT-260	1,697,462.6	2,523,930.6	4479	
10-26-09	PT-261	1,697,531.9	2,523,330.6	4641	
10-26-09	PT-262	1,697,531.9	2,523,410.6	4539	
10-26-09	PT-263	1,697,531.9	2,523,490.6	4377	
10-26-09	PT-264*	1,697,531.9	2,523,730.6	4562	
10-26-09	PT-265	1,697,531.9	2,523,810.6	4676	
10-26-09	PT-266	1,697,531.9	2,523,890.6	4659	
~~10-26-09~~ 11-3-09	PT-267	1,697,601.2	2,523,290.6	4674	
~~10-26-09~~ 11-3-09	PT-268	1,697,601.2	2,523,370.6	4270	
10-26-09	PT-269*	1,697,601.2	2,523,450.6	4630	
10-26-09	PT-270	1,697,601.2	2,523,530.6	4374	
10-26-09	PT-271	1,697,601.2	2,523,850.6	4558	
11-3-09	PT-272	1,697,601.2	2,523,930.6	4664	
10-26-09	PT-273	1,697,670.5	2,523,490.6	4387	
10-26-09	PT-274	1,697,670.5	2,523,570.6	4259	
10-26-09	PT-275	1,697,670.5	2,523,650.6	4448	

Technician Signature [signature], Reviewed by [signature]

Gamma Radiation Survey @ UNC's NECR Mine Site
IRA Verification Survey
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter Ludlum 2221, Detector SPA-3 #30

Instrument Calibration Date: 4-15-09, Instrument Daily Function Check Performed: yes

2"x2" NaI Detector Collimated X Yes or ___ No.

Survey Area/Unit Decsription Home Site

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
10-26-09	PT-276	1,697,670.5	2,523,730.6	4756	Inside edge of boundary
10-26-09	PT-277	1,697,670.5	2,523,810.6	5069/4655	is not cleaned initially need to clean the area. Resurvey 11/6
10-26-09	PT-278	1,697,739.8	2,523,530.6	4632	
10-26-09	PT-279	1,697,739.8	2,523,610.6	4393	
10-26-09	PT-280	1,697,739.8	2,523,690.6	4114	
12-11-09	PT-281 9	1,696,752.8	2,523,078.1	4211	
11-6-09	PT-277 RR			4655	Survey after clean-up @ pt-277

Technician Signature [signature], Reviewed by [signature]

Gamma Radiation Survey @ UNC's NECR Mine Site
NECR IRA
Static Gamma Radiation Survey Field Form

Instrumentation : Scaler/Ratemeter L2221, Detector SPA-3 #30

Instrument Calibration Date: 04-15-09, Instrument Daily Function Check Performed: Yes

2"x2" NaI Detector Collimated ✓ Yes or _____ No.

Survey Area/Unit Decsription Zone 4 Road

Survey Date/Time	Survey Point ID/Description	Survey Point Coordinate		Gamma Radiation Reading, CPM	Comments/Notes
		Northing	Easting		
10-20-09	P208	1697446	2523270	4705	
	P209	1697446	2523350	4399	
	P210	1697446	2523430	4116	
	P203	1697377	2523430	4416	
	P204	1697377	2523710	4829	Soil Sample P0953
	P197	1697308	2523830	4668	" " P1005
	P189	1697238	2523950	4463	

Technician Signature _____, Reviewed by _____

B-5

ON-SITE GAMMA SPEC SOIL SAMPLING ROUTING LOG

AVM Environmental Services, Inc.
Soil Sample Routing Log

(Lot #)

Sample ID	Sample Type/Description	Sample Date	Tech	Sample prep & Sealed Date	Wt. of Sample	Count Date	Tech
AS01	Grab / Excavated Arroyo bed @ 50 ft. Transect C. GPS point 1	10-7-09 @ 1140	VP	10-7-09 1440 (1)	1200 g.	10-8-09 10-9-09	VP
AS02	Grab/Excavated Arroyo bed @ 100 Ft transect C. GPS point 2	10-7-09 @ 1200	VP	10-7-09 1441 (2)	1200 g	10-8-09 10-9-09	VP
Z4NSS01	Zone 4 North area Exc Control SS # 01	10-8-09 @ 1020	VP	10-8-09 @ 1245 (3)	1200 g	10-12-09 10-13-09	VP
Z4NSS02	" " " " " " SS#2	10-8-09 @ 1030	VP	10-8-09 @ 1248 (4)	1200 g	10-9-09 10-13-09	VP
UA Slope	UA Slope ≥ 200' from Start / For info only Scanned C = 5100 cpm	10-9-09 @ 1100	VP	10-9-09 @ 1231 (5)	1200 g	10-12-09 10-13-09	VP
Z4NSS03	Zone 4 North Exc Control Sample, 4' Ex. Area @ highest cpm 5704, N 1697723 E 2523577	10-12-09 @ 1005	VP	10-12-09 @ 1243 (6)	1200 g	10-14-09 10-13-09	VP
Z4NSS04	" " " 4.5' Ex. @ highest cpm 5940, N 1697730, 2523702	10-12-09 @ 1015	VP	10-12-09 @ 1244 (7)	1200 g	10-14-09 10-13-09	VP
Z4NSS05	" " " 1-2' Ex. @ highest cpm 5460 cpm @ 1697354 2523814	10-12-09 @ 1025	VP	10-12-09 @ 1245 (8)	1200 g	10-14-09 10-13-09	VP
AS01b	Grab\UA excavation @ 50' transect 2nd Sample GPS point 3	10-13-09 @ 1312	VP	10-13-09 @ 1600 (9)	1200 g	10-13-09 10-16-09	VP
AS02b	Grab/UA excavation @ 100' transect GPS point 4 2nd Sample	10-13-09 @ 1316	VP	10-13-09 @ 1601 (10)	1200 g	10-13-09 10-16-09	VP
AS03a	Grab/UA excavation @ 150' transect GPS point 5 1st Sample	10-13-09 @ 1322	VP	10-13-09 @ 1602 (11)	1200 g	10-13-09 10-16-09	VP
Z4NSS06	Grab / Zone 4 1697497 2523412 9706 cpm	10-14-09 1035	VP	10-14-09 1345 (12)	1200 g	10-16-09 10-19-09	VP
Z4NSS07	Grab / Zone 4 1697330 2523525 4838 cpm	10-14-09 1153	VP	10-14-09 1346 (13)	1200 g	10-16-09 10-19-09	VP
Alignment A 1ft DPS01	Grab Composite / Diesel odor pits A 1 ft from Surface	10-13-09 @ 1450	VP	10-14-09 1347 (14)	1200 g	10-16-09 10-19-09	VP
Alignment A 3ft DPS02	Grab Composite Diesel odor pit A 3 ft from Surface	10-13-09 @ 1450	VP	10-14-09 1348 (15)	1200 g	10-16-09 10-19-09	VP
B01	UA East Slope midway @ 150 transect	10-16-09 @ 1000	VP	10-16-09 1357 (16)	1200 g	10-19-09 10-20-09	VP
AS04a	Grab/ UA Excavation @ 200' trans. GPS-6 1st	10-16-09 @ 1010	VP	10-16-09 1359 (17)	1200 g	10-19-09 10-20-09	VP
AS05a	Grab / UA Excavation @ 250' trans. GPS 7 1st	10-16-09 @ 1015	VP	10-16-09 1401 (18)	1200 g	10-19-09 10-20-09	VP
AS06a	Grab / UA Excavation @ 300' trans Gamma point-8	10-16-09 @ 1020	VP	10-16-09 1402 (19)	1200 g	10-19-09 10-20-09	VP
B02	Grab/ UA West Slope middle @ 300	10-16-09 1025	VP	10-16-09 1403 (20)	1200 g	10-19-09 10-20-09	VP

NO 350 g

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AVM Environmental Services, Inc.
Soil Sample Routing Log

Sample ID	Sample Type/Description	Sample Date	Tech	Sample prep & Sealed Date	Wt. of Sample	Count Date	Tech
AS11a	Grab/UA EXC @ 550' trans Gamma point 9	10-16-09 @ 1110	VP	10-16-09 @ 1435	1200g	10-19-09 10-20-09	NP VP
AS12a	Grab/UA EXC @ 600' trans Gamma point 10	10-16-09 @ 1120	VP	10-16-09 @ 1436	1200g	10-19-09 10-20-09	NP
AS13a	Grab/UA EXC @ 650' trans Gamma point 11	10-16-09 @ 1130	VP	10-16-09 @ 1437	1200g	10-19-09 10-20-09	NP
ZN4SS08	Z4N SS @ N1697497 E2523412 after cleanup (Previous Z4NSS06)	10-19-09 @ 1022	NP	10-19-09 @ 1428	1200g	10-20-09 10-21-09	VP
ZN4SS09	Z4N pre Excavation ±2' N1697597 E2523870 Center of Ex. highest cpm location	10-19-09 @ 1120	NP	10-19-09 @ 1430	1200g	10-20-09 10-21-09	VP
AS14a	UA Exc @ 700' transect, Grab	10-19-09 @ 1135	NP	10-19-09 @ 1432	1200g	10-20-09 10-21-09	VP
AS15a	UA Exc @ 750' transect, Grab	10-19-09 @ 1140	NP	10-19-09 @ 1433	1200g	10-20-09 10-21-09	VP
AS16a	UA Exc @ 800' transect, Grab	10-19-09 @ 1145	NP	10-19-09 @ 1435	1200g	10-20-09 10-21-09	VP
P204	Zone 4 Road P. 204 4829 cpm	10-20-09 @ 953	NP	10-20-09 @ 1335	1200g	10-21-09 10-22-09	VP
P197	Zone 4 Road P. 197 4668 cpm	10-20-09 @ 1005	NP	10-20-09 @ 1337	1200g	10-21-09 10-22-09	VP
B01b	UA East slope mid @ 150' trans	10-20-09 @ 1015	VP	10-20-09 @ 1339	1200g	10-21-09 10-22-09	VP
B04a	UA west slope @ 600' trans	10-20-09 @ 1120	VP	10-20-09 @ 1341	1200g	10-21-09 10-22-09	VP
B05a	UA East slope @ 750' trans	10-20-09 @ 1130	VP	10-20-09 @ 1343	1200g	10-21-09 10-22-09	VP
AS07a	UA Bed @ 350 ft trans	10-21-09 @ 1000	VP	10-21-09 @ 1341	1200g	10-22-09 10-26-09	VP
AS08a	UA Bed @ 400 ft trans	10-21-09 @ 1010	VP	10-21-09 @ 1343	1200g	10-22-09	VP
AS09a	UA Bed @ 450 ft trans	10-21-09 @ 1020	VP	10-21-09 @ 1345	1200g	10-22-09 10-26-09	VP
B03a	UA East slope @ 750 ft trans.	10-21-09 @ 1025	VP	10-21-09 @ 1347	1200g	10-22-09 10-26-09	VP VP
AS10a	UA Bed @ 500' trans.	10-22-09 @ 940	NP	10-22-09 @ 1220	1200g	10-22-09 10-26-09 10-27-09	VP
AS00a	UA Bed @ 0' trans	10-24-09 @ 940	NP	10-26-09 @ 1507	1200g	10-27-09 10-29-09	VP
B00a	UA Slope West @ 0' trans	10-24-09 @ 960	NP	10-26-09 @ 1508	1200g	10-27-09 10-29-09	VP

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AVM Environmental Services, Inc.
Soil Sample Routing Log

Sample ID	Sample Type/Description	Sample Date	Tech	Sample prep & Sealed Date	Wt. of Sample	Count Date	Tech
20091024-1		10-24-09 @ 1000	G NP	10-26-09 @ 1509	1200g/#	10-27-09 10-29-09	VP
B05b	UA Slope @ 750' trans East	10-26-09 @ 920	NP	10-26-09 @ 1510	1200g	10-27-09 10-29-09	VP
SSPT-235	Home site ver pt 235	10-26-09 @ 1445	NP	10-27-09 @ 949	350		VP
SSPT-239	" " " pt 239	10-26-09 @ 1455	NP	10-27-09 @ 950	350		VP
SSPT-243	" " pt 243	10-26-09 @ 1330	NP	10-27-09 @ 951	350		VP
SSPT-264	" " pt 264	10-26-09 @ 1340	NP	10-27-09 @ 952	350		VP
SSPT-269	" " pt 269	10-26-09 @ 1345	NP	10-27-09 @ 953	350		VP
SSPT-213	" " pt 213 5077cpm	10-27-09 @ 1330	NP	10-27-09 @ 1500	1200#	10-29-09 11-2-09	VP
SSPT-201	" " pt 201 5337cpm	10-27-09 @ 1335	NP	10-27-09 @ 1501	1200#	10-29-09 11-2-09	VP
SSPT-172	" " pt 172 4924cpm	10-27-09 @ 1341	NP	10-27-09 @ 1502	1200#	10-29-09 11-2-09	VP
AS04b	UA Bottom @ 200' trans	10-30-09 @ 1130	GS	11-2-09 @ 1320	1200#	11-3-09 11-4-09	VP
AS07b	UA Bottom @ 350' trans	10-30-09 @ 1330	GS	11-2-09 @ 1322	1200#	11-3-09 11-4-09	VP
AS17a	UA Bed @ 850ft trans	11-2-09 @ 940	VP	11-2-09 @ 1324	1200#	11-3-09 11-4-09	VP
AS18a	UA Bed @ 900ft trans	11-2-09 @ 945	VP	11-2-09 @ 1326	1200#	11-3-09 11-4-09	VP
B06a	UA West Slope @ 900ft trans	11-2-09 @ 950	VP	11-2-09 @ 1328	1200g	11-3-09 11-4-09	VP
AS19a	UA Bed @ 950ft trans	11-2-09 @ 955	VP	11-2-09 @ 1330	1200g	11-3-09 11-4-09	VP
AS20a	UA Bed @ 1000ft trans	11-2-09 @ 1000	VP	11-2-09 @ 1332	1200g	11-3-09 11-4-09	VP
AS21a	UA Bed @ 1050ft trans	11-2-09 @ 1005	VP	11-2-09 @ 1505	1200g	11-3-09 11-4-09	VP
B07a	UA East slope @ 1050ft trans	11-2-09 @ 1010	VP	11-2-09 @ 1507	1200g	11-3-09 11-4-09	VP
AS22a	UA Bed @ 1100ft trans	11-2-09 @ 1015	VP	11-2-09 @ 1509	1200g	11-3-09 11-4-09	VP

AVM Environmental Services, Inc.
Soil Sample Routing Log

Sample ID	Sample Type/Description	Sample Date	Tech	Sample prep & Sealed Date	Wt. of Sample	Count Date	Tech
AS23a	uA Bed @ 1150 ft trans	11-2-09 @ 1020	VP	11-2-09 @ 1544	1200	11-3-09 11-4-09	VP
AS24a	uA Bed @ 1200 ft trans	11-2-09 @ 1025	VP	11-2-09 @ 1513	1200	11-3-09 11-4-09	VP
B08a	uA West Slope @ 1200 ft trans	11-2-09 @ 1030	VP	11-3-09 @ 926	1200	11-3-09 11-4-09	VP
AS25a	uA Bed @ 1250 ft trans	11-2-09 @ 1035	VP	11-3-09 @ 928	1200	11-3-09 11-4-09	VP
AS26a	uA Bed @ 1300 ft trans	11-2-09 @ 1040	VP	11-3-09 @ 930	1200	11-3-09 11-4-09	VP
AS27a	uA Bed @ 1350 ft trans	11-2-09 @ 1045	VP	11-3-09 @ 932	1200	11-3-09 11-4-09	VP
B09a	uA East Slope @ 1350 ft trans	11-2-09 @ 1050	VP	11-3-09 @ 934	1200	11-3-09 11-4-09	VP
AS04c	uA Bottom @ 200' trans	11-3-09 @ 1450	VP	11-4-09 @ 943	1200	11-6-09 11-10-09	VP
AS07c	uA Bottom @ 350' trans	11-3-09 @ 1500	VP	11-4-09 @ 944	1200	11-6-09 11-10-09	VP
Z15S03	Zone 1 Exc Soil Sample	11-6-09 900	VP	11-6-09 @ 1310	1200	11-10-09 11-11-09	VP
Z15S07	Zone 1 Exc Soil Sample	11-6-09 @ 930	VP	11-6-09 @ 1311	1200	11-10-09 11-11-09	VP
AS22b	uA Bed @ 1100' trans	11-10-09 @ 927	VP	11-10-09 @ 1350	1200	11-11-09 11-13-09	VP
AS23b	uA Bed @ 1150' trans	11-10-09 @ 931	VP	11-10-09 @ 1352	1200	11-11-09 11-13-09	VP
AS24b	uA Bed @ 1200' trans	11-10-09 @ 938	VP	11-10-09 @ 1354	1200	11-11-09 11-13-09	VP
AS33a	uA Bed @ 1650' trans	11-10-09 @ 1416	VP	11-10-09 @ 1600	1200	11-11-09	VP
AS34a	uA Bed @ 1700' trans	11-10-09 @ 1420	VP	11-10-09 @ 1601	1200	11-11-09 11-13-09	VP
B11a	uA East Slope @ 1650' trans	11-10-09 @ 1425	VP	11-10-09 @ 1530	1200	11-11-09 11-13-09	VP
AS28a	uA Bottom @ 1400'	11-11-09 @ 934	VP	11-11-09 @ 1200	1200	11-13-09	VP
AS29a	uA Bottom @ 1450'	11-11-09 @ 939	VP	11-11-09 @ 1201	1200	11-13-09	VP
AS30a	uA Bottom @ 1500'	11-11-09 @ 943	VP	11-11-09 @ 1202	1200	11-13-09	VP

AVM Environmental Services, Inc.
Soil Sample Routing Log

Sample ID	Sample Type/Description	Sample Date	Tech	Sample prep & Sealed Date	Wt. of Sample	Count Date	Tech
B10a	UA West Slope @ 1500'	11-11-09 @ 948	VP	11-11-09 @ 1203	1200	11-13-09	NP
AS31a	UA Bottom @ 1550'	11-11-09 @ 952	VP	11-11-09 @ 1204	1200	11-13-09	NP
AS32a	UA Bottom @ 1600'	11-11-09 @ 957	VP	11-11-09 @ 1205	1200	11-13-09	NP
Z103b-SS	Zone 1 Exc control Sample, Same location as Z01-03-SS	11-13-09 @ 0955	NP	11-13-09 1352	1200	11-16-09 11-17-09	VP
AS33b	UA Bed @ 1650 Trns · Second Sample	11-13-09 @ 1015	NP	11-13-09 1353	1200	11-16-09 11-17-09	VP
AS34b	UA Bed @ 1700' Trns · Second Sample	11-13-09 @ 1105	NP	11-13-09 1354	1200	11-16-09 11-17-09	NP
Z1-12-SS	Ex. Control Sample for Excavation	11-16-09 @ 835	VP	11-16-09	1200	11-16-09 11-19-09	VP
AS32b	UA Bottom @ 1600'	11-17-09 @ 920	VP	11-17-09 @ 1300	1200	11-19-09	VP
AS31b	UA Bottom @ 1550'	11-17-09 @ 925	VP	11-17-09 @ 1301	1200	11-19-09	VP
AS29b	UA Bottom @ 1450'	11-17-09 @ 930	VP	11-17-09 @ 1302	1200	11-19-09	VP
AS28b	UA Bottom @ 1400'	11-17-09 @ 935	VP	11-17-09 @ 1303	1200	11-19-09	VP
AS27b	UA Bottom @ 1350	11-17-09 @ 940	VP	11-17-09 @ 1304	1200	11-19-09	VP
AS26b	UA Bottom @ 1300'	11-17-09 @ 945	VP	11-17-09 @ 1305	1200	11-19-09	VP
AS21b	UA Bottom @ 1050'	11-17-09 @ 10	VP	11-17-09 @ 1306	1200	11-19-09	VP
CS01	Culvert Sample	11-19-09 @ 1123	VP	11-20-09 @ 910	1200	11-22-09	VP
AS31c	UA Bottom @ 1550'	11-19-09 @ 1500	VP	11-20-09 1140	1200	11-22-09	VP
AS32c	UA Bottom @ 1600'	11-19-09 @ 1505	VP	11-20-09 1141	1200	11-22-09	VP
Z4NSS14	Ex Control Sample for Excavation = 8' deep in Z4 New Culvert	11-20-09 1233	NP VP	11-21-09 @ 815	1200	11-22-09	VP
Z1-29-SS	Z1 Hand Side exc. control Sample	11-24-09 @ 1040	VP NP	11-25-09 @ 815	1200	11-28-09	VP
HSROC-01	Hill Side Zone 2, Rock outcrop	11-24-09 @ 1143	VP NP	11-25-09 @ 816	1200	11-28-09	VP

AVM Environmental Services, Inc.
Soil Sample Routing Log

Sample ID	Sample Type/Description	Sample Date	Tech	Sample prep & Sealed Date	Wt. of Sample	Count Date	Tech
21-256-SS	Exc. Control SS in HS zone1	12-3-09 @ 905	UP	12-3-09 @ 1038	1200g	12-4-09 12-6-09	UP
HS22-01	Home site zone 2 Exc. Control SS count: 4825	12-4-09 @ 1210	UP	12-4-09 @ 1551	1200g	12-6-09 12-7-09	UP
HS22-02	" " " 6577 "	12-4-09 @ 1215	UP	12-4-09 @ 1552	1200g	12-6-09 12-7-09	UP
HS22-03	" " " " 6160	12-4-09 @ 1455	UP	12-4-09 @ 1553	1200g	12-6-09 12-7-09	UP
SSPT 181	Home Site Vac. point 181	12-14-09 @ 850	UP	12-14-09 1220	1200g	12-15-09 12-17-09	UP
SSPT 185	" " " " 185	12-14-09 @ 905	UP	12-14-09 1227	1200g	12-15-09 12-17-09	UP
SSPT 147	" " " " 147	12-14-09 @ 915	UP	12-14-09 1228	1200g	12-15-09 12-17-09	UP
SSPT 144	" " " " 144	12-14-09 925	UP	12-14-09 1229	1200g	12-15-09 12-17-09	UP
SSPT 136	" " " " 136	12-14-09 940	UP	12-14-09 1230	1200g	AD10 @ 1100	12-14-09
21-30-SS	Exc Control SS	12-21-09 @ 940	UP	12-21-09 @ 1217	1200g	12-22-09 12-23-09	UP

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IRA SOIL SAMPLING LOG

NECR Mine Site
IRA Soil Sampling Log

Sample ID	Sample Date	Sample Area	Sample Description	Comments/Notes	Tech
A501	10-07-09 @ 1140	UA Bed	UA Bottom @ 50' transect		VP
A502	10-07-09 @ 1200	UA Bed	UA Bottom @ 100' transect		VP
Z4NSS01	10-8-09 @ 1020	Home Site Zone 4 North	Zone 4 North area Ex Control Soil Sample	N 1697260 E 2523943	VP
Z4NSS02	10-8-09 @ 1030	"	" " " "	N 1697254, E 2523960	VP
UA Slope	10-9-09 @ 1100	UA Slope	UA Slope ≈ 200' transect Mid Slope Scanned @ 5100 cpm		VP
Z4NSS03	10-12-09 @ 1003	Home Site Zone 4 North	Zone 4 Ex Control from Excavation 4' deep, Sample from pt w highest Ct 5704.	N 1697723 E 2523577	VP
Z4NSS04	10-12-09 @ 1015	"	" " " " 4.5' excavation high count @ scan 5940 cpm	N 1697730 E 2523702	VP
Z4NSS05	10-12-09 @ 1025	"	" " " " 1-2' excavation @ high cpm 5460	N 1697354 E 2523814	VP
A501b	10-13-09 @ 1312	UA Bed	UA Exc bottom @ 50' transect 2nd Sample	Dup Sample A001E 1300 Sent to Lab	VP
A502b	10-13-09 @ 1316	"	" " @ 100' transect 2M Sample		VP
A503a	10-13-09 @ 1322	"	UA Exc Bottom @ 150' trns		VP
Z4NSS06	10-14-09 @ 1035	Home Site Zone 4	Z4 Exc Control 9706 cpm	N 1697447 E 2523412	VP
Z4SS07	10-14-09 @ 1153	"	Z4 Ex Control 4838 cpm	N 1697330 E 2523525	VP
DPS01	10-13-09 @ 1450	Zone 1	Diesel Order Pit Attempt A @ 1 foot depth Composite		VP
DPS02	10-13-09 @ 1455	"	" " " " @ 3 foot depth Composite		VP
B01	10-16-09 @ 1000	UA Slope	UA East mid slope @ 150' transect		VP
A504a	10-16-09 @ 1010	UA Bed	UA Exc Bottom @ 200' trns		VP
A505a	10-16-09 @ 1015	"	" " @ 250' trns		VP
A506a	10-16-09 @ 1020	"	" " @ 300' trns	Dup Sample A002E 1710 Sent to Lab	VP
B02	10-16-09 @ 1025	UA Slope	UA West mid Slope @ 300' transect		VP

NECR Mine Site
IRA Soil Sampling Log

Sample ID	Sample Date	Sample Area	Sample Description	Comments/Notes	Tech
AS11a	10-16-09 @ 1110	UA Bed	UA Bottom @ 550' trans.		VP
AS12a	10-16-09 @ 1120	UA Bed	UA Bottom @ 600' trans.		VP
AS13a	10-16-09 @ 1130	UA Bed	UA Bottom @ 650' trans.		VP
ZN45508	10-19-09 @ 1022	Home site Zone 4	Z4 Ex control (Previous ZN45508) after further cleanup	N1697497 E2523412	VP
ZN45509	10-19-09 @ 1120	Home site Zone 4	Z4 Ex Control from 2' deep ex.	N1697597 E2523870	VP
AS14a	10-19-09 @ 1135	UA Bed	UA Bottom @ 700' trans.		VP
AS15a	10-19-09 @ 1140	UA Bed	UA Bottom @ 750' trans.		VP
AS16a	10-19-09 @ 1145	UA Bed	UA Bottom @ 800' trans	Dup Sample AD03 @ 1705	VP
P204	10-20-09 @ 953	Home site Zone 4	Zone 4 Road GPS point 204, sampled @ point with highest cpm, 4829 cpm		VP
P197	10-20-09 @ 1005	Home site Zone 4	Zone 4 Road GPS point 197 sampled @ point with highest cpm, 4668		VP
B01b	10-20-09 @ 1015	UA slope	UA Slope @ 150' trans mid slope East		VP
B04a	10-20-09 @ 1120	UA slope	UA Slope @ 600' trans mid slope west		VP
B05a	10-20-09 @ 1130	UA slope	UA Slope @ 750' trans mid slope East		VP
AS07a	10-21-09 @ 1000	UA Bed	UA Bottom @ 350' trans		VP
AS08a	10-21-09 @ 1010	UA Bed	UA Bottom @ 400' trans		VP
AS09a	10-21-09 @ 1020	UA Bed	UA Bottom @ 450' trans		VP
B03a	10-21-09 @ 1025	UA slope	UA slope @ 750' trans mid slope East		VP
AS10a	10-22-09 @ 0940	UA Bed	UA Exc Bottom @ 500' trns	Dup Sample AD04 @ 1702	VP
AS00a	10-24-09 @ 940	UA Bed	UA Exc bottom @ 0' trans		VP
B00a	10-24-09 @ 900	UA ~~Bed~~ slope	UA slope @ 0' trans mid slope west		VP

NECR Mine Site
IRA Soil Sampling Log

Sample ID	Sample Date	Sample Area	Sample Description	Comments/Notes	Tech
20091024-1	10-24-09 @1000	near UA @00	W 102° 30' 32.2" N. 35° 35' 35.3"		AP
SSPT-235	10-26-09 @1445	Home site Zone 4	Home site Verification Pt-235 Soil Sample, surface		AP
SSPT-239	10-26-09 @1455	"	" " " Pt-239		AP
SSPT-243	10-26-09 @1330	"	" " " Pt-243		AP
SSPT-264	10-26-09 @1340	"	" " " Pt-264		AP
SSPT-269	10-26-09 @1345	"	" " " Pt-269	Dup Sample ADOS @ 1445	AP
B05b	10-26-09 @0920	UA Slope	UA East slope @ 750'-trans		AP
SSPT-213	10-27-09 @1330	Home site Zone 4	HS Site Verification Pt-213 Sample collected Elevated Gamma Rd	5077 cpm	AP
SSPT-201	10-27-09 1335	"	" Pt-201	5337 cpm	AP
SSPT-172	10-27-09 1341	"	" Pt-172	4927 cpm	AP
AS04b	10-30-09 @1130	UA bed	Second Sample @ 200' trans Exc. Bottom.	Gregg Collected Sample.	GS
AS07b	10-30-09 @1330	UA bed	Second Sample, UA Bottom @ 350' trans.	Gregg Collected Sample	GS
AS17a	11-2-09 @ 940	UA bed	UA Bottom @ 850' trans		AP
AS18a	11-2-09 @ 945	UA bed	UA Bottom @ 900' trans		AP
B06a	11-2-09 @ 950	UA slope	UA Slope @ 900' west		AP
AS19a	11-2-09 @ 955	UA Bed	UA Bottom @ 950' trans.		AP
AS20a	11-2-09 @ 1000	UA bed	UA Bottom @ 1000' trans	Field duplicate ADOS @ 1705	AP
AS21a	11-2-09 @1005	UA Bed	UA Bottom @ 1050' trans		AP
B07a	11-2-09 @ 1010	UA slope	UA East slope @ 1050' trans		AP
AS22a	11-2-09 @1015	UA Bed	UA Bottom @ 1100' trans		AP

NECR Mine Site
IRA Soil Sampling Log

Sample ID	Sample Date	Sample Area	Sample Description	Comments/Notes	Tech
AS23a	11-2-09 @1020	UA Bed	UA Bottom @ 1150' trans		VP
AS24a	11-2-09 @1025	UA Bed	UA Bottom @ 1200' trans		VP
Bo8a	11-2-09 @1030	UA slope	UA West slope @ 1200' trans		VP
AS25a	11-2-09 @1035	UA Bed	UA Bottom @ 1250' trans		VP
AS26a	11-2-09 @1040	UA Bed	UA Bottom @ 1300' trans		VP
AS27a	11-2-09 @1045	UA Bed	UA Bottom @ 1350' trans		VP
B09a	11-2-09 @1050	UA slop	UA East slope @ 1350' trans		VP
AS04c	11-3-09 @1450	UA bed	UA Bottom @ 200' trans		VP
AS07c	11-3-09 @1500	UA Bed	UA Bottom @ 350' trans.		VP
SSPT-189	11-3-09 @1422	Home Site zone4	Zone 4 exc control ss @ Pt. 189		VP
Z15503	11-6-09 @900	HS Zone1 EXC	Zone1 EXC Control Sample from excavation N1696[illegible] E2522777	~40x10' x 4-ft deep Excavation, rock Sample @ highest st ct @ 6983cpm	VP
Z15507	11-6-09 @930	HS Zone1 EXC.	" " " N1696499 E2522672	150x50' Excavation up to 3' deep, Sample @ highest static 5096 cpm	VP
AS22b	11-10-09 @927	UA Bed	UA Bottom @ 1100' trans	Field duplicate AD07 @1600	VP/NP
AS23b	11-10-09 @931	UA Bed	UA Bottom @ 1150' trans		VP/NP
AS24b	11-10-09 @938	UA Bed	UA Bottom @ 1200' trans.		
AS33a	11-10-09 @1410	UA Bed	UA Bottom @ 1650' trns		
AS34a	11-10-09 @1420	UA Bed	UA Bottom @ 1700' trns		
B11a	11-10-09 @1455	UA slope	UA East Slope @ 1650' trns		
AS28a	11-11-09 @934	UA Bed	UA Bottom @ 1400' trans		VP
AS29a	11-11-09 @939	UA Bed	UA Bottom @ 1450' trans		VP

NECR Mine Site
IRA Soil Sampling Log

Sample ID	Sample Date	Sample Area	Sample Description	Comments/Notes	Tech
AS30a	11-11-09 @ 943	UA Bed	UA Bottom @ 1500' trans		NP
B10a	11-11-09 @ 948	UA Slope	UA West Slope @ 1500' trans		NP
AS31a	11-11-09 @ 952	UA Bed	UA Bottom @ 1550' trans		NP
AS32a	11-11-09 @ 957	UA Bed	UA Bottom @ 1600' trans		NP
Z103b-SS	11-13-09 @ 0958	HS Z1	Zone 1 Exc Control Sample from Previous excavation 10' x 40 x 7' deep	Same loc as Z1-03-SS after further Exc. Three Static Counts @ highest 5306cpm	[illegible]
AS33b	11-13-09 @ 1015	UA Bed	UA Bottom @ 1650' trns 2nd Sample	after further excavation	NP
AS34b	11-13-09 @ 1105	UA Bed	UA Bottom @ 1700' trns 2nd Sample	after further excavation Field Dup AD08	NP
Z1-12-SS	11-16-09 @ 855	Z1	Ex Control for Ex. in Zone 1 N1696574 E 2522895	Took the Sample for highest Static 1 min cpm 5224 of 11 Static Point	NP
AS32b	11-17-09 @ 920	UBed	UA Bott Re exc @ 1600' trns	2nd Sample after Re-ex.	NP VP
AS31b	11-17-09 @ 925	"	" " " @ 1550' trns	" " "	NP VP
AS29b	11-17-09 @ 930	"	" " " @ 1450' trns	" " "	NP VP
AS28b	11-17-09 @ 935	"	" " " @ 1400' trns	" " "	NP VP
AS27b	11-17-09 @ 940	"	" " " @ 1350' trns	" " "	NP VP
AS26b	11-17-09 @ 945	"	" " " @ 1300' trns	" " "	NP VP
AS21b	11-17-09 @ 1035	"	" " " @ 1050' trns	" " "	NP
CS01	11-19-09 @ 1123	Culvert Exc.	Culvert excavation @ the end of ~~[illegible]~~ UA		VP
AS31C	11-19-09 1500	UA Bed	UA bottom @ 1550' trns	3rd sample after further excavation	VP
AS32C	11-19-09 1505	UA Bed	" " 1600' trns	" " "	VP
SSPT132	11-20-09 @ 944	Home Site Zone 1	Zone 1 (HS) Verification Soil Sample	Field Dup AD09 @ 1200	NP VP
SSPt-215	11-20-09 @ 955	Home Site Zone 4	Zone 4 HS Verification Point Sample		

NECR Mine Site
IRA Soil Sampling Log

Sample ID	Sample Date	Sample Area	Sample Description	Comments/Notes	Tech
Z4NSS14	11-20-09 @ 1233	Zone 4 Home site	Sample from Bottom of Excavation (12) N1697400 1, E2523226.4 5162 cpm	10×20×8' Exc. Near Culvert, VNC Rdg 4890 cpm Ex-Control Sample	VP
Z1-25-SS	11-24-09 @ 1040	Zone 1 Home Site	Excavation Control Sample Exc. 11 ≈7.5' deep N1696632 E2522144	Ex Control Sample for Home Site exc @ height of 3 static [illegible] 6355 cpm.	VP
HSR0C01	11-24-09 @ 1143	Hill Side Zone 2	Rock out crop sample from area around N1696569 E2523504	Hill Side Rock for [illegible]	VP VP
Z1-256SS	12-3-09 @ 905	Zone 1 Home Site	Excavation control Sample 2nd Sample @ Z1-25-SS after Further exc total 9-10 feet deep	Sample @ Z1-25 after further exc. ≈10' for exc. Control.	VP
HSZ2-01	12-4-09 @ 1210	Hill Side Zone 2	Ex Control Sample from Hill Side static Rdg 4825 cpm N1696513 E2523057	Sample Collected because Static level above 4650 cpm	VP VP
HSZ2-02	12-4-09 @ 1215	Hill Side Zone 2	Exc. Control for hill side Static 6577 cpm N1696362 E2522941	" static level above 4650	VP
HSZ2-03	12-4-09 @ 1455	Hill Side Zone 2	Ex Control for Test Exc. Pit in hill side Zone, 6160 cpm at Sample pt in Pit	EXC Test Pit in hill side area N E	VP
SSPT-181	12-14-09 @ 850	Zone 2 HSite	Zone 2 Home Site Verification Soil Sample	4660 cpm	VP VP
SSPT-185	12-14-09 @ 905	"	"	4473 cpm	VP VP
SSPT-147	12-14-09 @ 915	"	"	4131 cpm	VP VP
SSPT-144	12-14-09 @ 925	"	"	4131 cpm	VP VP
SSPT-136	12-14-09 @ 940	"	"	4730 cpm Field QA/QC Duplicate AD10 @ 1100	VP VP
SSPT-046	12-16-09 @ 1035	Zone 1 Home Site	Zone 1 Home Site Verification Soil Sample	4523 cpm	VP VP
SSPT-140	12-16-09 @ 1250	Zone 2 Hill Site	Zone 2 Hill Site Verification Sample	4651 cpm after further Excavation, Initial 5197 cpm	VP VP
SSPT-049	12-18-09 @ 1000	Zone 1 Home Site	Zone 1 HS Verification Soil Sample	4644 cpm	VP
Z1-30-SS	12-21-09 @ 940	Zone 1 Home Site	EXC Control Sample N1696494 E2522849	Sample @ Z1-30 [illegible] excavation Near Culvert well due to cpm above AL →	VP DUP AD @ 12[illegible]
SSPT-061	1-4-10 @ 1014	Zone 2 Hill Site	Zone 2 Home Site Verification Soil Sample		VP
SSPP-064	1-4-10 @ 1025	"	Zone 2 Home Site Verification Soil Sample		VP
SSPT-057	1-4-10 @ 1035	Zone 2/1 Hill Site	Zone 2/1 Home Site Verification Sample		VP
SSPT-053	1-4-10 @ 1045	"	" "		VP

PG

APPENDIX C

RESULTS OF WILCOXIN-MANN-WHITNEY TESTS USING PROUCL 4.0

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs
Correlated Static Gamma Radiation Results from Entire IRA Step-out Area

User Selected Options

From File	January 6, 2010 Static Gamma Survey
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	1.14
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Site and Reference Areas

Area of Concern Data: IRA Area Ra-226 (pCi/g) based on Revised IRA Correlation
Background Data: RSE Background Reference Area Ra-226 (pCi/g) based on laboratory analysis

Raw Statistics

	Site	Background
Number of Observations	281	25
Number of Distinct Observations	231	8
Minimum	0.6	0.6
Maximum	6.566	1.3
Mean	1.593	1.036
Median	1.513	1
Standard Deviation	0.717	0.182
SE of Mean	0.0428	0.0365

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of IRA Area >= Mean/Median of Background + 1.14

Site Rank Sum W-Stat	40452
WMW Test U-Stat	-6.324
WMW Critical Value (0.050)	-1.645
P-Value	1.27E-10

Conclusion with Alpha = 0.05

Reject H0, Conclude Site < Background + 1.14
P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs
Correlated Static Gamma Radiation Results from Inside IRA Berm

User Selected Options

From File	January 6, 2010 Static Gamma Survey inside excluded area
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	1.14
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Reference Areas

Area of Concern Data:IRA Area inside berm Ra-226 (pCi/g) based on revised IRA correlation
Background Data: RSE Background Reference Area Ra-226 (pCi/g) based on laboratory analysis

Raw Statistics

	Site	Background
Number of Valid Observations	112	25
Number of Distinct Observations	103	8
Minimum	0.688	0.6
Maximum	6.566	1.3
Mean	1.993	1.036
Median	1.765	1
SD	0.952	0.182
SE of Mean	0.09	0.0365

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 1.14

Site Rank Sum W-Stat	7151
WMW Test U-Stat	-3.213
WMW Critical Value (0.050)	-1.645
P-Value	6.57E-04

Conclusion with Alpha = 0.05

Reject H0, Conclude Site < Background + 1.14
P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs
Soil Analytical Results from Unnamed Arroyo

User Selected Options

From File	Laboratory analytical results for Ra-226 (pCi/g) by EPA Method 901.1
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	1.14
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Reference Areas

Area of Concern Data: IRA Unnamed Arroyo Ra-226 by laboratory analysis (pCi/g)
Background Data: Background Reference Area Ra-226 by laboratory analysis (pCi/g)

Raw Statistics

	Site	Background
Number of Valid Observations	46	25
Number of Distinct Observations	15	8
Minimum	0.4	0.6
Maximum	2.2	1.3
Mean	1.033	1.036
Median	1	1
SD	0.494	0.182
SE of Mean	0.0729	0.0365

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 1.14

Site Rank Sum W-Stat	1104
WMW Test U-Stat	-6.639
WMW Critical Value (0.050)	-1.645
P-Value	1.58E-11

Conclusion with Alpha = 0.05

Reject H0, Conclude Site < Background + 1.14
P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs
Soil Analytical Results from Entire IRA Step-out Area

User Selected Options

From File	Laboratory analytical results for Ra-226 (pCi/g) by EPA Method 901.1
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	1.14
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Reference Areas

Area of Concern Data: IRA Step-out Area Ra-226 by laboratory analysis (pCi/g)
Background Data: Background Reference Area Ra-226 by laboratory analysis (pCi/g)

Raw Statistics

	Site	Background
Number of Valid Observations	24	25
Number of Distinct Observations	15	8
Minimum	0.5	0.6
Maximum	3.5	1.3
Mean	1.525	1.036
Median	1.5	1
SD	0.618	0.182
SE of Mean	0.126	0.0365

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 1.14

Site Rank Sum W-Stat	367
WMW Test U-Stat	-4.65
WMW Critical Value (0.050)	-1.645
P-Value	1.66E-06

Conclusion with Alpha = 0.05

Reject H0, Conclude Site < Background + 1.14
P-Value < alpha (0.05)

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs
Soil Analytical Results from IRA Step-out Area Inside Berm

User Selected Options

From File	Laboratory analytical results for Ra-226 (pCi/g) by EPA Method 901.1
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	1.14
Selected Null Hypothesis	Site or AOC Mean/Median >= Background Mean/Median Plus Substantial Difference, S (Form 2)
Alternative Hypothesis	Site or AOC Mean/Median Less Than Background Mean/Median Plus Substantial Difference, S

Reference Areas

Area of Concern Data: IRA Step-out Area Inside Berm Ra-226 by laboratory analysis (pCi/g)
Background Data: Background Reference Area Ra-226 by laboratory analysis (pCi/g)

Raw Statistics

	Site	Background
Number of Valid Observations	8	25
Number of Distinct Observations	6	8
Minimum	0.7	0.6
Maximum	2.3	1.3
Mean	1.7	1.036
Median	1.65	1
SD	0.521	0.182
SE of Mean	0.184	0.0365

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC >= Mean/Median of Background + 1.14

Site Rank Sum W-Stat	74
WMW Test U-Stat	-2.584
WMW Critical Value (0.050)	-1.645
P-Value	0.00489

Conclusion with Alpha = 0.05

Reject H0, Conclude Site < Background + 1.14
P-Value < alpha (0.05)

APPENDIX D

LABORATORY ANALYTICAL REPORTS AND DATA VALIDATION RESULTS

D-1 ENERGY LABS - C09101143-001

D-2 ENERGY LABS - C09110701-001

D-3 ENERGY LABS - C09110701-001

D-4 ENERGY LABS - C09120541-001

D-5 ENERGY LABS - C10010244-001

D-6 DATA VERIFICATION REPORT

D-7 LDC- 22496

D-8 LDC – 22740

(PROVIDED ELECTRONICALLY)

APPENDIX H

REMOVAL SITE EVALUATION REPORT, RED WATER POND ROAD

Prepared for:

United Nuclear Corporation
P.O. Box 3077
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FINAL

REMOVAL SITE EVALUATION REPORT
RED WATER POND ROAD
NORTHEAST CHURCH ROCK MINE SITE

January 26, 2010

Prepared by:

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ACRONYMS

bgs	below ground surface
Bi-214	bismuth-214
CPM	counts per minute
DCGL	Derived Concentration Guideline Level
DQA	Data Quality Assurance
DQO	Data Quality Objective
EDD	electronic data deliverable
EPA	Environmental Protection Agency
FSL	field screening level
MARSSIM	Multi-Radiation Survey and Site Investigation Manual
MDC	minimum detectable concentration
MDL	method detection limit
NaI	sodium iodide
NCP	National Contingency Plan
NECR	Northeast Church Rock
NNEPA	Navajo Nation Environmental Protection Agency
pCi/g	picoCurie per gram
QA/QC	quality assurance/quality control
Ra-226	radium-226
RPM	Remedial Project Manager
RSE	removal site evaluation
RWPR	Red Water Pond Road
UCL	upper confidence limit
UNC	United Nuclear Corporation
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WMW	Wilcoxin-Mann-Whitney

1.0 INTRODUCTION

This report describes the objectives, scope of work, and results of the Removal Site Evaluation (RSE) conducted along Red Water Pond Road (RWPR) in 2007 and 2009. The RSE of RWPR was conducted in accordance with the *Interim Removal Action (IRA) Construction Plan* (MWH, 2009) and the *Removal Site Evaluation Work Plan* (MWH, 2006). The RSE area for RWPR (Study Area) is located primarily on the Navajo Reservation (see Drawing 1, *Site Map*) and includes the roadway itself plus a 50-foot wide area on both the west and east sides of the roadway (50-foot buffers), that could have been impacted through historic use of the roadway as a haul road and/or by drainage from the road. The area extends from Highway 566 to the first arroyo that crosses RWPR (east-west arroyo) near the reclaimed Quivira Mine. The study area is adjacent to the NECR-1 step-out area for the Northeast Church Rock (NECR) mine.

The objectives of this work were to:

(1) confirm the prior sampling results and statistical evaluation (see February 19, 2009 correspondence to USEPA) that showed that the mean/median of the data from the southern and northern sections of RWPR are statistically higher than the adjacent NECR-1 step-out area immediately to the west; and

(2) evaluate the vertical limits and distribution of elevated subsurface activity levels within RWPR and the adjacent 50-ft buffers.

The investigation activities contributing to the RWPR RSE and used in the prior statistical evaluation (February 2009) were conducted in two phases. The first phase consisted of static radiation gamma surveying and surface soil sampling during the Supplemental RSE (SRSE) between November 5 and 14, 2007, described in detail in the *Supplemental Removal Site Evaluation Report* (MWH, 2007) and summarized in this report as they apply to RWPR. The second phase consisted of static radiation gamma surveying of surface soils, gamma radiation screening of subsurface soils, and surface and subsurface soil sampling conducted between September 8 and 10, 2009 as part of the IRA for the NECR mine.

In addition to the data obtained during the SRSE and the RWPR RSE, the interpretations included in this report also considered the preliminary results of Weston's investigation of RWPR (draft results, December 2009), which indicated that high activity levels (many times greater than their reported background level) were present in and adjacent to RWPR north of the east-west arroyo at the base of the Quivira Mine. While these results reflect conditions north of the east-west arroyo and therefore just outside of the Study Area, they indicate the potential for ongoing impacts to the Study Area from the Quivira Mine due to wind-borne transport and indicate that Quivira is a source of the contamination. In addition, there is the potential for traffic, plowing and maintenance activities on the roadway to transport materials into the Study Area.

2.0 FIELD INVESTIGATION SCOPE OF WORK

2.1 DATA QUALITY OBJECTIVES

As described above, the Study Area includes the roadway and adjacent area within 50 feet of the edges of the actual road on both the west and east sides (50-foot buffers) from Highway 566 to the first (east-west) arroyo that crosses RWPR near the reclaimed Quivira Mine. The Study Area may have been impacted by vehicular transport associated with the former Quivira Mine, which used RWPR as a haul road for the mine, or by wind or water transport of materials (soil and sediments) associated with the formerly active NECR and/or Quivira Mines, indicating that the Quivira Mine is a source of the materials. Radionuclides are also present naturally in the rocks and soils of this region, as observed in the background reference area used for the NECR RSE (MWH, 2007).

The roadway itself consists of a compacted sand and gravel road with some evidence of layering (i.e., slightly different soils), as discussed in Section 3.2. The road is active and is managed by the Navajo Division of Transportation. It is our understanding that road maintenance activities include regrading, infill of potholes, addition of new road base, and snow plowing. Because of these activities, as well as stormwater/snowmelt runoff, the surface of the road is continuously being reworked, cleaned and mixed. Additionally, the IRA conducted during and after this RSE in 2009 resulted in a temporary increase in vehicular and heavy equipment traffic and additional regrading of the road surface south of the east-west arroyo. Because of the continuous changes the roadway surface has and continues to undergo, investigation activities were limited to subsurface soils (<0.5 ft bgs) within the roadway (except for the static gamma measurements from the RWPR RSE). Both surface (0 to 0.5 ft bgs) and subsurface soils (>0.5 ft bgs) were sampled in the 50-foot buffers.

Previous investigation activities have suggested that while there may be some impacts along the southern portion of the road closer to Highway 566 that may be partially attributable to drainage from NECR, there is evidence that past and current activities associated with the Quivira Mine have significantly impacted RWPR, particularly the northern portion of the Study Area. Statistical analysis using the Wilcoxon-Mann-Whitney (WMW) Test (MARSSIM, 2000) was conducted on Ra-226 concentrations in soil samples (EPA Method 901.1) from the SRSE (MWH, 2007) to compare results from the 50-ft buffers to those from the step-out area adjacent to the roadway (see February 16, 2009 Memorandum in Appendix C). The conclusion of that analysis was that the mean/median of Ra-226 concentrations along RWPR is greater than the mean/median within the step-out area (prior to the IRA) within a 95% confidence interval. This suggests that the source of Ra-226 along RWPR is different than in the step-out area, and likely includes impacts from past activities along RWPR associated with the Quivira Mine.

All investigation activities conducted along RWPR by UNC have been restricted to areas south of the east-west arroyo, since any impacts on the northern side of the arroyo can be assumed to be attributable to the immediately adjacent Quivira Mine. The results from Weston's recent gamma survey of the Quivira Mine and RWPR north of the east-west arroyo support this assumption, as the highest activity levels were present at the base of the Quivira Mine at RWPR.

Since previous RSE investigation activities (e.g., the SRSE static gamma surveying and surface soil sampling and analysis) indicated that elevated levels of Ra-226 were present in soils along RWPR, at least in surface soils within the 50-ft buffers, the Study Area was considered a Class 1 survey area, as per MARSSIM (EPA, 2000). The principal questions for this investigation were:

1) What are the levels and extent of Ra-226 within the Study Area?

2) Are elevated levels of Ra-226 present in surface (0 to 0.5 ft bgs) and subsurface soils (>0.5 ft bgs)?

3) Are the levels such that they warrant further characterization or evaluation for a removal action to prevent direct exposure or further transport of contaminants?

4) What are the likely sources of elevated levels of Ra-226 in soils?

5) Do the results confirm that the mean/median of the data from the southern and northern sections of RWPR is statistically higher than in adjacent step-out areas immediately to the west?

In order to make decisions based on the above questions, it was necessary to collect the following data:

- Vertical and lateral extent and concentrations of Ra-226 in surface and subsurface soils;
- Spatial location (horizontal and vertical) of samples and measurements (Ra-226 concentrations);
- Count rate of collimated surface static gamma radiation (field gamma survey); and
- The applicable Derived Concentration Guidance Levels ($DCGL_W$ and $DCGL_{EMC}$), and the Minimum Detectable Concentrations (MDCs).

As per MARSSIM, a *release criterion* is a regulatory limit expressed in terms of dose or risk. Exposure pathway modeling is used to calculate a radionuclide-specific predicted concentration or surface area concentration of specific nuclides that could result in a dose or specific risk equal to the release criterion. Such a concentration is termed the *derived concentration guideline level (DCGL)*. DCGLs are often obtained from responsible regulatory agency guidance based on default modeling input parameters; otherwise site-specific parameters can be used to determine DCGLs. The DCGLs are used as *investigation levels* that, if exceeded, trigger some response such as further characterization or remediation. MARSSIM defines two potential DCGLs based on the area of contamination:

- If the residual radioactivity is evenly distributed over a large area, MARSSIM looks at the average activity over the entire area. The *$DCGL_W$* (the DCGL used for the statistical tests) is derived based on an average concentration over a large area. The "W" in $DCGL_W$ stands for WMW Test.
- If the residual radioactivity appears as small areas of elevated activity within a larger area, typically smaller than the area between measurement locations, MARSSIM considers the results of individual measurements. The *$DCGL_{EMC}$* (the DCGL used for the elevated measurement comparison (EMC)), is derived separately for these small areas and generally from different exposure assumptions than those used for larger areas.

For the NECR RSE, the *$DCGL_W$ of* 1.14 pCi/g was based on the EPA Region 9 Preliminary Remediation Goal (PRG) for Ra-226 for a residential use scenario and a 1×10^{-4} risk level, while the *$DCGL_{EMC}$* was specified by EPA Region 9 during development of the *Removal Site Evaluation Work Plan* (MWH, 2006).

The parameters of interest are the absolute and mean concentrations of Ra-226 in surface and subsurface soils within the Study Area. The null hypothesis (H_o) is that the mean/median concentration of Ra-226 is greater than the NECR Field Screening Level (FSL) of 2.24 pCi/g, the $DCGL_W$ plus the background mean (1.0 pCi/g). The alternative hypothesis (H_a) is that the mean/median concentration of Ra-226 is less than the FSL. The hypotheses will be tested using statistical methods consistent with the assumptions supported by the data. All statistical estimators

(e.g., means) will have acceptable confidence limits (see Section 3.6. of the *Removal Site Evaluation Work Plan*).

Based on the principal study questions for the Study Area discussed above, the decision statements are:

- If concentrations of Ra-226 do not exceed the DCGLs then the area will not require any further action.

- If concentrations do exceed the DCGLs, evaluation of removal action alternatives and/or additional investigation will be required.

All statistical significance tests (e.g., the WMW test) were conducted at the 95% confidence level (i.e., a false positive rate or Type I error of 5%) and a nominal Type II error of 10%. Stated otherwise, all significance tests had a significance level, α, equal to 0.05 and a Type II error, β, equal to 0.10. Evaluation of the data and the selection of the appropriate statistical testing procedure was made in accordance with the Data Quality Assessment (DQA) process, as discussed in Section 7.0 of the RSE Work Plan. The number of samples required to meet the DQOs (13) was developed as part of the RSE Work Plan (MWH, 2006). The sampling design described in the following sections was designed to support the individual DQOs and to meet these tolerance criteria.

This investigation was conducted in accordance with the Quality Assurance Project Plan (QAPP) that was developed for the NECR RSE, as described in the *Removal Site Evaluation Work Plan*. The QAPP was prepared to describe the project requirements for all field and Contract Laboratory Program (CLP) activities and data assessment activities associated with the RSE. The QAPP presents in specific terms the policies, organization, functions, and quality assurance/quality control (QA/QC) requirements designed to meet the DQOs for the sampling activities described in this report. Additionally, the QAPP provides guidance that establishes the analytical protocols and documentation requirements to ensure the data are collected, reviewed, and analyzed in a consistent manner. The QAPP was prepared in accordance with the document *EPA Requirements for Quality Assurance Project Plans* (EPA, 2001) and the EPA guidance document *Guidance for Quality Assurance Project Plans* (EPA, 2002).

2.2 STATIC GAMMA RADIATION SURVEY OF SURFACE SOILS

Static gamma surveying has been conducted along RWPR twice: first in November 2007 during the SRSE (MWH, 2008) and second during the RWPR RSE in September 2009 and reported here. During the SRSE, forty-six static gamma measurements were collected within the 50-ft buffers (MWH, 2008). Surveying was conducted using a Ludlum 2221 with a 2-by-2-inch sodium iodide (NaI) crystal scintillation detector (Eberline SPA-3) fitted with a lead collimator to minimize the effects of radiation shine, according to the Standard Operation Procedures (SOPs) included in the *Removal Site Evaluation Work Plan* (MWH, 2006) and the *Supplemental Removal Site Evaluation Work Plan* (MWH, 2008). The detector was held eighteen inches above the ground to obtain a one-minute integrated count. The gamma measurements were collected on an 80-foot triangular grid cast on a random origin.

During the RWPR RSE, 30 additional gamma radiation measurements were collected within the roadway and 50-ft buffers at the same locations as the subsurface soil sampling locations (soil borings and test pits) discussed in Section 2.4. These measurements were collected in September 2009 at the beginning of the IRA, before any regrading of RWPR was conducted for the IRA.

The static gamma radiation survey results were converted to Ra-226 concentrations using the regression equation developed from the correlation between the supplemental gamma survey results and co-located surface soil samples analyzed for Ra-226 during the SRSE. The resulting regression

analysis showed an R^2 value of 0.92, exceeding the minimum specified value of 0.8 (see Appendix A of the *Supplemental Removal Site Evaluation Report*) and resulted in the following regression equation:

$$Ra\text{-}226\ pCi/g = (0.0013 \times gamma\ radiation\ level,\ CPM) - 4.5378$$

The static gamma radiation levels in counts per minute (CPM) from the SRSE were converted to surface soil Ra-226 concentrations using the above equation. The equivalent Ra-226 concentrations provide data of a quality sufficient for field screening.

2.3 SURFACE SOIL SAMPLING

During the SRSE in 2007, seven surface soil samples were collected from within the 50-ft buffers (based on a sampling frequency of 20% of the static gamma measurements collected from the NECR-1 step-out area), as presented in the *Supplemental Removal Site Evaluation Report* (MWH, 2008). The sample locations were randomly selected over a regular grid covering the same area as the gamma survey points and then co-located with the static gamma measurements by moving each randomly selected soil sample location to the closest gamma point. The surface soil samples were collected manually as grab samples from 0 to 0.5 feet bgs.

An additional nine surface soil samples were collected from the test pits within the 50-foot buffers in 2009 as part of the RWPR RSE. The sample locations were randomly selected over the RWPR Study Area within the 50-ft buffers and then co-located with the closest test pits, excluding locations already sampled during the SRSE. The samples were collected as grab samples from the test pits described in the following section.

2.4 SUBSURFACE SOIL SAMPLING

In order to evaluate subsurface soils (greater than 0.5 feet bgs), soil samples were collected in the roadway from boreholes using a drilling rig and in the 50-ft buffers from test pits using an excavator. Sample locations were placed along transects across the roadway and 50-ft buffers that were spaced 200 feet apart. At each transect, three equally spaced locations were selected: one in the roadway and two in the 50-ft buffers on either side. The initial transect (origin) was selected randomly. Sample locations in the 50-ft buffers were placed in the center of each buffer and locations in the roadway were placed on alternating lanes of the road to allow passage of traffic during sampling. Ten soil borings were drilled using a rotary rig fitted with augers. Soil samples were collected using a modified 18-inch California split-spoon sampler in order to maximize sample size. Twenty test pits were advanced with an excavator within the 50-ft buffers. Soil samples were collected manually from the bucket of the excavator. Drilling, excavating and soil sampling was conducted in accordance with the SOPs described in the *Removal Site Evaluation Work Plan.*

Soil samples were collected and retained in plastic bags for gamma scanning and submittal to the laboratory for analysis of Ra-226. Gamma scanning during drilling and excavating was conducted using the same type of meter as for the static gamma radiation surveying (Section 2.2). The detector was mounted vertically with the crystal on top in a six-inch diameter cylinder. A reference sample with known Ra-226 activity (1.9 pCi/g) was placed in a sample container or plastic bag and placed around the probe and a one-minute count was performed. The subsurface soil samples collected from the soil borings or test pits were placed in the same style of sample container and in similar quantity as the reference sample. The counts per minute for the sample were compared to the data for the reference sample as a screening tool to estimate Ra-226 concentrations in soil while drilling or excavating. A single reference sample count was used for each location; at each new location a new reference sample count was used for the comparison. The results of the gamma scanning were used to evaluate whether Ra-226 concentrations exceeded the FSL, and if so, the depths of impacts and to guide sampling locations (e.g., to target the depth at which concentrations were just below the FSL).

Drilling or excavating was continued until equivalent Ra-226 concentrations were estimated to be below the FSL using the gamma meter. A minimum of two samples were collected for laboratory analysis from each borehole using the following protocol:

- Boreholes - an upper soil sample at one foot bgs and a lower sample where equivalent Ra-226 concentrations as per the gamma scan were just below the FSL.

- Test pits - an upper surface soil sample (<0.5 ft bgs) and a lower sample where equivalent Ra-226 concentrations as per the gamma scan were just below the FSL.

At each location, drilling or excavating was advanced until native soils were observed.

2.5 CHEMICAL ANALYSES AND DATA VALIDATION

Soil samples were documented, prepared and packaged for shipment to the laboratory according the SOPs included in the RSE Work Plan (MWH, 2006). The samples were submitted to ALS (formerly Paragon) and analyzed for Radium-226 by gamma spectroscopy (EPA Method 901.1) with a minimum reporting limit of at last 1.0 pCi/g. The analyses were conducted, verified and validated in accordance with the RSE QAPP (MWH, 2006). Data validation included 90% using Level III and 10% using Level IV (EPA Contract Laboratory Program), as per the QAPP.

2.6 STATISTICAL HYPOTHESIS TESTING

Statistical comparisons between datasets, such as Ra-226 concentrations in soils along RWPR versus background concentrations, or between concentrations along RWPR versus concentrations in the NECR-1 step-out area, were conducted using the methods recommended in MARSSIM. Since Ra-226 is present in the background and has a non-normal distribution, the primary statistical test that was used was the WMW Test.

Prior to conducting the WMW test, verification of the assumptions of the test was first conducted. The first assumption is that the samples were collected randomly. Each of the sample locations were placed on a regular grid cast on a random origin. Samples were then collected at regular intervals vertically depending on the sampling method (i.e., test pits versus soil borings), except for the deepest sample at each location (see Section 2.0). The depth of the deepest (last) sample at each location was targeted to be just below the FSL using the gamma screening, which is a biased (non-random) sampling design. However, samples above the deepest sample were collected randomly and overall the data appear to be representative of Ra-226 concentrations in soil. Therefore, for the purposes of this analysis, it is assumed that the randomness assumption is met.

The second assumption is that the data are spatially independent. As discussed in Section 3.2 and observed on Drawing 2, 3 and 4, there appear to be several groupings or clusters of higher Ra-226 concentrations (elevated measurements). Therefore, it does not appear that the assumption of spatial independence is met, which is likely related to higher concentrations along the northern portion of the road, associated with the Quivira Mine.

The third assumption has to do with symmetry. For the Students-t test, it is assumed that the distribution of the data is nearly normal (symmetric and unimodal) and that the variances are similar, whereas this is not a required assumption for the WMW test, which is a non-parametric test (not dependent on normality). The distribution of Ra-226 in both surface and subsurface soils is non-symmetrical and both are skewed to the right (towards higher concentrations), as presented in section 3.0. Using the full datasets, the appropriate statistical test to use as per MARSSIM is the WMW test. The non-parametric Quantile Hypothesis Test can also be used. The Quantile Hypothesis Test is more sensitive to right tails in skewed distributions. The subsurface soils dataset, with apparent

outliers removed, is nearly normal, and so both parametric (e.g., Student's-t test) and non-parametric (e.g., WMW and Quantile tests) are applicable.

The fourth assumption is that the sample sizes determined for the tests are sufficient to achieve the data quality objectives (DQOs) set for the Type I ($\alpha = 0.05$) and Type II ($\beta = 0.10$) error rates, and the power of the tests ($1-\beta$) to detect adequate remediation is sufficient. If the hypothesis that the residual radioactivity in the Study Area exceeds the release criterion is accepted, there should be reasonable assurance that the test is equally effective in determining that a survey unit has residual contamination less than the $DCGL_W$; otherwise, unnecessary remediation may result. The number of samples required to meet the DQOs was developed as part of the *Removal Site Evaluation Work Plan*. Since the total number of samples collected for this investigation for both surface and subsurface soils exceeded the minimum required as per the DQOs ($n = 13$), it is assumed that a sufficient number of samples were collected and the WMW test is of sufficient power. However, dividing the datasets into subgroups (e.g., north versus south) results in smaller datasets, and so in these cases the power of the tests is diminished.

In addition to conducting the appropriate hypothesis test, the elevated measurement concentration (EMC) should be performed (MARSSIM, 2000) against each measurement to ensure that none exceed the $DCGL_{EMC}$ + background concentration of 3.0 pCi/g. If any measurement in the Study Area exceeds 3.0 pCi/g, then MARSSIM recommends additional investigation, at least locally, regardless of the outcome of the WMW test.

The WMW test is designed to detect whether or not the activity (Ra-226 concentrations) exceeds the $DCGL_W$. The advantage of the nonparametric WMW test is that it does not assume that the data are normally or log-normally distributed (MARSSIM, 2000). The hypotheses that are used in the WMW, as applied to the RWPR data, are listed below.

For comparison to background:

- Null Hypothesis (H_O): the mean concentration in the Study Area exceeds that in the background reference area by more than the $DCGL_w$.

- Alternative Hypothesis (H_A): the mean concentration in the Study Area exceeds that in the background reference area by less than the $DCGL_W$

For comparison to the adjacent NECR-1 step-out area or between different areas of RWPR:

- Null Hypothesis (H_O): Study Area mean/median is less than or equal to the reference area mean/median.

- Alternative Hypothesis (H_A): Study Area mean/median is greater than the reference area mean/median.

Note that the forms of the null and alternative hypothesis statements included with ProUCL 4.0 are worded slightly different than in the MARSSIM manual, but the results lead to the same conclusions.

The null hypothesis (H_o) is assumed to be true unless the statistical test indicates that it should be rejected in favor of the alternative hypothesis (H_a). It is assumed that any difference between the reference area and the Study Area concentration distribution is due to a shift in the survey unit concentrations to higher values (i.e., due to the presence of residual radioactivity in addition to background). Some or all of the Study Area measurements may be larger than some of the reference area measurements (some by more than the $DCGL_W$ in the case of background comparisons), while still meeting the release criterion. The result of the hypothesis test determines whether or not the

survey unit as a whole is deemed to meet the release criterion when comparing to background, while the EMC is used to screen individual measurements (MARSSIM, 2000).

The statistical tests were run using ProUCL 4.0 to evaluate the results for both surface and subsurface soils. The statistical parameters that were used in ProUCL are consistent with the DQOs, as described in the *Removal Site Evaluation Work Plan*. The Confidence Coefficient was set to 95% (alpha = 0.05) and when comparing to background, a Substantial Difference ($DCGL_W$) of 1.24 pCi/g was used.

3.0 FINDINGS AND DISCUSSION

3.1 STATIC GAMMA RADIATION SURVEY RESULTS

Forty-six static gamma radiation measurements were collected in November 2007 during the SRSE (MWH, 2008), all from the 50-foot buffers except one from the middle of the roadway at the north end of the Study Area. The results of these gamma measurements are shown on Drawing 2, *SRSE Static Gamma Measurements*. Gamma measurements were converted to equivalent Ra-226 concentrations using the SRSE regression equation (see Section 2.1). Here is a statistical summary of the results as Ra-226 in pCi/g:

- Quantity 46
- Minimum 2.70
- Maximum 29.95
- Mean 10.15
- Median 6.36
- Standard deviation 7.74
- 75th percentile 13.32

These results indicated that 100% of the static gamma radiation measurements collected within the 50-ft buffers exceeded the NECR FSL of 2.24 pCi/g ($DCGL_W$ + background) and all but four exceeded 3.0 pCi/g ($DCGL_{EMC}$ + background). Statistical hypothesis testing was previously conducted on these measurements from the SRSE using the WMW test (see the February 16, 2009 memorandum in Appendix C). The conclusion of that analysis was that mean/median gamma measurements as Ra-226 (pCi/g) along RWPR were greater than in the step-out area adjacent to RWPR.

Comparison of gamma measurements from the northern versus southern portions of RWPR shows that there are differences in the data distributions along the road, which can be seen on Drawing 2 and in the boxplots included in Appendix C. As seen on the boxplots, the mean and interquantile range of gamma measurements are greater in the northern portion. The highest measurements (above the 75th percentile) are clustered in three general areas:

1. at the northern end of the road near the east-west arroyo and the Quivira Mine;
2. around the small drainage that crosses the central portion of the investigation area; and
3. at the very southern end of the road there was one measurement above the 75th percentile.

Six of the nine highest readings occurred in a cluster along the northern 500 feet of the road before it crosses the east-west arroyo (see Drawing 2). The gamma level in the one measurement from the roadway was 11.1 pCi/g. The preliminary data from the Weston survey (December 2009) also showed elevated activity levels on and adjacent to RWPR north of the east-west arroyo adjacent to the Quivira Mine.

Thirty more static gamma radiation measurements were collected during the RWPR RSE in September 2009 over the same general area as the SRSE along RWPR, and included 10 measurements in the roadway, as shown on Drawing 3, *RWPR RSE Static Gamma Measurements*. As during the SRSE, the gamma measurements were converted to equivalent Ra-226 concentrations using the SRSE regression equation (see Section 2.1). Here is a statistical summary of the results as Ra-226 in pCi/g:

- Quantity 30
- Mean 11.60
- Median 8.31
- Standard deviation 9.09

- Minimum 3.42
- Maximum 40.55
- 75th percentile 12.57

These results indicated that 100% of the gamma measurements exceeded the FSL and 3.0 pCi/g ($DCGL_{EMC}$), including the 10 measurements within the roadway. The distribution of gamma measurements along RWPR is similar to what was observed in the SRSE gamma survey, discussed above. Gamma measurements were only collected from along RWPR during the RWPR RSE in 2009, and so a comparison of these gamma measurements to measurements from the step-out area (SRSE) was not conducted. However, the mean and distribution of gamma measurements along RWPR from the RWPR RSE (2009) are similar to those from the SRSE (2007), as seen on Drawings 2 and 3, and the boxplots included in Appendix C. Therefore, these results were consistent with the previous conclusion that the mean/median gamma measurements as Ra-226 (pCi/g) along RWPR were greater than in the step-out area adjacent to RWPR prior to the IRA (see the February 16, 2009 in Appendix C).

The distributions of gamma measurements from the northern versus southern portions of RWPR were also consistent with measurements from the SRSE, and indicated that gamma levels are generally higher in the northern portion. This can be seen on Drawing 3 and the boxplots in Appendix C. Of the eight measurements that exceeded the 75th percentile (12.57 pCi/g), six were from the northern end of the road and two were adjacent to the drainage that crosses the central portion of the road (see Drawing 3). Only one measurement was collected from the roadway at the very northern end of the road nearest to the Quivira Mine; this measurement also exceeded the 75th percentile.

Comparing the gamma measurements from the 50-ft buffers to those from the roadway reveals that those from the 50-ft buffers appear to be generally higher and with a greater range of values than those from the roadway. Concentrations in the 50-ft buffers ranged from 3.42 to 40.55 pCi/g (mean = 13.4), while in the roadway they ranged from 3.7 to 18.0 pCi/g (mean = 7.9).

3.2 SURFACE AND SUBSURFACE SOIL SAMPLE RESULTS

3.2.1 Soil Analytical and Lithologic Data Summary

Seventy-six surface (<0.5 feet bgs) and subsurface (1 to 6 feet bgs) soil samples were collected from the test pits and soil borings along RWPR, as shown on Drawing 4, *Soil Analytical Results*. The soils that were observed during drilling within the roadway (SB-1 though SB-10) were described by a geologist and recorded on boring logs, which are included in Appendix A. Soils appeared relatively similar throughout, consisting primarily of fine to medium grained sand and silty sand with some gravel. At each location, there was evidence of layering, typically with more gravel in the top layer and more fine silty sand in the lower layer(s). Soils within the 50-ft buffers were similar, consisting primarily of fine grained sand, with some silt and gravel. The upper one foot or so consisted of a gravely sand at some locations, and some areas contained silty sand. Native material consisting of very dense silty sand was encountered at 5.5 feet in soil boring SB-05 and possibly at 2.5 feet in SB-07. Bedrock was encountered at 2.5 ft in TP-22; bedrock was not encountered in any of the soil borings.

A gamma meter was used during drilling and excavation to screen the soils every foot (see Section 2.3). The results of both the gamma screening measurements and the soil analytical results are included in Table 2, *Soil Analytical and Gamma Screening Results*, and the analytical results are shown on Drawing 4. The analytical results were validated in accordance with the RSE Work Plan (see Section 2.4). The results of the data validation indicated that the data are acceptable and useable for their intended purpose. Here is a statistical summary of the Ra-226 concentrations (pCi/g) for all soil samples:

Parameter	All Samples	Surface	Subsurface	RSE Background
Quantity	76	16	60	25
Minimum	0.75	2.38	0.75	0.60
Maximum	69.0	69.0	30.8	1.30
Mean	5.33	18.04	1.95	1.04
Median	1.30	14.5	1.24	1.00
Standard deviation	10.72	19.20	1.40	1.20
75th Percentile	2.76	17.25	3.88	0.18

Eighteen of the analytical results were flagged as estimated (J+) and considered potentially biased high because the density of the sample was not within fifteen percent of the standard used to calibrate the instrument (see the Validation Report in Appendix B). All of those flagged J+ were results less than the FSL, except one just above the FSL.

The statistical distribution of the Ra-226 concentrations in soil can be seen in the histogram included in Appendix C. The histogram shows that the distribution of Ra-226 in soil is non-normal and skewed to the right toward higher concentrations.

3.2.2 Surface Soil Data Summary

Sixteen surface soil samples were collected from the 50-ft buffers during the SRSE and the RWPR RSE (see Drawing 4). Concentrations of Ra-226 were greater than the NECR FSL at 100% of the locations and all but two exceeded 3.0 pCi/g, as can be seen on the histogram and boxplots included in Appendix C and Table 1. Concentrations ranged from 2.4 to 66.6 pCi/g with a mean of 18.0 pCi/g (see above).

A comparison of Ra-226 concentrations in surface soil from the 50-ft buffers along RWPR (RWPR RSE, 2009) versus the step-out area (SRSE, 2007) reveals that their distributions are different. Statistical hypothesis testing was conducted on these two datasets using the WMW Test (ProUCL 4.0). The conclusion of that analysis was that the mean/median concentrations of Ra-226 (pCi/g) in surface soil along RWPR were greater than in the step-out area adjacent to RWPR (see ProUCL results in Appendix C). Additionally, these two datasets were compared using both the Student's-t Test and the Quantile Hypothesis Test, using parameters consistent with the DQOs. Both tests reached the same conclusion that concentrations were higher along RWPR than they were in the RSE step-out area, prior to the IRA (see Appendix C).

The distribution of Ra-226 concentrations along RWPR (south to north) appears similar to the pattern of gamma measurements (see Drawing 4 and the boxplots in Appendix C). Of those that exceeded the 75th percentile, two were adjacent to the east-west arroyo at the northern end of RWPR, one was adjacent to the small drainage that crosses the central portion of the area, and one was at the southern end of the area on the east side near Highway 566. Two of the three highest concentrations were the closest to the Quivira Mine (see Drawing 4).

3.2.3 Subsurface Soil Data Summary

Sixty subsurface soil samples were collected from along RWPR, 20 from the roadway (soil borings) and 40 from the 50-ft buffers (test pits) during the RWPR RSE (2009), as shown on Drawing 4. Ra-226 concentrations were less than the FSL in 100% of the 20 samples collected in the roadway (soil boring samples from 1 to 6 ft bgs), as shown on the histogram and boxplots in Appendix C and on Table 1. Concentrations from within the roadway ranged from 0.8 to 2.1 pCi/g, with a mean of 1.3 pCi/g, all below the FSL.

Within the 50-ft buffers, six of the 40 samples contained Ra-226 greater than the FSL; (four of them greater than 3.0 pCi/g), as shown in Table 1 and on Drawing 4. Concentrations ranged from 0.75 to

30.8 pCi/g, with a mean of 2.28 pCi/g. The highest concentrations (i.e., those exceeding the FSL) in subsurface soil along RWPR were all located in the northern portion of the Study Area, closest to the Quivira Mine, consistent with the gamma measurements and surface soil measurements; as is clearly seen on the boxplots included in Appendix C. The six samples that exceeded the FSL came from depths of 1 to 3 ft bgs; three (4.3 to 30.8 pCi/g) from two test pits near the east-west arroyo (east side of RWPR), and the other three (2.5 to 3.1 pCi/g) from two test pits south of the home sites driveway (west side of RWPR). The highest concentration (30.8 pCi/g) was observed at 1.0 feet bgs in TP-30, the northeastern-most sample location for the Study Area (closest to the Quivira Mine). Ra-226 concentrations were all below the FSL in other portions of the Study Area.

4.0 SUMMARY AND CONCLUSIONS

The results of the RSE conducted in the Study Area along RWPR indicated the following:

- Surface static gamma measurements collected during both the SRSE and the RWPR RSE, reported as equivalent Ra-226 concentrations using the SRSE correlation, **exceeded** the FSL at 100% of the locations within the 50-ft buffers and the roadway; all but four exceeded 3.0 pCi/g.

- Surface soil Ra-226 concentrations were **greater than** the FSL at 100% of the locations within the 50-ft buffers;

- Subsurface soil Ra-226 concentrations were **less than** the FSL at 100% of the locations (1 to 6 ft bgs) within the roadway;

- Subsurface soil Ra-226 concentrations were **less than** the FSL at all locations within the 50-ft buffers, except four test pits located along the northern portion of RWPR within approximately 600 feet of the east-west arroyo crossing to the Quivira Mine.

These results do not change the conclusions of the February 2009 statistical evaluation of the previous RSE gamma survey and surface data sets. The results of the evaluation indicated that the mean/median of the data for both the southern and northern sections of RWPR are statistically higher than adjacent areas immediately to the west in the NECR-1 step-out area. Overall, the results offer further indication that RWPR and the immediate buffer areas on either side of the roadway were likely impacted by historic use of the road by the operators of the Quivira Mine; impacts within the Study area may also have been impacted by wind-or water-borne transport from the Quivira Mine. Due to the proximity of NECR to the southern portion of RWPR and based on local drainage patterns in this area, past operations at the NECR site could also have caused some impact along the southern portion of the Study Area in addition to the impacts from past use of RWPR as a haul road for the Quivira Mine. Impacts from NECR are considered unlikely to extend beyond the small drainage that crosses the central portion of the Study Area. Impacts along the northern portion of the Study Area are likely associated with the Quivira Mine due to the proximity of the mine, past use of RWPR as a haul road, and the potential for ongoing road use and maintenance to transport materials from the north side of the east-west arroyo into the Study Area.

Based on the results of the Weston investigation and the RWPR RSE results from the northern portion of RWPR, further investigation of the continuing impacts to RWPR from the Quivira Mine is warranted. Unless the continuing impacts to RWPR are addressed, any removal action conducted on RWPR is likely to only be temporarily effective.

5.0 REFERENCES

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TABLES

Table 1 Soil Analytical and Gamma Screening Results						
Location ID	**Depth**	**Ra-226 901.1 Results**		**Static Gamma Survey**		**Comments**
	(ft bgs)	**pCi/g**	**TPU[1]**	**Sample**	**Reference[2]**	
Subsurface Samples from Roadway[3]						
RW-SB-01	1.0[4]	1.3 J+	0.33	31,246	30,624	
	2.5	1.18	0.28	31,444	30,624	
	4.0			30,269	30,624	
RW-SB-02	1.0	1.21	0.3	20,152	20,064	
	2.5	0.94	0.3	19,752	20,064	
	4.0			na	20,064	
RW-SB-03	1.0	0.81 J+	0.28	17,615	17,879	
	2.5	1.61 J+	0.34	17,181	17,879	
	4.0			16,111	17,879	
RW-SB-04	1.0	1.4	0.29	17,286	18,464	
	2.5	1.11	0.27	17,002	18,464	
	4.0			17,156	18,464	
RW-SB-05	1.0	0.89	0.28	22,840	24,039	
	2.5			22,855	24,039	
	4.0			23,038	24,039	
	5.5	1.34 J+	0.33	24,647	24,039	
RW-SB-06	1.0	1.37 J+	0.34	20,589	20,865	
	2.5	1.33 J+	0.31	20,497	20,865	
	4.0			20,447	20,865	
RW-SB-07	1.0	1.27 J+	0.32	22,176	22,648	
	2.5	1.22 J+	0.31	21,113	22,648	
	4.0			21,432	22,648	
RW-SB-08	1.0	1.12 J+	0.29	19,234	19,762	
	2.5	1.31	0.3	19,659	19,762	
	4.0			19,065	19,762	
RW-SB-09	1.0	1.12	0.29	14,750	15,598	
	2.5	1.24	0.28	14,880	15,598	
	4.0			15,127	15,598	
RW-SB-10	1.0	2.09	0.4	15,994	15,412	
	2.5			15,678	15,412	
	4.0			15,855	15,412	
	5.5	1.73	0.34	15,357	15,412	
Surface and Subsurface Samples from 50-ft Buffers[5]						
Home-SS-428[6]	0	**9.2**	0.4			From Suppplemental RSE 4/08
Home-SS-429	0	**4.6**	0.3			From Suppplemental RSE 4/08
Home-SS-430	0	**2.9**	0.3			From Suppplemental RSE 4/08
Home-SS-431	0	**18.7**	0.6			From Suppplemental RSE 4/08
Home-SS-433	0	**28.5**	0.7			From Suppplemental RSE 4/08
Home-SS-434	0	**5.3**	0.4			From Suppplemental RSE 4/08
Home-SS-448	0	**17.1**	0.5			From Suppplemental RSE 4/08
RW-TP-11	0	**69.0**	8.2	44,751	31,213	
	1.0			31,306	31,213	
	2.0	1.49 J+	0.34	31,606	31,213	
	3.0	0.87 J+	0.29	31,285	31,213	
	4.0			31,460	31,213	
	5.0			31,414	31,213	
RW-TP-12	0	**15**	1.9	22,120	20,256	
	1.0	1	0.26	20,158	20,256	
	2.0			20,198	20,256	
	3.0	0.75	0.24	20,159	20,256	
RW-TP-13	1.0	1.28 J+	0.34	21,519	21,927	
	2.0			21,692	21,927	
	3.0	1.26	0.28	20,324	21,927	

Table 1 Soil Analytical and Gamma Screening Results						
Location ID	**Depth**	**Ra-226 901.1 Results**		**Static Gamma Survey**		**Comments**
	(ft bgs)	**pCi/g**	**TPU[1]**	**Sample**	**Reference[2]**	
RW-TP-14	1.0	**3.11**	0.48	22,302	22,347	
	2.0			21,589	22,347	
	3.0	**2.46 J+**	0.44	21,570	22,347	
RW-TP-15	0	**2.38**	0.39	21,236	21,244	
	1.0	**2.61**	0.44	21,561	21,244	
	2.0			20,495	21,244	
	3.0	1.51	0.3	20,107	21,244	
RW-TP-16	1.0			21,495	21,839	
	2.0	1.3	0.28	21,719	21,839	
	3.0	1.26	0.28	21,512	21,839	
RW-TP-17	0	**44.3**	5.3	26,552	19,837	
	1.0	2.03	0.37	20,576	19,837	
	2.0	1.18 J+	0.29	19,817	19,837	
	3.0			19,684	19,837	
RW-TP-18	1.0	1.24	0.29	17,014	17,170	
	2.0			16,597	17,170	
	3.0	1.41	0.31	17,132	17,170	
RW-TP-19	1.0	1.39	0.31	15,138	15,138	
	3.0			15,233	15,138	
	3.0			15,402	15,138	
	4.0	1.15	0.3	14,929	15,138	
RW-TP-20	1.0	2.02 J+	0.37	14,780	14,519	
	3.0	1.19	0.29	13,742	14,519	
	3.0			14,281	14,519	
RW-TP-21	0	**19.7**	2.4	16,923	14,519	
	2.0			14,796	14,519	
	3.0	1.06	0.28	14,733	14,519	
	3.0			14,754	14,519	
	4.0	1.11	0.29	14,377	14,519	
RW-TP-22	0	14	1.7	16,749	15,138	
	2.0	1.39	0.31	13,701	15,138	
	3.0			na	15,138	Bedrock @ ~2.5' bgs
RW-TP-23	1.0	1.23	0.29	17,391	17,170	
	2.0			16,776	17,170	Sample spooned off of sidewall
	3.0	1.21	0.29	16,716	17,170	
	3.0			16,785	17,170	
RW-TP-24	1.0	1.08	0.25	19,193	19,837	
	2.0			19,579	19,837	
	3.0	1.17	0.28	19,637	19,837	
RW-TP-25	0	**18.7**	2.3	24,416	21,839	
	1.0			21,639	21,839	
	2.0	1.2	0.29	21,901	21,839	
	3.0	1.02	0.29	21,740	21,839	
RW-TP-26	1.0	1.16	0.28	21,369	21,244	Road cut
	2.0			20,895	21,244	Road cut
	3.0	0.95	0.25	21,526	21,244	Road cut
	3.0			21,452	21,244	Road cut
	4.0			21,051	21,244	Road cut
RW-TP-27	0	**8.9**	1.2	23,074	22,347	
	1.0	1.25	0.28	21,156	22,347	
	2.0			21,439	22,347	
	3.0	1.71	0.34	21,391	22,347	
RW-TP-28	0	**10.3**	1.4	22,427	21,927	
	1.0	0.83	0.23	21,814	21,927	
	2.0			21,676	21,927	
	3.0	1.05	0.25	21,880	21,927	

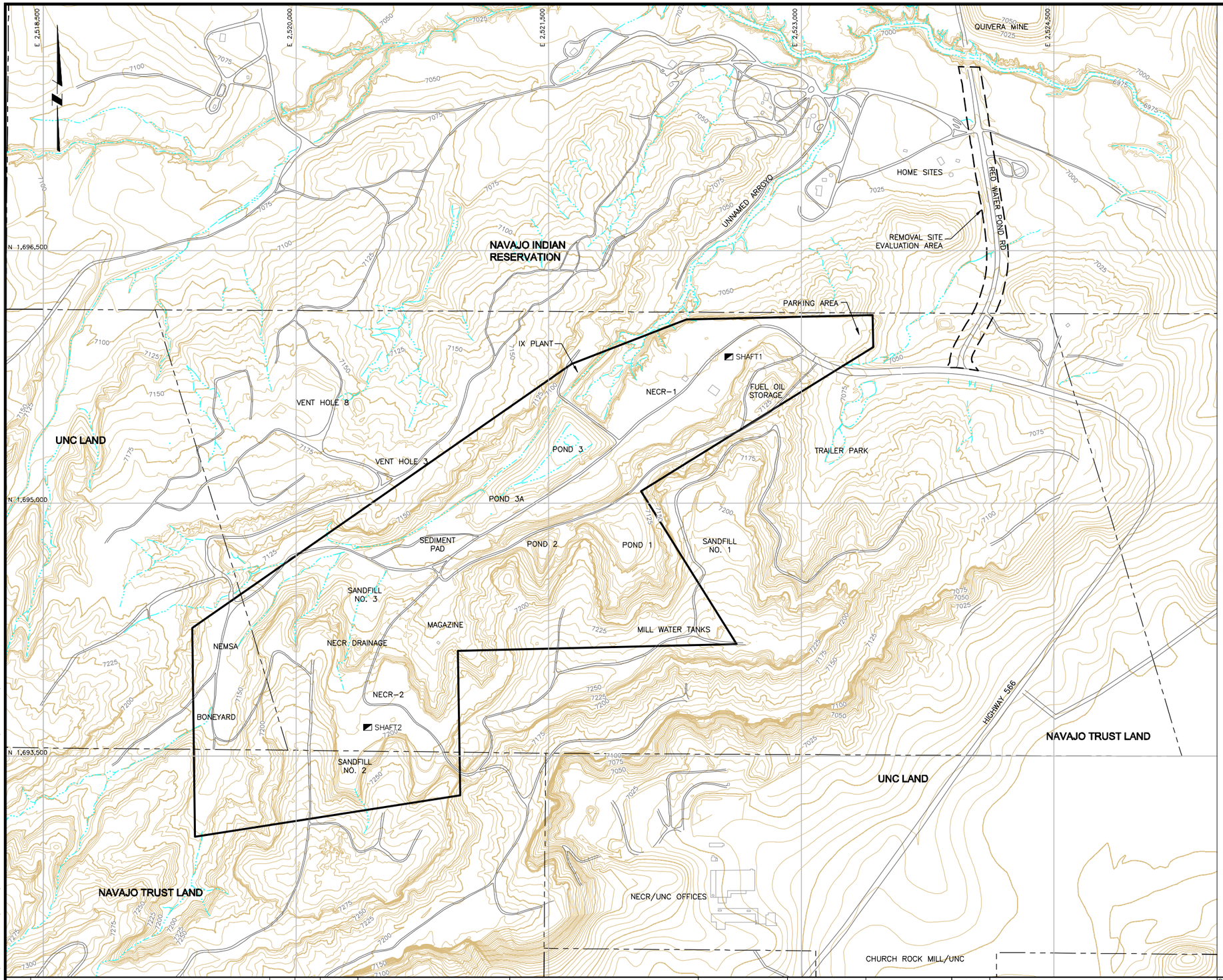
Table 1 Soil Analytical and Gamma Screening Results						
Location ID	**Depth**	**Ra-226 901.1 Results**		**Static Gamma Survey**		**Comments**
	(ft bgs)	**pCi/g**	**TPU[1]**	**Sample**	**Reference[2]**	
RW-TP-29	1.0	**4.31**	0.62	20,503	20,256	
	2.0			19,807	20,256	
	3.0	0.84	0.25	19,945	20,256	
RW-TP-30	1.0	**30.8**	3.7	36,338	31,213	Former drainage
	2.0			32,574	31,213	
	3.0	**6.26**	0.87	31,937	31,213	
	4.0			31,881	31,213	
	5.0			31,729	31,213	
	6.0	1.14 J+	0.3	31,324	31,213	
	7.0			31,742	31,213	
	8.0			31,590	31,213	

Notes:

1. TPU = Total Propagated Uncertainty at 2 standard deviations (s).
2. Reference material from borrow source and contains Ra-226 at 1.9 pCi/g.
3. Samples collected from boreholes using an auger drilling rig and an 18-inch split-spoon sampler.
4. Samples from18-inch split-spoon samplers analyzed over total interval recovered.
5. Samples collected from test pits using and excavator as grab samples.
6. Surface soil samples collected in April 2008 for Supplemental RSE.
7. Cells shaded and with bold values indicate exceedance of 2.24 pCi/g.

J+ = estimated biased high by laboratory due to density differences between sample and calibration standard.
n/a = not applicable

DRAWINGS



LEGEND:

- 7040 — EXISTING GROUND SURFACE CONTOUR & ELEVATION, FEET
- NECR MINE SITE PERMIT BOUNDARY
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- SHAFT LOCATION

SCALE
300 0 300 600 FEET
CONTOUR INTERVAL = 5 FEET

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED FOR FINAL	CHF	RTL	01/14/10
A	DRAFT	CHF	RTL	12/22/09

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PROJECTION:
STATE PLANE COORDINATES

ZONE:
NEW MEXICO WEST

DATUM:
NAD 83

UNITS:
US FEET

DESIGNED BY	T LEESON	01/14/10
DRAWN BY	C FOWLER	01/14/10
CHECKED BY	T LEESON	01/14/10
APPROVED BY	T LEESON	01/14/10
PROJECT MANAGER	T LEESON	01/14/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

unc
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION
NORTHEAST CHURCH ROCK MINE

PROJECT
REMOVAL SITE EVALUATION
RED WATER POND ROAD

TITLE
SITE MAP

MWH

DRAWING 1 of 4
REVISION 0
FILE NAME 1007552D010

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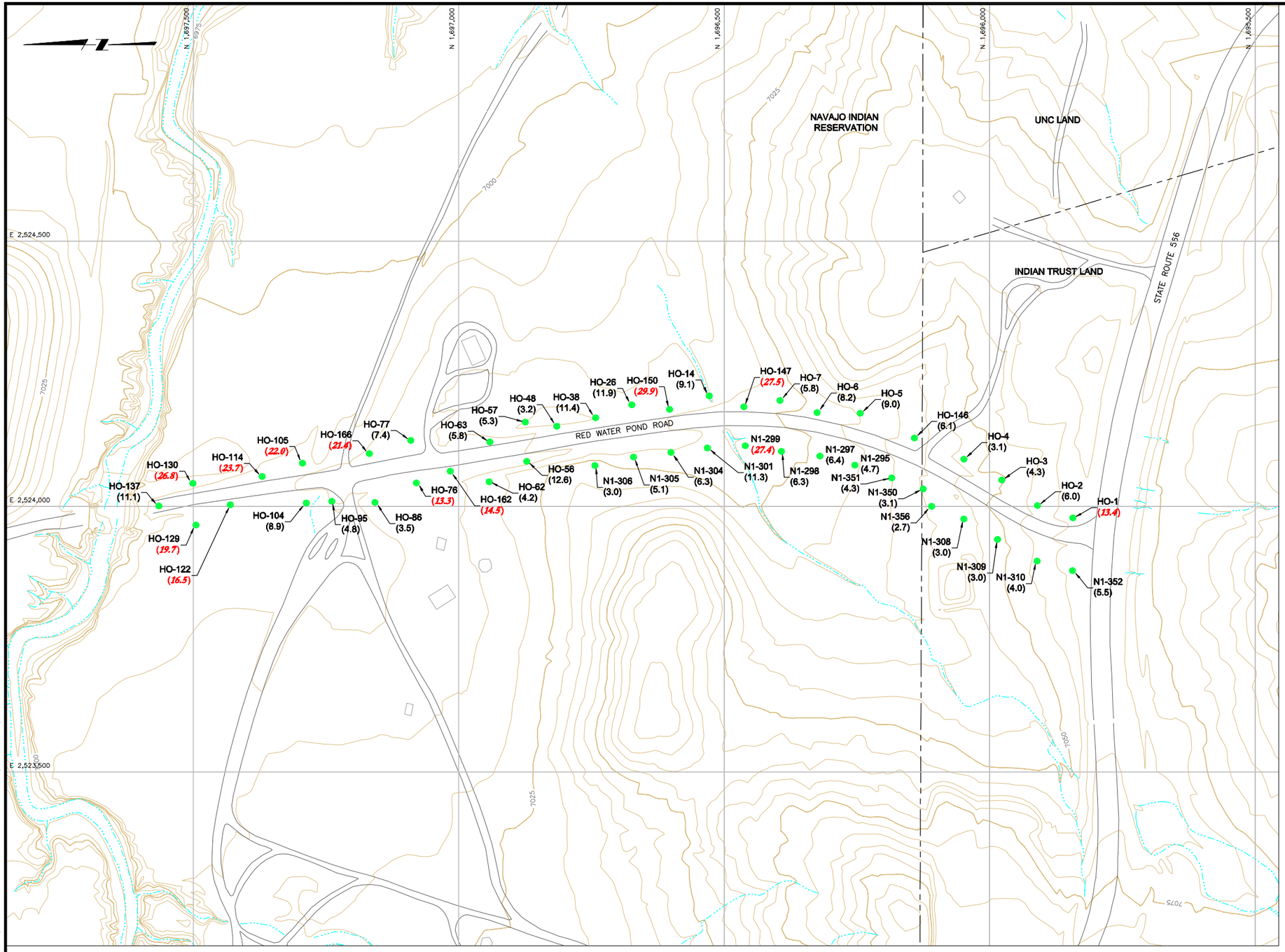

LEGEND:

- 7040 — EXISTING GROUND SURFACE CONTOUR & ELEVATION, FEET
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- GAMMA SAMPLE LOCATION
- HO-5 (9.0) — LOCATION ID; Ra-226 (pCi/g) EQUIVALENT
- *(13.4)* — MEASUREMENTS WITHIN UPPER 25% OF VALUES (>13.3 pCi/g)

NOTE:

GAMMA MEASUREMENTS COLLECTED IN NOVEMBER 2007 AS PART OF THE SUPPLEMENTAL REMOVAL SITE EVALUATION.

PLAN

SCALE
100 0 100 200 FEET
CONTOUR INTERVAL = 5 FEET

ISSUE / REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED FOR FINAL	CHF	RTL	01/14/10
A	DRAFT	CHF	RTL	12/22/09

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PROJECTION:
STATE PLANE COORDINATES

ZONE:
NEW MEXICO WEST

DATUM:
NAD 83

UNITS:
US FEET

DESIGNED BY	T LEESON	01/14/10
DRAWN BY	C FOWLER	01/14/10
CHECKED BY	T LEESON	01/14/10
APPROVED BY	T LEESON	01/14/10
PROJECT MANAGER	T LEESON	01/14/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

unc
P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: REMOVAL SITE EVALUATION RED WATER POND ROAD
TITLE: SRSE STATIC GAMMA MEASUREMENTS

MWH

DRAWING: 2 of 4
REVISION: 0
FILE NAME: 1007552D009

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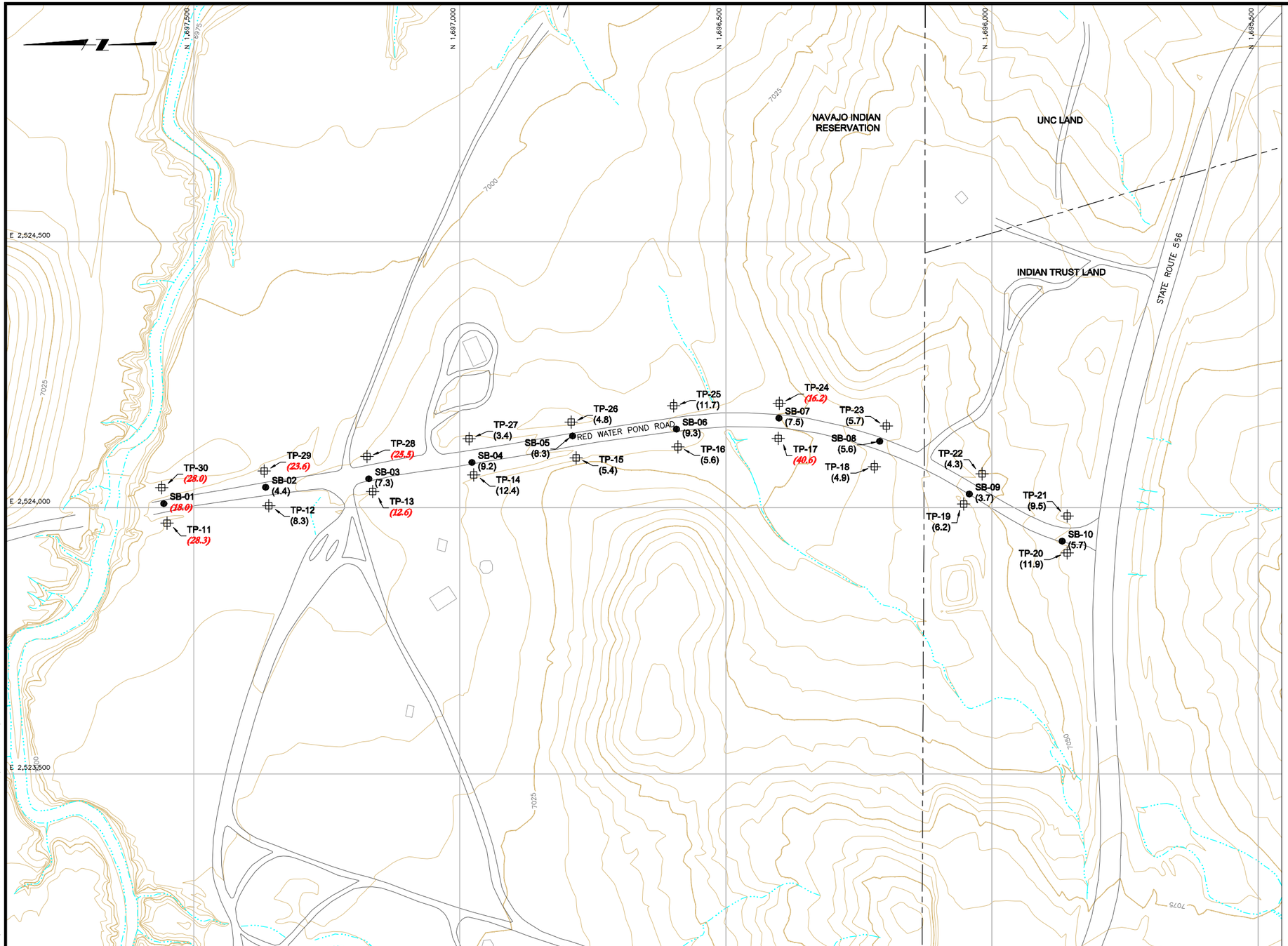

LEGEND:

- 7040 — EXISTING GROUND SURFACE CONTOUR & ELEVATION, FEET
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- SOIL BORING
- TEST PIT
- SB-08 (5.6) — LOCATION ID, Ra-226 (pCi/g) EQUIVALENT
- *(40.6)* — MEASUREMENTS WITHIN UPPER 75% OF VALUES (>12.6 pCi/g)

NOTE:

GAMMA MEASUREMENTS COLLECTED IN SEPTEMBER 2009 AS PART OF THE RED WATER POND ROAD REMOVAL SITE EVALUATION.

PLAN

SCALE

100 0 100 200 FEET

CONTOUR INTERVAL = 5 FEET

ISSUE / REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED FOR FINAL	CHF	RTL	01/14/10
A	DRAFT	CHF	RTL	12/22/09

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PROJECTION:
STATE PLANE COORDINATES

ZONE:
NEW MEXICO WEST

DATUM:
NAD 83

UNITS:
US FEET

DESIGNED BY	T LEESON	01/14/10
DRAWN BY	C FOWLER	01/14/10
CHECKED BY	T LEESON	01/14/10
APPROVED BY	T LEESON	01/14/10
PROJECT MANAGER	T LEESON	01/14/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE

PROJECT: REMOVAL SITE EVALUATION
RED WATER POND ROAD

TITLE: RWPR RSE STATIC GAMMA MEASUREMENTS

DRAWING: 3 of 4

REVISION: 0

FILE NAME: 1007552D011

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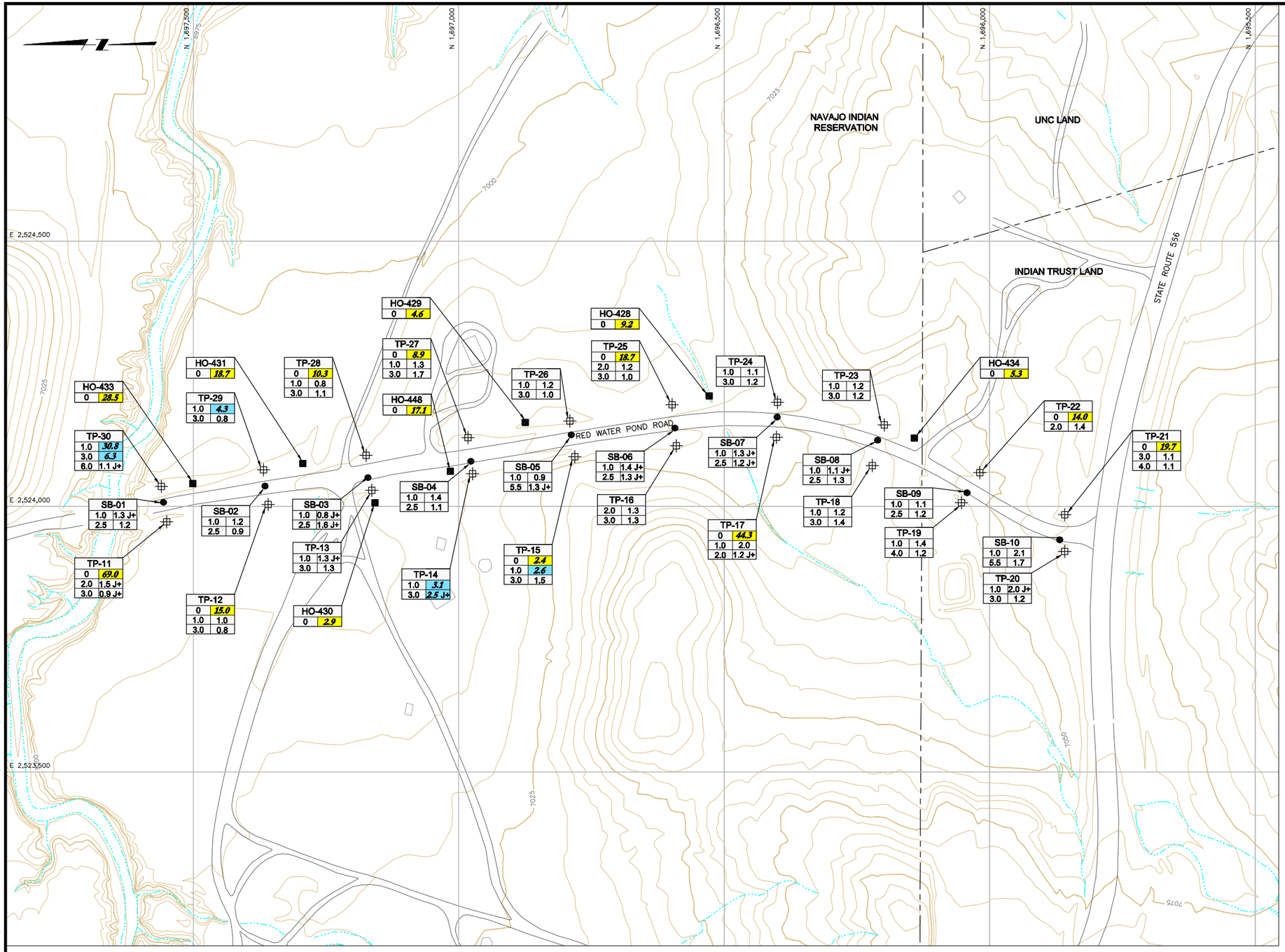

LEGEND:

- 7040 — EXISTING GROUND SURFACE CONTOUR & ELEVATION, FEET
- APPROXIMATE OWNERSHIP BOUNDARY
- ROADS
- NATURAL DRAINAGE
- PHYSICAL STRUCTURE
- SOIL BORING
- TEST PIT
- RSE SURFACE SOIL SAMPLE
- SB-09 (1.0 | 1.1 / 2.5 | 1.2) — LOCATION ID; Ra-226 (pCi/g); DEPTH (ft bgs)
- 19.7 — SURFACE SAMPLES (0–0.5') EXCEEDING FIELD SCREENING LEVEL (2.24).
- 6.3 — SUBSURFACE SAMPLES (>0.5') EXCEEDING FIELD SCREENING LEVEL (2.24).
- J+ — POSSIBLY BIASED HIGH DUE TO HIGH MATRIX DENSITY COMPARED TO CALIBRATION STANDARD

NOTES:

1. SAMPLES COLLECTED SEPTEMBER 2009 (TEST PITS , SOIL BORINGS) AND NOVEMBER 2007 (SURFACE SOIL).
2. GAMMA MEASUREMENTS WERE USED TO SCREEN SOILS DURING DRILLING AND EXCAVATION AND ENSURE THAT SOILS BENEATH THE DEEPEST LAB SAMPLES ARE LESS THAN 2.24 pCi/g.

PLAN

SCALE
100 0 100 200 FEET
CONTOUR INTERVAL = 5 FEET

ISSUE REV	DESCRIPTION	TECH	ENG	DATE
0	ISSUED FOR FINAL	CHF	RTL	01/14/10
A	DRAFT	CHF	RTL	12/22/09

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PROJECTION:
STATE PLANE COORDINATES

ZONE:
NEW MEXICO WEST

DATUM:
NAD 83

UNITS:
US FEET

DESIGNED BY	T LEESON	01/14/10
DRAWN BY	C FOWLER	01/14/10
CHECKED BY	T LEESON	01/14/10
APPROVED BY	T LEESON	01/14/10
PROJECT MANAGER	T LEESON	01/14/10
CLIENT APPROVAL		
CLIENT REFERENCE NO.		

P.O. BOX 3077
Gallup, New Mexico 87305-3077

PROJECT LOCATION: NORTHEAST CHURCH ROCK MINE
PROJECT: REMOVAL SITE EVALUATION
RED WATER POND ROAD
TITLE: SOIL ANALYTICAL RESULTS
DRAWING: 4 of 4
REVISION: 0
FILE NAME: 1007552D008

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APPENDICES

APPENDIX A

FIELD NOTES

SOIL BORING LOGS

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd.	RW-SB-01

BORING LOCATION		
Red Water Pond Rd.	Date Drilled: 9/9/09 Date Completed: _____	Northing: _____ Easting: _____
	Logged By: R. Young	Ground Surface Elevation (ft): _____
	Drilling Contractor: WDC	Measuring Point (MP) Elevation (ft): _____
	Drilling Method: HSA	MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1						V				
2	20	80	0			*C	90	SP		Fine-coarse gravelly sand, f-c sand, brown, dry to slightly moist, → subangular-angular gravel, medium dense
3	10	80	10			*C	100	SP		Fine sand w/ some fine gravel and some fines, yellowish-brown to brown, slightly moist, medium dense to stiff,
4										
5	5	80	15			*C	100	SP		Fine sand w/ some fines and gravel, yellowish brown to brown, slightly moist, stiff
6										END OF HOLE
7										
8										RY

*C California Split Sppon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.
Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd.	RW-SB-02

BORING LOCATION		
Red Water Pond Rd.	Date Drilled: 9/9/09 Date Completed: _____	Northing: _____ Easting: _____
	Logged By: R. Young	Ground Surface Elevation (ft):
	Drilling Contractor: WDC	Measuring Point (MP) Elevation (ft):
	Drilling Method: HSA	MP is Ground Surface Datum:

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1										
2		MS	25			*C	100	SP		Fine sand w/ silt, yellowish-brown, dry, loose to medium dense sand
3		MS	25			*C	100	SP		Fine sand and some silt, yellowish-brown, dry to slightly moist, ~~loose to~~ medium dense
4										
5		90	10			*C	100	SP		Fine sand w/ some fines, yellowish-brown, dry to slightly moist, medium dense
6										
7										END OF HOLE
8										RY
9										

*C California Split Sppon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.
Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd.	RW-SB-~~04~~ RW 03

BORING LOCATION		
Red Water Pond Rd.	Date Drilled: 9/9/05 Date Completed: ____	Northing: ____ Easting: ____
	Logged By: R. Young	Ground Surface Elevation (ft):
	Drilling Contractor: WDC	Measuring Point (MP) Elevation (ft):
	Drilling Method: HSA	MP is Ground Surface Datum:

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1										
2		80	20			*C	100	SP		Sand w/ some silt, yellowish-brown, dry, medium dense
3	<5	80	15			*C	100	SP		Sand w/some silt, trace fine gravel, yellowish-brown, dry to slightly moist, medium dense
4										
5	25	75				*C	100	SP		Fine-coarse gravelly sand, f-c sand, yellowish-brown, dry to slightly moist, medium dense to loose, same "wash" material w/ variable colors
6										
7										END OF HOLE
8						RY				
9										

*C California Split Sppon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.
Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd.	RW-SB-04 E

BORING LOCATION		
Red Water Pond Rd.	Date Drilled: 9/7/09 Date Completed: _____	Northing: _____ Easting: _____
	Logged By: R. Young	Ground Surface Elevation (ft):
	Drilling Contractor: WDC	Measuring Point (MP) Elevation (ft):
	Drilling Method: HSA	MP is Ground Surface Datum:

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1							~~100~~			
2	20	80	0			*C	100	SP		Sand w/ some fine gravel, f-med sand, yellowish-brown, dry to slightly moist, loose sand
3										↓
4	20	80				*C	100	SP		As above, fine-coarse sand, angular to sub-angular gravel, slightly moist
5	45	60	40			*C	100	SP		Silty sand mix w/ trace fine gravel, yellowish-brown, slightly moist, medium dense sand, couple ~~cobbles~~ RY coarse gravel pieces
6										END OF HOLE
7										RY
8										
9										

*C California Split Sppon Sampler (2.5" I.D.)

S Standard penetration test sampler

c Cuttings

▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.

Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd	RW-SB-05

BORING LOCATION: Red Water Pond Rd. (Road cut)

Date Drilled: 9/9/09 Date Completed: _____ Northing: _____ Easting: _____

Logged By: R. Young Ground Surface Elevation (ft): _____

Drilling Contractor: WCD Measuring Point (MP) Elevation (ft): _____

Drilling Method: HSA MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	GRAIN SIZE % SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1										
2	<5	80	20			*C	100	SP		Silty sand w/ trace fine gravel, tan to yellowish brown, dense, dry (road base)
		90	10					SP		Silty sand, yellowish-brown, medium dense, dry to slightly moist
3	30	70						SP		Gravelly sand, F-C gravel, medium sand, yellowish ~~brown, dry to slightly moist, loose~~
4	ROCK					*C	80	Rock		Limestone rock core, bedrock?, boulder? @ ~3.0' bgs
5	40	60	0			*C	95	SP		Gravelly sand, fine to coarse sand and fine to coarse gravel, angular, moist, variable colors (yellow-bn, yellow, tan) loose to medium dense
										* doesn't look natural, old drainage?
6	<5	10	90			*C	100	ML		Silt w/ some fine sand and trace fine gravel, yellowish brown, very hard/dense, slightly moist, NATIVE
7										END OF HOLE
8										
9										

*C California Split Sppon Sampler (2.5" I.D.)

S Standard penetration test sampler

c Cuttings

▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.

Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd	RW-SB-06

BORING LOCATION		
Red Water Pond Rd	Date Drilled: 9/9/09 Date Completed: _____ Logged By: R. Young Drilling Contractor: WDC Drilling Method: HSA	Northing: _____ Easting: _____ Ground Surface Elevation (ft): _____ Measuring Point (MP) Elevation (ft): _____ MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1										
2	<5	80	20			*C	100	SP		Silty sand w/ trace fine gravel, brown, dry, very dense road rock
3		80	20			*C	100	SP		Fine sand w/ some fine sands, yellowish, dry to slightly moist, medium dense
4										* Road Fill / Native Interface @ 2.6' bgs
5	0	100	0			*C	100	SP		Fine sand, yellowish-brown, dry to slightly moist, loose to medium sand ^dense
6										END OF HOLE
7										RW
8										
9										

*C California Split Sppon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.
Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project: NECR IRA RW Pond Rd

Boring ID: RW-SB-07

BORING LOCATION: Red Water Pond Rd

Date Drilled: 9/9/09 Date Completed: _____

Logged By: R. Young

Drilling Contractor: WDC

Drilling Method: HSA

Northing: _____ Easting: _____

Ground Surface Elevation (ft): _____

Measuring Point (MP) Elevation (ft): _____

MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1										
2	25	75	0			*C	100	SP		Fine to medium sand w/ some fine gravel, reddish brown to brown, medium dense to dense, dry to slightly moist (road fill)
3	5	85	10			*C	100	SP		Silty sand w/ trace fine gravel, yellowish-brn, medium dense, slightly moist, (native soil)
4										
5	<5	100	<5				100	SP		Fine sand w/ trace fines and trace fine gravel, yellowish-brown, dry to slightly moist, medium dense
6										
										END
7										
8										RJ
9										

*C California Split Sppon Sampler (2.5" I.D.)

S Standard penetration test sampler

c Cuttings

▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.

Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NELR IRA RW Pond Rd.	RW-SB-08

BORING LOCATION		
Red Water Pond Rd.	Date Drilled: 9/9/08 Date Completed: _____	Northing: _____ Easting: _____
	Logged By: R. Young	Ground Surface Elevation (ft): _____
	Drilling Contractor: WDC	Measuring Point (MP) Elevation (ft): _____
	Drilling Method: HSA	MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	% SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1	20	80	0			*C	100	SP		Gravelly sand, brown, fine-coarse gravel, dry to slightly moist, medium dense to dense (road fill)
2										
3	30	70	0			*C	100	SP		Gravelly sand, light brown, fine-coarse gravel up to 1" dry, very hard/dense, road fill/native ~3'
4	5	95	0			*C	100	SP		Fine sand w/some fine gravel, yellowish-brown, medium dense sand, dry to slightly moist
5										
6										
7										END OF HOLE
8										LJ
9										

*C California Split Sppon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.
Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NECR IRA RW Pond Rd.	RW-SB-09

BORING LOCATION: Red Water Pond Rd.

Date Drilled: 9/9/09 Date Completed: _____ Northing: _____ Easting: _____

Logged By: R. Young Ground Surface Elevation (ft): _____

Drilling Contractor: WDC Measuring Point (MP) Elevation (ft): _____

Drilling Method: HSA MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	GRAIN SIZE % SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1										
2	45	100				*C	100	SP		Fine sand w/ some fine gravel, dry to slightly moist, yellowish-bn, loose to medium dense sand
3		100				*C	100	SP		Fine sand, yellowish-bn, dry, very loose sand
4										
5	45	100				*C	100	SP		Fine to med sand, yellowish-bn, dry to slightly moist, medium dense, trace fine-coarse gravel
6										END OF HOLE
7										
8										RWJ
9										

*C California Split Sppon Sampler (2.5" I.D.)

S Standard penetration test sampler

c Cuttings

▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.

Moisture: dry, moist or wet

SOIL BORING LOG FORM

Project:	Boring ID:
NELR IRA Red Water Pond Rd.	RW-SB-10 (1')

BORING LOCATION		
Red Water Pond Rd.	Date Drilled: 4/4/09 Date Completed: _____ Logged By: Rob Young Drilling Contractor: WDC Drilling Method: HSA	Northing: _____ Easting: _____ Ground Surface Elevation (ft): _____ Measuring Point (MP) Elevation (ft): _____ MP is Ground Surface Datum: _____

DEPTH (FEET)	GRAIN SIZE % GRAVEL	GRAIN SIZE % SAND	% FINES	MAX. GAMMA READING (cpm)	BLOWS (6 IN.)	SAMPLE TYPE	% RECOVERY	USCS/ASTM CLASS	UNIT/LAYER	LITHOLOGIC DESCRIPTION (USCS name; color; size and angularity of each component or plasticity; density; moisture content; weathering, additional facts)
1						*C	RG 100	RG SP		
2	25	100					100	SP		Medium sand, some fine gravel, tan, loose sand, dry
3	0	100	0			*C				Fine sand, tan to yellowish-brown, loose sand, dry
4							100	SP		
5	0	100				*C	100	SP		As above, grades to dry to slightly moist
6										As above, finer material with depth
7		100				*C	100	SP		
8										EOH
										RG

*C California Split Sppon Sampler (2.5" I.D.)
S Standard penetration test sampler
c Cuttings
▼ Elevation of ground water

Unit/Layer: fill, road base, soil, alluvium, native, bedrock, etc.
Moisture: dry, moist or wet

FIELD-TESTED GAMMA RESULTS

NECR IRA RWPR RSE
Borehole Soil Sample Screening

PRB-01-08

Instrument:		Reference Material	1.9 pCi/g	Gross Counts	77059/5min	CPM	15412	Hole 10
		Reference Material	1.9 pCi/g	Gross Counts	77989/5MIN	CPM	15598	9
Background Counts		Reference Material	1.9 pCi/g	Gross Counts	98810/5min	CPM	19762	8
CPM		Reference Material		Gross Counts		CPM		

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/9/08	RW-SB-10 (1')	10	15994/1m	15994	
9/9/08	RW-SB-10 (2.5)	10	15678/1m	15678	
9/9/08	RW-SB-10 (4.0)	10	15855/1m	15855	
9/9/08	RW-SB-10 (5.5)	10	153571/1m	153571	
9/9/08	" "	"	80296/5m	16059	
"	"	"	15605/1m	15605	
"	"	"	15699/1m	15697	
9/9/08	RW-SB-09 (1.0)	9	14750/1m	14750	
9/9/08	RW-SB-09 (2.5)	9	14880/1m	14880	
9/9/08	RW-SB-09 (4.0)	9	15127/1m	15127	
9/9/08	RW-SB-09 (4.0)	9	15590/1m	15590	
9/9/08	RW-SB-08 (1.0)	8	19234/1m	19234	
"	RW-SB-08 (2.5)	8	19659/1m	19659	
"	RW-SB-08 (4.0)	8	38130/2m	19065	
"	RW-SB-08 (4.0)	8	19216/1m	19216	

NECR IRA RWPR RSE
Borehole Soil Sample Screening

PRB 1-08

Instrument:

								Hole
		Reference Material	1.9 pCi/g	Gross Counts	113242/5min	CPM	22648	7
		Reference Material	1.9 pCi/g	Gross Counts	104325/5 min	CPM	20865	6
Background Counts		Reference Material	1.9 pCi/g	Gross Counts	120197/5 min	CPM	24039	5
CPM		Reference Material	1.9 pCi/g	Gross Counts	92321 /5 min	CPM	18464	4

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/9/09	RW-SB-07 (1.0)	7	22176 /1mi	22176	•
9/9/09	RW-SB-07 (2.5)	"	21113 /1min	21113	•
9/9/09	RW-SB-07 (4.0)	"	21432/1min	21432	
9/9/09	RW-SB-07 (4.0)	"	21983 /1min	21983	
9/9/09	RW-SB-06 (1.0)	6	20587 /1min	20589	
9/9/09	RW-SB-06 (2.5)	"	20539/1min	20539	
9/9/09	RW-SB-06 (~~4.0~~) 2.5	"	20497/1min	20497	
9/9/09	RW-SB-06 (4.0)	"	40895 /2m	20447	
9/9/09	RW-SB-05 (1.0)	5	22840/1m	22840	
9/9/09	RW-SB-05 (2.5)	"	22855/1m	22855	SHORT SAMPLE/SMALLER THAN REF
9/9/09	RW-SB-05 (4.0)	"	23082/1m	23082	
9/9/09	"	"	22679/1m	22679	
9/9/09	RW-SB-05 (5.5)	"	24647 /1m	24647	
9/9/09	RW-SB-05 (5.5)	"	25028 /1m	25028	
9/9/09	RW-SB-04 (1.0)	4 17286	~~9239~~ /1m	17286	
9/9/09	RW-SB-04 (2.5)	"	17002/1m	17002	
9/9/09	RW-SB-04 (4.0)	"	17156/1m	17156	
9/9/09					

NECR IRA RWPR RSE
Borehole Soil Sample Screening

PRBI-08

Hole

Instrument:

		Reference Material	1.9 pCi/g	Gross Counts	89485/5m	CPM	17897	3
		Reference Material	1.9 pCi/g	Gross Counts	100324/5m	CPM	20064	2
Background Counts		Reference Material	1.9 pCi/g	Gross Counts	153119/5m	CPM	30624	1
CPM		Reference Material		Gross Counts		CPM		

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/9/09	RW-SB-03 (1.0)	3	17615/1MIN	17615	
9/9/09	RW-SB-03(2.5)	"	17181/1MIN	17181	SHORT SAMPLE
9/9/09	RW-SB-03(4.0)	"	16111/1min	16111	
9/9/09	RW-SB-02(1.0)	2	/1 min	20152	
9/9/09	RW-SB-02(2.5)	"	/1 min	19752	
9/9/09	RW-SB-02(4.0)	"	/1min	~~31~~	
9/9/09	RW-SB-01 (1.0)	1	31246/1 MIN	31246	
9/9/09	RW-SB-01 (2.5)	"	31444 /1 MIN	31444	
9/9/09	RW-SB-01 (4.0)	"	30269/1MIN	30269	

* Recheck done in office

NECR IRA RWPR RSE
Borehole Soil Sample Screening

Instrument:		Reference Material	1.9 pCi/g	Gross Counts	41598/5MIN	CPM	8320
		Reference Material		Gross Counts		CPM	
Background Counts		Reference Material		Gross Counts		CPM	
CPM		Reference Material		Gross Counts		CPM	

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/9/09	RW-SB-02 (4.0)	2	7706 /min	7706	Recheck in office
~~9/9/09~~	~~RW-SB-01 (1.0)~~	~~1~~			~~Recheck in office~~ RM
9/9/09	RW-SB-01 (1.0)	1	8059 /1min	8059	Recheck in office
9/9/09	RW-SB-01 (2.5)	1	8104 /1min	8104	Recheck in office
9/9/09	RW-SB-01 (4.0)	1	7522 /1min	7522	Recheck in office

NECR IRA RWPR RSE
Borehole Soil Sample Screening

Pit
21,
19,2

Instrument:		Reference Material	1.9 pCi/g	Gross Counts	72596/5min	CPM	14519
		Reference Material	1.9 pCi/g	Gross Counts	75691/5min	CPM	15138
Background Counts		Reference Material		Gross Counts		CPM	
CPM		Reference Material		Gross Counts		CPM	

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/10/09	RW-TP-21(0)	21	16923/1min	16923	Surface sample — Gravelly sand
9/10/09	RW-TP-21(2.0)	"	14796/1min	14796	Fine sand
9/10/09	RW-TP-21(3.0)	"	14733/1min	14733	↓
9/10/09	"	"	29508/2min	14754	↓
9/10/09	RW-TP-21(4.0)	"	14377/1min	14377	Gravelly sand
9/10/09	"	"	29749/2min	14874	↓
9/10/09	RW-TP-20(1.0)	20	29560/2min	14780	Gravelly sand, dense
9/10/09	RW-TP-20(3.0)	"	13742/1min	13742	↓
9/10/09	"	"	28562/2min	14281	↓
9/10/09	RW-TP-~~20~~ 19 (1.0)	19	15138/1min	15138	Fine sand
9/10/09	RW-TP-19(3.0)	"	15233/1min	15233	↓
9/10/09	"	"	15402/1min	15402	↓
9/10/09	RW-TP-19(4.0)	"	14929/1min	14929	↓
9/10/09	RW-TP-22(0)	22	16749/1min	16749	Surface Samp — Sandy gravel | gravelly sand
9/10/09	RW-TP-22(2)	"	13701/1min	13701	
9/10/09	RW-TP-22(3.0)	"	—/1min	—	NO SAMPLE - Bedrock@~2.5' bgs

NECR IRA RWPR RSE
Borehole Soil Sample Screening

TP

Instrument:		Reference Material	1.9 pCi/g	Gross Counts	85854 / 5 min	CPM	17170
		Reference Material	1.9 pCi/g	Gross Counts	99187 / 5 min	CPM	19837
Background Counts		Reference Material		Gross Counts	109196 / 5 min	CPM	21839
CPM		Reference Material		Gross Counts		CPM	

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/10/09	RW-TP-23 (1.0)	23	17391 / 1 min	17391	Gravelly sand
9/10/09	RW-TP-23 (2.0)	"	16776 / 1 min	16776	* spooned off sidewall — Fine sand
9/10/09	RW-TP-23 (3.0)	"	16716 / 1 min	16716	↓
9/10/09	"	"	33571 / 2 min	16785	↓
9/10/09	RW-TP-18 (1.0)	18	17014 / 1 min	17014	Fine sand w/ some gravel
9/10/09	RW-TP-18 (2.0)	"	16957 / 1 min	16957	Fine sand
9/10/09	RW-TP-18 (3.0)	"	17132 / 1 min	17132	↓
9/10/09	"	"	16584 / 1 min	16584	
9/10/09	RW-TP-17 (0)	17	26552 / 1 min	26552	SURFACE SAMP — Gravelly sand
9/10/09	RW-TP-17 (1.0)	"	20576 / 1 min	20576	Fine sand
9/10/09	RW-TP-17 (2.0)	"	19817 / 1 min	19817	↓
9/10/09	RW-TP-17 (3.0)	"	39369 / 2 min	19684	↓
9/10/09	RW-TP-24 (1.0)	24	19193 / 1 min	19193	Fine sand
9/10/09	RW-TP-24 (2.0)	"	19579 / 1 min	19579	w/ some gravel
9/10/09	RW-TP-24 (3.0)	"	39347 / 2 min	19637	↓
9/10/09	RW-TP-25 (0)	25	24416 / 1 min	24416	SURFACE SAMP — Fine sand
9/10/09	RW-TP-25 (1.0)	"	21639 / 1 min	21639	
9/10/09	RW-TP-25 (2.0)	"	21901 / 1 min	21901	↓
9/10/09	RW-TP-25 (3.0)	"	43480 / 2 min	21740	

NECR IRA RWPR RSE
Borehole Soil Sample Screening

Instrument:

		Reference Material	1.9 pCi/g	Gross Counts	109196/5 min	CPM	21839	16,25
		Reference Material	1.9 pCi/g	Gross Counts	106222/5 min	CPM	21244	26,19
Background Counts		Reference Material	1.9 pCi/g	Gross Counts	111738/5 min	CPM	223477	14,29
CPM		Reference Material		Gross Counts		CPM		

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/10/09	RW-TP-16(1.0)	16	21495/1min	21495	Gravelly sand
9/10/09	RW-TP-16(2.0)	"	21719/1min	21719	Fine sand
9/10/09	RW-TP-16(3.0)	"	43024/2min	21512	↓
9/10/09	RW-TP-26(1.0)	26	21369/1min	21369	* ROAD CUT BANK — Fine sand, red, very dense
9/10/09	RW-TP-26(2.0)	"	20895/1min	20895	* top of Road Cut
9/10/09	RW-TP-26(3.0)	"	43053/2min	21526	↓
9/10/09	RW-TP-26(3.0)	"	42904/2min	21452	↓
9/10/09	RW-TP-26(4.0)	"	42103/2min	21051	Loose, fine sand
9/10/09	RW-TP-15(0)	15	21236/1min	21236	SURFACE SAMP — Loose fine sand
9/10/09	RW-TP-15(1.0)	"	21561/1min	21561	↓
9/10/09	RW-TP-15(2.0)	"	20495/1min	20495	Gravelly sand
9/10/09	RW-TP-15(3.0)	"	40213/2min	20107	~~(med-coarse sand~~ + gravel) moist
9/10/09	RW-TP-14(1.0)	14	22302/1min	22302	- Gravelly sand
9/10/09	RW-TP-14(2.0)	"	21589/1min	21589	- (f-c sand) - moist to wet
9/10/09	RW-TP-14(3.0)	"	21570/1min	21570	- As above, wet
9/10/09	RW-TP-27(0)	27	23074/1min	23074	SURFACE SAMP — Fine sand, drg
9/10/09	RW-TP-27(1.0)	"	21156/1min	21156	Gravelly sand (fine-coa moist
9/10/09	RW-TP-27(2.0)	"	21439/1min	21439	↓
9/10/09	RW-TP-27(3.0)	"	42783/2min	21391	

NECR IRA RWPR RSE
Borehole Soil Sample Screening

TP

Instrument:

		Reference Material	1.9 pCi/g	Gross Counts	1096381/5M	CPM	21927
		Reference Material	1.9 pCi/g	Gross Counts	101280/5M	CPM	20256
Background Counts		Reference Material	1.9 pCi/g	Gross Counts	156067/5M	CPM	31213
CPM		Reference Material		Gross Counts		CPM	

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/10/09	RW-TP-28 (0)	28	22427 /1min	22427	SURFACE SAMP Very fine sand, dry
9/10/09	RW-TP-28 (1.0)	"	21814 /1min	21814	
9/10/09	RW-TP-28 (2.0)	"	216726/1min	21676	
9/10/09	RW-TP-28 (3.0)	"	43761/2min	21880	Silty sand, dry
9/10/09	RW-TP-13 (1.0)	13	21519 /1min	21519	Red, silty sand, moist
9/10/09	RW-TP-13 (2.0)	"	21692 /1min	21692	Brown, as above
9/10/09	RW-TP-13 (3.0)	"	40648/2min	20324	yellow-bn gravelly sand
9/10/09	RW-TP-12 (0)	12	22120/1min	22120	SURFACE SAMP Fine sand w/ some gravel
9/10/09	RW-TP-12 (1.0)	"	20158 /1min	20158	
9/10/09	RW-TP-12 (2.0)	"	20198/1min	20198	
9/10/09	RW-TP-12 (3.0)	"	40319 /2min	20159	As above, trace gravel
9/10/09	RW-TP-29 (1.0)	29	20503 /1min	20503	Fine sand w/ some gravel
9/10/09	RW-TP-29 (2.0)	"	19807 /1min	19807	
9/10/09	RW-TP-29 (3.0)	"	39890/2min	19945	
9/10/09	RW-TP-30 (1.0)	30	36338/1min	36338	Silty sand, yellow-brown dry
9/10/09	RW-TP-30 (2.0)	"	32574/1min	32574	
9/10/09	RW-TP-30 (3.0)	"	31937/1min	31937	
9/10/09	RW-TP-30 (3.0)	"	32625/1min	32625	
9/10/08	RW-TP-30 (4.0)	"	63762/2min	31881	
9/10/09	RW-TP-30 (5.0)	"	64029/2min	32014	As above, moist
9/10/09	RW-TP-30 (5.0)	"	63458/2min	31729	

28,13
12,29
30,1

NECR IRA RWPR RSE
Borehole Soil Sample Screening

JP

Instrument:		Reference Material	1.9 pCi/g	Gross Counts	156067/5m	CPM	31213	30, 11
		Reference Material	1.9 pCi/g	Gross Counts	31444/1m	CPM	31444	30, 11
Background Counts		Reference Material		Gross Counts		CPM		
CPM		Reference Material		Gross Counts		CPM		

Date	Soil Sample ID	Sample Location	Gross Gamma counts	Gross cpm	Comments
9/10/09	RW-TP-30(5.0)	30	64123/2min	32061	*definitely once a drainage; yllw-bn moist sandy silt
9/10/09	RW-TP-30(6.0)	11	62648/2min	31324	
9/10/09	RW-TP-30(6.0)	11	62774/2min	31387	
9/16/09	RW-TP-30(7.0)	11	63484/2min	31742	
9/10/09	RW-TP-30(7.0)	11	31632/1min	31632	
9/10/09	RW-TP-30(8.0)	11	31590/1min	31590	
9/10/09	RW-TP-30(8.0)	11	31444/1min	31444	
9/10/09	RW-TP-11(0)	11	44751/1min	44751	SURFACE SAMP Fine Sand, dry
9/10/09	RW-TP-11(1.0)	11	31306/1min	31306	As above, moist
9/10/09	RW-TP-11(2.0)	11	31606/1min	31606	
9/10/09	RW-TP-11(3.0)	11	31285/1min	31285	
9/10/09	RW-TP-11(3.0)	11	63172/2min	31586	
9/10/09	RW-TP-11(4.0)	11	62921/2min	31460	Sandy Silt
9/10/09	RW-TP-11(5.0)	11	62828/2min	31414	
9/10/09	RW-TP-11(6.0)	11			

FIELD NOTE BOOK

"Rite in the Rain®"
ALL-WEATHER WRITING PAPER

ALL-WEATHER

ENVIRONMENTAL FIELD BOOK

Name Rob Young / Jed Thompson

Address

Phone

Project NECR Drilling (IRA)
Redwater Pond Road
Sept. 2009

This book is printed on "Rite in the Rain" All-Weather Writing Paper - A unique paper created to shed water and enhance the written image. It is widely used throughout the world for recording critical field data in all kinds of weather. For best results, use a pencil or an all-weather pen.

Specifications for this book:

Location NECR Date 9/8/09

Project / Client UNC

~~-7000~~ - Met Jed in hotel lobby

RSC - Construction Ahead, R and L closed, only buses

Albuquerque Rental Co.
- Action Safety (505) 878-9690
- Highway Supply (505) 345-8295
- Convention Services (505) 243-9889

0920 - Phone calls to Rental Co's

Action Safety - Construction Ahead, one lane road, flagger (all x2), check on 15 mph signs

1000 - Travel to Albuquerque to pick up signage from Action Safety

1515 - Returned to NECR building

1545 - Drove site while Jed meets with NNEPA & EPA (Bill)

1600 - Deliver signage to site

Location RW Pond Rd. Date 9/9/09

Project / Client UNC R. Young

0630 - Depart LaQuinta
0645 - Meet Jed + Nat - drillers and floggers at UNC shop
0700 - Set up construction signs
0745 - Tailgate safety meeting w/ WSC, EPA, and NWH, and Rads
0800 - Drilled RW-SB-10 and sampled down to 7 feet bgs
0900 - EPA (Bill) found hole depth and final readings acceptable
0915 - Move rig and truck to RW-SB-09, re-reference the gamma meter
0920 - Start drilling RW-SB-09
0930 - No exceeding ref, 5.5 ft tot
0940 - Move and begin drilling RW-SB-08
1000
1010 - Moved to RW-SB-07
1030 - All samples clean
1035 - Move to RW-SB-06

Location Date 9/9/09

Project / Client

1100 - All samples below reference at RW-SB-06
1110 - Move to RW-SB-05
1130 - All samples below reference except deep outlier that is over but still w/in margin of error
1200 - LUNCH
1230 - Move to RW-SB-04
1245 - All samples below reference
1300 - Move rig + truck to RW-SB-03
1315 - All samples below RW-SB-03 below reference levels
1320 - Move rig + truck to RW-SB-02
1340 - All samples below reference
* had to use smaller bags, will take measurements / readings again at UNC building
1440 - Take down construction signs and load into UNC building
1540 - Begin splitting samples and prepping for shipment
1700 - END OF DAY @ site

Location NECR Date 9/10/09

Project / Client UNC/IRA R. Young

0605 - Depart hotel for UNC site
0630 - Arrive @ NECR
0700 - Calibrate gamma detector according to Nat's calibration steps
0730 - Prep sampling supplies and talk to Rick (UNC) bout getting the backhoe going
0820 - Arrive at Red Water Pond Rd and prep while waiting for backhoe
0840 - On-site (RW) w/ Ronald, backhoe operator, H&S meeting w/ Ron
0915 - Complete RW-TP-21 and move to RW-TP-20
0935 - Complete RW-TP-21 (clean @ 3.0 bgs) and move to RW-TP-19
0955 - Complete RW-TP-19 and move to RW-TP-22
1010 - Complete RW-TP-22, clean @ 2.0' bgs, bedrock @ 2.5' bgs, move rig to RW-TP-23
1030 - Complete RW-TP-23, clean @ 3.0' bgs, move to RW-TP-18

Location Date 9/10/09

Project / Client

1041 - Move to RW-TP-17 after RW-TP-18 was clean @ 3.0' bgs - Jed wants samples @ 1, 2, 3+ feet bgs now, even w/ surface samples
1115 - Move to RW-TP-~~25~~ 16 after finishing 17 and 24 (both clean and term at 3.0' bgs)
1130 - RW-TP-16 done, clean, 3.0' bgs TD, move rig to RW-TP-25
1240 - Move to RW-TP-15, 25 was hot (~200-300) @ 3.0', but found material well under ref @ 4.0' bgs
1300 - Lunch, move to RW-TP-14
1310 - Sample RW-TP-14, clean @ 1.0' bgs, go down to 3.0', move to RW-TP-27
1320 - RW-TP-27 to 3.0', move to RW-TP-28
1338 - RW-TP-28 clean, down to 3.0' bgs Move rig to RW-TP-13
1350 - RW-TP-13 down to 3.0' bgs, move to RW-TP-12 & 29

Location NECR Date 9/10/09

Project / Client UNC/IRA R. Young

1350 - Wipe out tube for gamma reader for 3rd time today
1410 - RW-TP-12 clean @ 1.0' bgs, taken to 3.0' bgs, move to RW-TP-29
1420 - RW-TP-29 down to 3.0' bgs, move backhoe to RW-TP-30
1505 - RW-TP-30 taken down to 8.0' bgs. Likely an old drainage as "hot material" below 3.0' bgs was fine sandy silt w/ some gravel, point also located in current ditch/drainage that leads to unnamed arroyo. Readings below ~224 pCi/g but ~~not~~ very close) not quite lower than the 1.9 pCi/g reference
1506 - Move to RW-TP-11
1520 - Leave site after nearing 1.9 pCi/g @ RW-TP-11 at approx. 6.0' bgs

Location NECR Date 9/11/09

Project / Client UNC/IRA

0630 - leave hotel
0700 - Sort + prep samples for shipment
1000 - Fill out shipping labels and prep for shipment. Load truck w/ construction signs to take back to Action Safety in Albuquerque.
1100 - Leave for Albuquerque
1600 - Back to Gallup and depart for SLC (Rob)

APPENDIX B

LABORATORY ANALYTICAL AND DATA VALIDATION RESULTS

LABORATORY REPORT

Due to its size (>900 pages), the laboratory report will be included on a disk in the printed version of this report only.

VALIDATION REPORT

DATA VERIFICATION REPORT

INTRODUCTION

This report presents a summary of the verification results for the sample data collected as for United Nuclear Corporation (UNC) specific to the Northeast Church Rock (NECR) site.

Samples were collected in September 2009 and were analyzed by ALS Laboratory Group of Fort Collins, Colorado. Samples were analyzed for radium-226 (Ra-226) by U.S. EPA method 901.1

The analytical results are expressed in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC). This data evaluation is presented in terms of the PARCC criteria and was based on the specific criteria presented in the *Quality Assurance Project Plan, United Nuclear Corporation, Northeast Church rock Site (QAPP),* (MWH 2006):

Data verification was performed by Laboratory Data Consultants (LDC) of Carlsbad, California. The verification report by LDC is attached to this report.

DATA VERIFICATION SUMMARY

Precision. Based on the laboratory replicate sample and field replicate results, the data are precise as reported.

Accuracy. Based on the calibration, and laboratory controls sample the data are accurate as qualified. Eighteen sample results were qualified by LDC with a "J+" flag, indicating a potential high bias, because the density of the sample was not within fifteen percent of the standard used to calibrate the instrument. A list of the samples qualified due to the sample density are listed below.

RW-SB-08(1.0)	RW-SB-05(5.5)	RW-TP-20(1.0)
RW-SB-07(1.0)	RW-SB-06(2.5)	RW-TP-14(3.0)
RW-SB-03(2.5)	RW-SB-06(1.0)	RW-TP-17(2.0)
RW-SB-01(1.0)	RW-SB-07(2.5)	RW-TP-13(1.0)
RW-SB-03(1.0)	RW-TP-11(3.0)	RW-TP-30(6.0)
RW-SB-06(12.5)	RW-TP-11(2.0)	RW-TP-11(0)DUP

Representativeness. Based on the results of the sample preservation and holding time evaluation; the method blank sample results; the field replicate sample evaluation; and the RL evaluation the data are considered representative of the site as reported.

Comparability. Standard methods of sample collection and standard units of measure were used during this project. The analysis performed by the laboratory was in accordance with current EPA methodology and the QAPP.

Completeness. Based on the results of the data verification, all data are considered valid as qualified.

APPENDIX C

STATISTICAL PLOTS AND RESULTS OF HYPTHOTHESIS TESTS USING ProUCL 4.0

STATISTICS EVALUATION MEMORANDUM
FEBRUARY 16, 2009

MWH

BUILDING A BETTER WORLD

MEMORANDUM

TO: Lance Hauer, GE

DATE: February 16, 2009

FROM: Leah Wolf Martin and Toby Leeson

CC: Larry Bush, UNC
Roger Florio, GE

SUBJECT: Statistical Evaluation of Gamma and Soil Analytical Results Along Red Water Pond Road, Northeast Church Rock Removal Site Evaluation

This memorandum provides a summary of a statistical data evaluation of gamma and soil analytical datasets from along Red Water Pond Road collected during the Northeast Church Rock Removal Site Evaluation (RSE). The collection and analysis of these data are presented in the *Removal Site Evaluation Report* (MWH, 2007) and *Supplemental Removal Site Evaluation Report* (MWH, 2008).

Objective

The objective of the statistical evaluation was to determine whether the Ra-226 concentrations are statistically different along Red Water Pond Road compared to Ra-226 concentrations in a reference area. Two separate datasets were compared consisting Ra-226 equivalent concentrations from the gamma surveying and concentrations from surface soil samples analyzed for Ra-226 in a laboratory. The gamma and surface soil data were collected as part of the Removal Site Evaluation (RSE) and Supplemental Removal Site Evaluation (SRSE) and these data as well as data collection methods are reported in the RSE and SRSE Reports (MWH, 2007 and MWH, 2008).

As reported in the Supplemental RSE Report (MWH, 2008), 100% of the gamma radiation measurements (Ra-226 equivalent) performed adjacent to the east and west sides of Red Water Pond Road, as well as the surface soil samples (Ra-226) collected adjacent to the road exceeded the field screening level (FSL) of 2.24 pCi/g. Elevated Ra-226 in soils near and beneath Red Water Pond Road may be associated with the historical use of this road as a haul road for former mine located to the north of the NECR site. In order to determine if the Ra-226 concentrations at sample locations adjacent to the Red Water Pond Road represent a different statistical population of data than from the area north of NECR-1 (reference area), the data from along Red Water Pond Road (within 50 feet) was statistically compared to data collected in the reference area north of NECR-1, as shown on Figure 1. If the populations are different, this implies that there are different sources of elevated Ra-226 concentrations in soils within these areas.

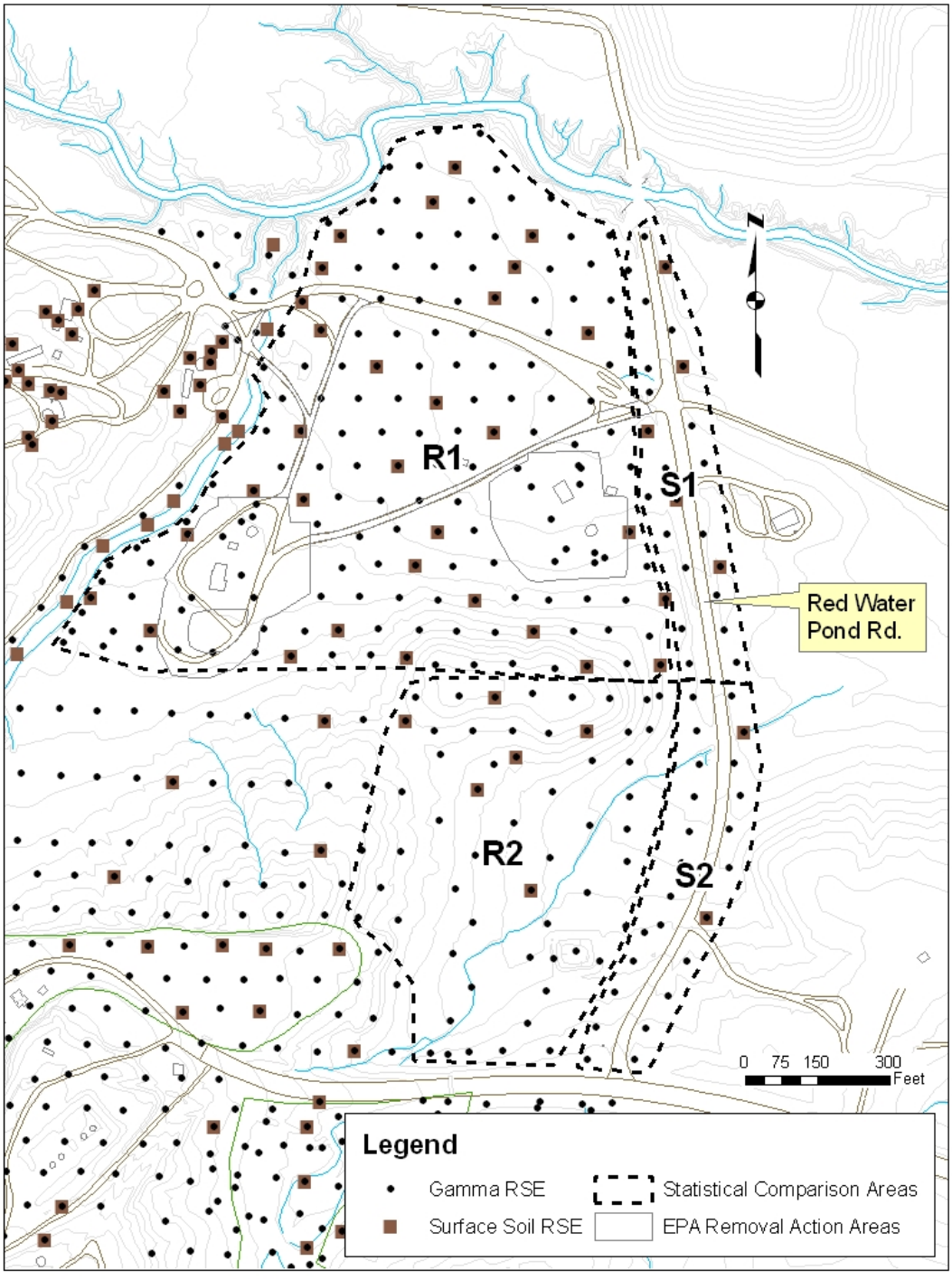

FIGURE 1 – STATISTICAL COMPARISON AREAS

Statistical Methods Background

The data were statistically analyzed using standard EPA methods included in the ProUCL 4.0 software. ProUCL contains statistical methods to address various environmental issues, as discussed in detail in the *ProUCL Version 4.0 Technical Guide* (EPA, 2007) and *Statistical Methods for Evaluating the Attainment of Cleanup Standards* (EPA, 1994). ProUCL was used to statistically evaluate the Red Water Pond Road and reference area data sets. Simple two-sample hypotheses testing methods were used to compare populations, including the Wilcoxon-Mann-Whitney (WMW) Rank Sum test and the quantile test. In addition, graphical displays of the data (side-by-side box plots and histograms) were used to further evaluate the data sets.

The WMW Rank Sum test and the quantile tests do not require a specific mathematical form for the underlying distribution and are called distribution-free or nonparametric statistical tests. As stated in the *ProUCL Technical Guide*: "*The property of robustness is the main advantage of nonparametric statistical tests. Nonparametric tests have good test performances for a wide variety of distributions, and those performances are not unduly affected by outliers." … "Nonparametric tests can be used on normal as well as for non-normal data sets. If one or both of the data sets fail to meet the normality test, or if the data sets appear to come from different types of populations, then the use of nonparametric tests is preferable. It should be noted that parametric tests are more powerful provided the underlying assumptions associated with those tests are satisfied. Nonparametric tests compare the shape and location of the two distributions instead of a statistical parameter such as mean."*

The WMW test is a nonparametric test used for determining whether a difference exists between the site and the reference or background population distributions. The WMW test analyzes whether or not numerical values (Ra-226 concentrations in pCi/g) from one population consistently tend to be larger (or smaller) than those from the other population. This test determines which distribution central tendency is higher by comparing the relative ranks of the two data sets when the data from both sources are sorted into a single list. One assumes that any difference between the background (reference area) and the site (area-of-concern) concentration distributions is due to a shift in location (mean, median) of the site concentrations to higher values (due to the presence of contamination in addition to the reference area).

One weakness of the WMW test is that it lacks power for the higher value end of the distribution, and it is therefore recommended that the quantile test (EPA, 1994) be used to compare the upper tails (higher values) of the two distributions. The quantile test (EPA, 1994) is a nonparametric test and is useful for detecting a shift to the right (higher values) in the right-tails of the data distribution between the site and background datasets. The quantile test, when used in parallel with the WMW test, provides the user with stronger, statistically more powerful evidence to make removal action decisions based on whether the site and reference area sample datasets represent different populations, and therefore different sources.

Statistical Evaluation

The reference area and Red Water Pond Road data sets were divided up into four areas: Reference Area 1 (R1), Reference Area 2 (R2), Survey Area 1 (S1), and Survey Area 2 (S2) for both the gamma and surface soil data, as shown on Figure 1. This was done to account for topographic features and allow for separate analysis of the northern and southern segments of Red Water Pond Road. Three scenarios were evaluated using the WMW and the quantile tests. Each of these scenarios is described below.

Scenario 1: Compared equivalent Ra-226 concentrations from gamma survey data between R1 and S1

Scenario 2: Compared equivalent Ra-226 concentrations from gamma survey data between R2 and S2

Scenario 3: Compared surface soil Ra-226 concentrations between R1 and S1

A comparison of surface soil Ra-226 concentrations was not performed for R2 and S2 due to the limited amount of data.

Sample numbers and a summary of sample statistics for each scenario are provided in Table 1.

Table 1
Scenario Summary Statistics

Scenario	Area	n	Min	Max	Mean	Median
Scenario 1	Reference (R1)	171	0.3-	12.2	2.673	2.4
Gamma	Red Water Pond (S1)	22	2.4	26.8	11.66	11.25
Scenario 2	Reference (R2)	56	0.3	45.9	6.788	3.8
Gamma	Red Water Pond (S2)	24	2.3	29.9	8.717	5.9
Scenario 3	Reference (R1)	25	0.7	26.6	3.992	1.8
Soil	Red Water Pond (S1)	5	2.9	28.5	14.36	17.1

For each of the three scenarios evaluated, the null and alternative hypotheses were as show below.

Null (H_0): Site or AOC Mean/Median Less Than or Equal to Background Mean/Median Concentration

Alternative (H_A): Site or AOC Mean/Median Greater Than Background Mean/Median

Where:

Site or AOC = Red Water Pond Road sites

Background = Reference area R1 or R2

The confidence coefficient was set to 95% (alpha = 0.05) for each of the evaluations. In addition, potential statistical outliers were not removed from the datasets since all potential outliers were located in the reference area and leaving them in the data sets was a conservative assumption.

Data Sets

See Figure 1 and worksheets in Attachment 1

ProUCL Output

See worksheets in Attachment 1

Results

The statistical data evaluation for the three scenarios using the WMW and quantile methods showed that there is a statistical difference in the mean/median concentrations between the Red Water Pond Road samples (area-of-concern) and the reference area (background) samples. The statistical difference is also evident in the box plots and histograms included for each scenario in Attachment 1. The evaluation showed that the mean/median of Red Water Pond Road sample concentrations is greater than the mean/median of the corresponding reference areas for each of the three scenarios as shown in Table 2. However, as shown in Table 3, the quantile test did not find that the Red Water Pond Road area (S2) concentrations were greater than the adjacent reference area (R2) and it deferred to the WMW analysis. The WMW analysis did conclude that the Red Water Pond Road area (S2) dataset represents a different population with a greater mean value of Ra-226 than the adjacent Reference area (R2) dataset.

Table 2 Wilcoxon-Mann-Whitney Results		
	p-Value	**Conclusion**
Scenario 1 (Gamma - R1 vs S1)	4.23E-12	Reject H_0, Conclude Site > Reference
Scenario 2 (Gamma - R2 vs S2)	2.45E-02	Reject H_0, Conclude Site > Reference
Scenario 3 (Soil - R1 vs S1)	4.46E-03	Reject H_0, Conclude Site > Reference

Table 3 Quantile Results				
	R	**K**	**# of Obs. in R Largest**	**Conclusion**
Scenario 1 (Gamma - R1 vs S1)	6	3	6	Reject H_0, Conclude Site > Reference
Scenario 2 (Gamma - R2 vs S2)	8	5	3	Do Not Reject H_0, Perform WMW
Scenario 3 (Soil - R1 vs S1)	6	3	3	Reject H_0, Conclude Site > Reference

References

MWH, 2007. Final Removal Site Evaluation Report Northeast Church Rock Mine Site. October 2007.

MWH, 2008. Final Supplemental Removal Site Evaluation Report Northeast Church Rock Mine Site. February 2008.

U.S. Environmental Protection Agency (EPA). *ProUCL Version 4.0 Technical Guide*, EPA/600/R-07/041, April 2007, www.epa.gov.

EPA. 1994. *Statistical Methods for Evaluating the Attainment of Cleanup Standards*, EPA 230-R-94-004, Washington, DC.

ATTACHMENT 1
SCENARIO DATA AND PROUCL OUTPUT

MWH

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MEMORANDUM

SCENARIO 1

Scenario 1 - Equivalent Ra-226 data comparing Areas R1 to Area S1

NORTHING	EASTING	LOCID	SURVEY_DAT	GAMMA	Equivalent Ra-226 (pCi/g)	Reference Area
1697293.1981	2523289.2032	HO-97	SUPP	4856	1.8	R1
1696738.6024	2523290.2435	HO-30	SUPP	5299	2.4	R1
1696962.6939	2523315.7743	HO-58	SUPP	5011	2.0	R1
1697083.0650	2523320.2077	HO-70	SUPP	4708	1.6	R1
1697368.9760	2523322.2624	HO-169	SUPP	4911	1.8	R1
1697226.2653	2523322.4746	HO-88	SUPP	5939	3.2	R1
1696812.2405	2523323.2692	HO-40	SUPP	5840	3.1	R1
1697499.3990	2523326.4325	HO-172	SUPP	6388	3.8	R1
1697593.8413	2523339.2969	HO-185	SUPP	5340	2.4	R1
1696689.0979	2523345.3590	N1-263	RSE	5352	1.2	R1
1697019.5318	2523360.0501	HO-64	SUPP	4933	1.9	R1
1696741.9649	2523360.3281	HO-153	SUPP	5522	2.6	R1
1697565.3024	2523364.6077	HO-174	SUPP	6374	3.7	R1
1697293.9289	2523366.8418	HO-98	SUPP	5472	2.6	R1
1697153.8785	2523368.2042	HO-79	SUPP	5039	2.0	R1
1697432.8191	2523368.5053	HO-115	SUPP	5708	2.9	R1
1696872.2074	2523368.5525	HO-51	SUPP	5326	2.4	R1
1697085.5093	2523399.3310	HO-71	SUPP	5299	2.4	R1
1697361.5439	2523401.2338	HO-107	SUPP	5612	2.8	R1
1697497.8231	2523401.2650	HO-123	SUPP	6556	4.0	R1
1697225.6704	2523402.0956	HO-89	SUPP	5272	2.3	R1
1696937.0568	2523403.2494	HO-59	SUPP	4913	1.8	R1
1696812.8290	2523405.1811	HO-41	SUPP	5713	2.9	R1
1696689.6257	2523427.0343	N1-264	RSE	5220	0.9	R1
1697640.4273	2523432.2910	HO-184	SUPP	4842	1.8	R1
1697293.3047	2523440.3651	HO-168	SUPP	5563	2.7	R1
1696744.7900	2523442.3316	HO-31	SUPP	5081	2.1	R1
1696879.1633	2523442.4045	HO-52	SUPP	5380	2.5	R1
1697434.7175	2523448.4397	HO-116	SUPP	5511	2.6	R1
1697574.1770	2523449.1143	HO-131	SUPP	9018	7.2	R1
1697012.0565	2523449.1575	HO-65	SUPP	4679	1.5	R1
1697154.0654	2523450.7110	HO-80	SUPP	5344	2.4	R1
1697709.8875	2523467.3554	HO-189	SUPP	5121	2.1	R1
1697500.7368	2523480.2934	HO-124	SUPP	5915	3.2	R1
1697640.1836	2523480.7564	HO-138	SUPP	7937	5.8	R1
1697361.6693	2523481.4379	HO-108	SUPP	5316	2.4	R1
1696952.0275	2523482.9651	HO-60	SUPP	6049	3.3	R1
1697226.3356	2523483.8814	HO-90	SUPP	5271	2.3	R1
1697084.7310	2523484.4020	HO-163	SUPP	4692	1.6	R1
1696807.8680	2523488.1690	HO-42	SUPP	4862	1.8	R1
1696684.3785	2523503.6449	N1-265	RSE	4908	0.3	R1
1696876.2910	2523520.1257	HO-158	SUPP	5794	3.0	R1
1696741.9422	2523528.6147	HO-32	SUPP	4988	1.9	R1
1697012.4663	2523528.7461	HO-66	SUPP	4083	0.8	R1
1697566.6616	2523528.7949	HO-132	SUPP	4643	1.5	R1
1697430.8998	2523529.3856	HO-117	SUPP	4586	1.4	R1
1697292.4792	2523529.6438	HO-99	SUPP	5627	2.8	R1
1697152.0630	2523529.7501	HO-81	SUPP	4530	1.4	R1
1697711.8961	2523529.9804	HO-142	SUPP	5465	2.6	R1
1697636.6337	2523558.6269	HO-176	SUPP	5291	2.3	R1
1697500.8413	2523560.4513	HO-125	SUPP	5013	2.0	R1
1696667.3521	2523561.4564	HO-21	SUPP	4569	1.4	R1
1697363.6388	2523562.2225	HO-109	SUPP	5368	2.4	R1
1697088.0045	2523564.1079	HO-72	SUPP	5358	2.4	R1
1697218.8086	2523566.4532	HO-167	SUPP	5588	2.7	R1
1696945.8745	2523567.5684	HO-159	SUPP	4860	1.8	R1
1696804.2213	2523567.6574	HO-43	SUPP	5025	2.0	R1
1697785.1640	2523568.6429	HO-144	SUPP	4280	1.0	R1
1696875.1129	2523600.0295	HO-53	SUPP	5694	2.9	R1
1697709.9159	2523604.7853	HO-177	SUPP	5821	3.0	R1
1696738.8047	2523606.4146	HO-33	SUPP	4979	1.9	R1
1697296.2867	2523607.5742	HO-100	SUPP	5568	2.7	R1
1697010.5167	2523608.5179	HO-67	SUPP	5271	2.3	R1
1697429.8810	2523609.5864	HO-118	SUPP	5659	2.8	R1
1697569.3874	2523609.6896	HO-133	SUPP	4636	1.5	R1

Scenario 1 - Equivalent Ra-226 data comparing Areas R1 to Area S1

NORTHING	EASTING	LOCID	SURVEY_DAT	GAMMA	Equivalent Ra-226 (pCi/g)	Reference Area
1697157.3791	2523610.0602	HO-82	SUPP	5015	2.0	R1
1697639.0630	2523638.8759	HO-139	SUPP	4980	1.9	R1
1697361.5981	2523640.0569	HO-110	SUPP	5367	2.4	R1
1697498.5525	2523640.8802	HO-126	SUPP	4870	1.8	R1
1697081.8744	2523641.5654	HO-73	SUPP	5096	2.1	R1
1697223.1768	2523642.2987	HO-91	SUPP	4564	1.4	R1
1696668.9092	2523643.1820	HO-22	SUPP	4489	1.3	R1
1696949.9501	2523644.4263	HO-61	SUPP	5093	2.1	R1
1696804.3156	2523646.3840	HO-156	SUPP	5064	2.0	R1
1697781.1191	2523657.4762	HO-145	SUPP	5552	2.7	R1
1697292.6556	2523682.9497	HO-101	SUPP	5834	3.0	R1
1697154.0641	2523685.5581	HO-165	SUPP	4650	1.5	R1
1696881.5308	2523686.1582	HO-54	SUPP	5522	2.6	R1
1697564.4367	2523687.0348	HO-134	SUPP	4715	1.6	R1
1696737.1572	2523687.4315	HO-34	SUPP	5438	2.5	R1
1697435.9304	2523688.2484	HO-171	SUPP	4810	1.7	R1
1697705.4593	2523689.0130	HO-143	SUPP	4517	1.3	R1
1697644.3791	2523721.3020	HO-140	SUPP	4952	1.9	R1
1697226.0756	2523721.4971	HO-92	SUPP	4852	1.8	R1
1696671.3805	2523723.0060	HO-23	SUPP	4490	1.3	R1
1697500.3379	2523729.0448	HO-173	SUPP	5355	2.4	R1
1696807.8341	2523730.0992	HO-44	SUPP	5185	2.2	R1
1697078.5743	2523733.9161	HO-74	SUPP	4511	1.3	R1
1697295.2253	2523763.1812	HO-102	SUPP	5477	2.6	R1
1697565.5100	2523767.0223	HO-175	SUPP	4939	1.9	R1
1696738.5032	2523767.2509	HO-154	SUPP	5186	2.2	R1
1697156.1673	2523767.9539	HO-83	SUPP	4972	1.9	R1
1697430.9790	2523770.2182	HO-119	SUPP	5136	2.1	R1
1696804.9894	2523799.6788	HO-45	SUPP	5275	2.3	R1
1697364.4495	2523800.7689	HO-111	SUPP	5429	2.5	R1
1697496.4496	2523801.4927	HO-127	SUPP	5128	2.1	R1
1697226.6179	2523803.7100	HO-93	SUPP	4965	1.9	R1
1697644.3888	2523803.7889	HO-141	SUPP	5004	2.0	R1
1696660.7854	2523811.7672	HO-24	SUPP	5261	2.3	R1
1697562.8385	2523845.9698	HO-135	SUPP	5461	2.6	R1
1697432.7483	2523850.4273	HO-120	SUPP	4944	1.9	R1
1696738.3113	2523850.4338	HO-35	SUPP	4925	1.9	R1
1697128.7662	2523855.0693	HO-84	SUPP	5105	2.1	R1
1696805.9407	2523879.1217	HO-46	SUPP	5254	2.3	R1
1696666.2354	2523880.6642	HO-151	SUPP	5169	2.2	R1
1697362.9089	2523883.6594	HO-112	SUPP	5606	2.8	R1
1697506.2342	2523887.9124	HO-128	SUPP	5443	2.5	R1
1697220.9735	2523888.6101	HO-94	SUPP	4554	1.4	R1
1696742.1878	2523925.8127	HO-36	SUPP	4972	1.9	R1
1697295.1176	2523925.9415	HO-103	SUPP	7945	5.8	R1
1697566.0685	2523927.2527	HO-136	SUPP	5565	2.7	R1
1697154.7490	2523928.8464	HO-85	SUPP	5266	2.3	R1
1697431.4127	2523930.5184	HO-121	SUPP	5562	2.7	R1
1696804.8951	2523961.6340	HO-47	SUPP	5324	2.4	R1
1696670.4705	2523962.6624	HO-25	SUPP	5584	2.7	R1
1697358.1963	2523967.1230	HO-113	SUPP	7854	5.7	R1
1696947.0097	2523969.3518	HO-160	SUPP	5121	2.1	R1
1697082.0656	2523971.2296	HO-75	SUPP	5265	2.3	R1
1696873.8718	2524004.5224	HO-55	SUPP	5435	2.5	R1
1697021.0794	2524008.9949	HO-68	SUPP	5961	3.2	R1
1696728.9038	2524011.7530	HO-37	SUPP	6246	3.6	R1
1696667.5057	2524033.4041	N1-307	RSE	5331	1.2	R1
1696805.7026	2524043.0972	HO-157	SUPP	5678	2.8	R1
1696715.8448	2522783.4751	N1-256	RSE	9588	11.4	R1
1696738.9804	2522803.2191	HO-27	SUPP	5035	2.0	R1
1696777.9933	2522823.1095	AB-038	RSE	4807	0.6	R1
1696810.1088	2522842.0667	HO-155	SUPP	4649	1.5	R1
1696843.4623	2522865.1922	AB-037	RSE	4904	0.3	R1
1696707.1191	2522866.6998	N1-257	RSE	5474	1.5	R1
1696877.4952	2522881.0483	HO-49	SUPP	5156	2.2	R1

Scenario 1 - Equivalent Ra-226 data comparing Areas R1 to Area S1

NORTHING	EASTING	LOCID	SURVEY_DAT	GAMMA	Equivalent Ra-226 (pCi/g)	Reference Area
1696738.6131	2522887.6805	HO-28	SUPP	4971	1.9	R1
1696811.6485	2522928.8471	HO-39	SUPP	5497	2.6	R1
1696913.6554	2522936.7355	AB-036	RSE	6174	3.2	R1
1696702.1501	2522943.7838	N1-258	RSE	14804	9.8	R1
1696740.9917	2522967.1524	HO-152	SUPP	10242	8.8	R1
1696882.0521	2522967.4542	HO-50	SUPP	7602	5.3	R1
1697045.1733	2523096.3287	AB-034	RSE	5705	2.1	R1
1697032.9621	2523183.3713	H6-004	RSE	18754	1.0	R1
1696694.6265	2523185.7424	N1-261	RSE	5966	1.0	R1
1696743.0978	2523202.5204	HO-29	SUPP	6437	3.8	R1
1697291.5409	2523202.5423	HO-96	SUPP	3332	0.3	R1
1697158.7948	2523208.7360	HO-78	SUPP	4921	1.9	R1
1697083.5838	2523239.0202	HO-69	SUPP	4968	1.9	R1
1697360.7206	2523241.0100	HO-106	SUPP	5440	2.5	R1
1697224.8791	2523243.0133	HO-87	SUPP	5685	2.9	R1
1696687.5852	2523261.7961	N1-262	RSE	5383	1.3	R1
1697156.7178	2523281.9420	HO-164	SUPP	4461	1.3	R1
1697428.7454	2523282.9853	HO-170	SUPP	7166	4.8	R1
1697015.6423	2523287.2060	HO-161	SUPP	5551	2.7	R1
0.0000	0.0000	AB-035	RSE	0	12.2	R1
0.0000	0.0000	H7-005	RSE	0	4.0	R1
725707.6450	3949321.1370	H6-001	RSE	19807	3.8	R1
725726.1400	3949334.4720	H6-002	RSE	20100	4.0	R1
725728.0420	3949342.5870	H6-003	RSE	20605	4.2	R1
725726.7900	3949351.1010	H6-004	RSE	18754	3.3	R1
725719.5290	3949331.3340	H6-005	RSE	20483	4.2	R1
725728.8700	3949283.0120	H7-001	RSE	17088	2.5	R1
725689.1070	3949281.8260	H7-002	RSE	24045	6.0	R1
725682.7730	3949273.4530	H7-003	RSE	34047	11.0	R1
725720.1870	3949297.0030	H7-004	RSE	18024	2.9	R1
725685.2780	3949321.7550	H7-005	RSE	20174	4.0	R1
725932.7300	3949373.4660	H8-001	RSE	18235	3.0	R1
725935.0480	3949372.3930	H8-002	RSE	19201	3.5	R1
725934.5230	3949361.5230	H8-003	RSE	18271	3.1	R1
725916.3430	3949339.2100	H8-004	RSE	18232	3.0	R1
725903.3180	3949359.0680	H8-005	RSE	18032	2.9	R1
725926.9180	3949319.8380	H9-001	RSE	17057	2.5	R1
725945.0950	3949318.5620	H9-002	RSE	18128	3.0	R1
725951.4820	3949315.7480	H9-003	RSE	18609	3.2	R1
725945.1260	3949312.2590	H9-004	RSE	18115	3.0	R1
725920.2140	3949312.1320	H9-005	RSE	16910	2.4	R1
1697494.6387	2523965.1635	HO-129	SUPP	18610	19.7	S1
1697564.7856	2524001.2472	HO-137	SUPP	12046	11.1	S1
1697429.6724	2524003.6701	HO-122	SUPP	16197	16.5	S1
1697287.0005	2524006.9987	HO-104	SUPP	10306	8.9	S1
1697157.3839	2524007.8808	HO-86	SUPP	6206	3.5	S1
1697238.8442	2524009.8298	HO-95	SUPP	7218	4.8	S1
1697500.4939	2524043.7053	HO-130	SUPP	24105	26.8	S1
1697079.7103	2524044.4833	HO-76	SUPP	13740	13.3	S1
1696942.5733	2524046.7427	HO-62	SUPP	6759	4.2	S1
1697369.7992	2524056.7847	HO-114	SUPP	21696	23.7	S1
1697015.9543	2524066.8313	HO-162	SUPP	14628	14.5	S1
1696743.2324	2524077.4819	N1-306	RSE	5827	2.4	S1
1697293.8022	2524081.6967	HO-105	SUPP	20401	22.0	S1
1696871.5203	2524085.0424	HO-56	SUPP	13149	12.6	S1
1696670.4993	2524093.3890	N1-305	RSE	7381	6.1	S1
1697168.0244	2524099.7556	HO-166	SUPP	19972	21.4	S1
1696941.2259	2524121.6305	HO-63	SUPP	7961	5.8	S1
1697090.0369	2524124.8698	HO-77	SUPP	9168	7.4	S1
1696815.0049	2524151.3963	HO-48	SUPP	5946	3.2	S1
1696874.2218	2524158.9861	HO-57	SUPP	7577	5.3	S1
1696742.0717	2524167.4277	HO-38	SUPP	12276	11.4	S1
1696673.6291	2524191.8017	HO-26	SUPP	12619	11.9	S1

From File: J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma3 eval\NECR Gamma3 r1s1.wst

Summary Statistics for Raw Full Data Sets

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Equivalent Ra-226 (pCi/g) (reference r1)	171	0.3	12.2	2.673	2.4	3.025	1.739	0.741	3.189	12.84	0.651
Equivalent Ra-226 (pCi/g) (red water pond road s1)	22	2.4	26.8	11.66	11.25	54.01	7.349	8.451	0.594	-0.76	0.63

Wilcoxon-Mann-Whitney Comparison Test for Full Data Sets without NDs - R1 vs S1

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma3 eval\NECR Gamma3 r1s1.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Equivalent Ra-226 (pCi/g)(red water pond road s1)

Background Data: Equivalent Ra-226 (pCi/g)(reference r1)

Raw Statistics

	Site	Background
Number of Valid Observations	22	171
Number of Distinct Observations	22	60
Minimum	2.4	0.3
Maximum	26.8	12.2
Mean	11.66	2.673
Median	11.25	2.4
SD	7.349	1.739
SE of Mean	1.567	0.133

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	3819
WMW Test U-Stat	6.83
WMW Critical Value (0.050)	1.645
P-Value	4.231E-12

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs) - R1 vs S1

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma3 eval\NECR Gamma3 r1s1.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Equivalent Ra-226 (pCi/g)(red water pond road s1)

Background Data: Equivalent Ra-226 (pCi/g)(reference r1)

Raw Statistics

	Site	Background
Number of Valid Observations	22	171
Number of Distinct Observations	22	60
Minimum	2.4	0.3
Maximum	26.8	12.2
Mean	11.66	2.673
Median	11.25	2.4
SD	7.349	1.739
SE of Mean	1.567	0.133

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.057)	6
Approximate K Value (0.057)	3
Number of Site Observations in 'R' Largest	6
Calculated Alpha	N/A

Conclusion with Alpha = 0.057

Reject H0, Conclude Site Concentration > Background Concentration

Outlier Tests for Selected Variables

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma3 eval\NECR Gamma3 r1s1.wst
Full Precision	OFF
Test for Suspected Outliers with Dixon test	1
Test for Suspected Outliers with Rosner test	1

Rosner's Outlier Test for Equivalent Ra-226 (pCi/g) (reference r1)

Number of data: 171
Number of suspected outliers: 1

#	Mean	sd	Potential outlier	Test value	Critical value (5%)	Critical value (1%)
1	2.67	1.73	12.2	5.49	3.5578	3.9278

For 5% Significance Level, there is 1 Potential Outlier
Therefore, Observation 12.2 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier
Therefore, Observation 12.2 is a Potential Statistical Outlier

Dixon's Outlier Test for Equivalent Ra-226 (pCi/g) (red water pond road s1)

Number of data = 22
10% critical value: 0.382
5% critical value: 0.43
1% critical value: 0.514

1. Data Value 26.8 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.206

For 10% significance level, 26.8 is not an outlier.
For 5% significance level, 26.8 is not an outlier.
For 1% significance level, 26.8 is not an outlier.

2. Data Value 2.4 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.056

For 10% significance level, 2.4 is not an outlier.
For 5% significance level, 2.4 is not an outlier.
For 1% significance level, 2.4 is not an outlier.

MWH

BUILDING A BETTER WORLD

MEMORANDUM

SCENARIO 2

Scenario 2 - Equivalent Ra-226 data comparing Areas R2 to Area S2

NORTHING	EASTING	LOCID	SURVEY_DAT	GAMMA	Equivalent Ra-226 (pCi/g)	Reference Area
1696139.0828	2523402.1260	N1-155	RSE	12924	6.8	r2
1696280.6708	2523408.8547	N1-185	RSE	5775	2.3	r2
1696202.0829	2523449.3123	N1-171	RSE	8180	8.0	r2
1696133.5417	2523483.9282	N1-156	RSE	13907	8.3	r2
1696277.0452	2523489.2626	N1-186	RSE	7340	6.0	r2
1696402.4925	2523493.0682	N1-213	RSE	7087	5.4	r2
1696551.4058	2523500.4611	N1-240	RSE	5073	0.3	r2
1696600.2543	2523522.2457	HO-15	SUPP	5492	2.6	r2
1695855.3543	2523553.0822	N1-268	RSE	21443	20.4	r2
1696531.2395	2523561.1157	HO-9	SUPP	5281	2.3	r2
1696341.9186	2523569.2801	N1-286	RSE	6445	3.9	r2
1696479.9067	2523573.5520	N1-292	RSE	5050	0.3	r2
1695854.2251	2523588.3375	N1-311	RSE	20578	19.0	r2
1695925.1106	2523594.8560	N1-270	RSE	10077	2.2	r2
1696063.3652	2523599.5239	N1-273	RSE	6368	3.7	r2
1696200.4066	2523603.1132	N1-280	RSE	18294	15.4	r2
1696602.2977	2523612.6999	HO-16	SUPP	5243	2.3	r2
1695859.2042	2523632.8369	N1-355	SUPP	12476	11.7	r2
1695994.0896	2523637.4179	N1-271	RSE	8904	9.8	r2
1696130.0183	2523639.7301	N1-277	RSE	9384	10.9	r2
1696530.2309	2523640.3559	HO-10	SUPP	6241	3.6	r2
1696269.2001	2523645.4046	N1-283	RSE	8327	8.4	r2
1696408.2536	2523650.8204	N1-289	RSE	5400	1.4	r2
1696460.3899	2523685.1739	HO-8	SUPP	6752	4.2	r2
1696601.1002	2523687.3618	HO-149	SUPP	4846	1.8	r2
1695861.1880	2523703.2671	N1-354	SUPP	10183	8.7	r2
1696530.1807	2523723.1579	HO-11	SUPP	5599	2.7	r2
1696337.5762	2523725.7591	N1-287	RSE	7617	6.7	r2
1696475.4675	2523731.0091	N1-293	RSE	6158	3.2	r2
1695918.8023	2523755.5384	N1-269	RSE	7047	5.3	r2
1696057.7200	2523759.2721	N1-274	RSE	16528	12.5	r2
1696197.1057	2523762.1950	N1-281	RSE	37406	45.9	r2
1696608.4692	2523764.9975	HO-17	SUPP	5222	2.3	r2
1695985.9171	2523794.1780	N1-272	RSE	5967	2.7	r2
1696126.5474	2523796.8390	N1-278	RSE	10609	3.1	r2
1696525.8443	2523800.6154	HO-12	SUPP	5341	2.4	r2
1696264.5326	2523803.0631	N1-284	RSE	8666	9.2	r2
1695861.0751	2523803.2487	N1-353	SUPP	8868	7.0	r2
1696402.7632	2523807.5771	N1-290	RSE	6467	3.9	r2
1696053.8601	2523808.9830	N1-275	RSE	6410	3.8	r2
1696601.5618	2523849.2177	HO-18	SUPP	5546	2.7	r2
1696530.5017	2523879.1999	HO-148	SUPP	5697	2.9	r2
1696193.1046	2523880.2918	N1-282	RSE	8298	8.3	r2
1696331.9110	2523886.6040	N1-288	RSE	27874	30.7	r2
1696469.2483	2523891.9763	N1-294	RSE	6353	3.6	r2
1696049.9303	2523905.0868	N1-276	RSE	5614	1.9	r2
1696597.9025	2523927.4231	HO-19	SUPP	4669	1.5	r2
1696323.6795	2523964.1445	N1-296	RSE	20349	18.6	r2
1696257.9956	2523964.6454	N1-285	RSE	6452	3.9	r2
1696527.8668	2523967.3749	HO-13	SUPP	6004	3.3	r2
1696393.2090	2523967.6553	N1-291	RSE	14088	8.6	r2
1696465.6634	2523969.3676	N1-300	RSE	6387	3.7	r2
1696596.8228	2524005.8130	HO-20	SUPP	6115	3.4	r2
1696531.9957	2524009.4148	N1-302	RSE	6428	3.8	r2
1696604.6148	2524032.3910	N1-303	RSE	5243	1.0	r2
1696070.3149	2523857.4809	N1-357	SUPP	55680	1.8	r2
1695843.4819	2523879.2739	N1-352	SUPP	7705	5.5	s2
1695910.4983	2523897.3545	N1-310	RSE	6602	4.2	s2

Scenario 2 - Equivalent Ra-226 data comparing Areas R2 to Area S2

NORTHING	EASTING	LOCID	SURVEY_DAT	GAMMA	Equivalent Ra-226 (pCi/g)	Reference Area
1695984.6960	2523938.3217	N1-309	RSE	5799	2.3	s2
1696048.4175	2523976.7508	N1-308	RSE	6076	3.0	s2
1695842.9565	2523978.7251	HO-1	SUPP	13800	13.4	s2
1696109.2062	2524000.4809	N1-356	SUPP	5568	2.7	s2
1695909.6391	2524002.0259	HO-2	SUPP	8143	6.0	s2
1696124.7711	2524033.0614	N1-350	RSE	5860	2.5	s2
1695977.0511	2524050.0631	HO-3	SUPP	6785	4.3	s2
1696184.3169	2524054.0359	N1-351	RSE	6835	4.8	s2
1696253.6105	2524078.1060	N1-295	RSE	7101	5.4	s2
1696048.3149	2524089.4613	HO-4	SUPP	5842	3.1	s2
1696319.4503	2524095.0271	N1-297	RSE	8397	8.5	s2
1696599.9394	2524102.1515	N1-304	RSE	8326	8.4	s2
1696391.8075	2524104.2509	N1-298	RSE	8367	8.5	s2
1696531.4170	2524110.4368	N1-301	RSE	12180	5.6	s2
1696460.2689	2524114.6014	N1-299	RSE	24537	25.4	s2
1696141.2178	2524129.2453	HO-146	SUPP	8176	6.1	s2
1696243.4281	2524175.9179	HO-5	SUPP	10436	9.0	s2
1696324.7241	2524176.9654	HO-6	SUPP	9805	8.2	s2
1696602.4717	2524183.1347	HO-150	SUPP	26529	29.9	s2
1696462.6587	2524188.0379	HO-147	SUPP	24617	27.5	s2
1696394.5915	2524200.0258	HO-7	SUPP	7930	5.8	s2
1696527.7237	2524208.8070	HO-14	SUPP	10488	9.1	s2

From File: J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma4 eval\NECR gamma4 r2s2.wst

Summary Statistics for Raw Full Data Sets

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Equivalent Ra-226 (pCi/g) (reference r2)	56	0.3	45.9	6.788	3.8	60.9	7.804	2.891	3.088	11.94	1.15
Equivalent Ra-226 (pCi/g) (red water pond road s2)	24	2.3	29.9	8.717	5.9	60.51	7.779	3.855	1.954	2.916	0.892

Wilcoxon-Mann-Whitney Test for Full Data Sets without NDs - Area R2 vs Area S2

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma4 eval\NECR gamma4 r2s2.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Equivalent Ra-226 (pCi/g)(red water pond road s2)
Background Data: Equivalent Ra-226 (pCi/g)(reference r2)

Raw Statistics

	Site	Background
Number of Valid Observations	24	56
Number of Distinct Observations	23	43
Minimum	2.3	0.3
Maximum	29.9	45.9
Mean	8.717	6.788
Median	5.9	3.8
SD	7.779	7.804
SE of Mean	1.588	1.043

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	1160
WMW Test U-Stat	1.969
WMW Critical Value (0.050)	1.645
P-Value	0.0245

Conclusion with Alpha = 0.05
Reject H0, Conclude Site > Background
P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs) - Area R2 vs Area S2

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma4 eval\NECR gamma4 r2s2.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Equivalent Ra-226 (pCi/g)(red water pond road s2)
Background Data: Equivalent Ra-226 (pCi/g)(reference r2)

Raw Statistics

	Site	Background
Number of Valid Observations	24	56
Number of Distinct Observations	23	43
Minimum	2.3	0.3
Maximum	29.9	45.9
Mean	8.717	6.788
Median	5.9	3.8
SD	7.779	7.804
SE of Mean	1.588	1.043

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.058)	8
Approximate K Value (0.058)	5
Number of Site Observations in 'R' Largest	3
Calculated Alpha	0.0485

Conclusion with Alpha = 0.058
Do Not Reject H0, Perform Wilcoxon-Mann-Whitney Ranked Sum

Outlier Tests for Selected Variables

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Gamma4 eval\NECR gamma4 r2s2.wst
Full Precision	OFF
Test for Suspected Outliers with Dixon test	1
Test for Suspected Outliers with Rosner test	1

Rosner's Outlier Test for Equivalent Ra-226 (pCi/g) (reference r2)

Number of data: 56
Number of suspected outliers: 1

#	Mean	sd	Potential outlier	Test value	Critical value (5%)	Critical value (1%)
1	6.79	7.73	45.9	5.06	3.172	3.528

For 5% Significance Level, there is 1 Potential Outlier
Therefore, Observation 45.9 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier
Therefore, Observation 45.9 is a Potential Statistical Outlier

Dixon's Outlier Test for Equivalent Ra-226 (pCi/g) (red water pond road s2)

Number of data = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497

1. Data Value 29.9 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.165

For 10% significance level, 29.9 is not an outlier.
For 5% significance level, 29.9 is not an outlier.
For 1% significance level, 29.9 is not an outlier.

2. Data Value 2.3 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.017

For 10% significance level, 2.3 is not an outlier.
For 5% significance level, 2.3 is not an outlier.
For 1% significance level, 2.3 is not an outlier.

MWH

BUILDING A BETTER WORLD

MEMORANDUM

SCENARIO 3

Scenario 3 - Surface Soil Ra-226 data comparing soil data north R1 vs S1

Point	Sample ID	Ra-226 Conc (pCi/g)	Area Code
1	HO-451	1.1	Reference
2	HO-461	1.2	Reference
3	H0-458	1.4	Reference
4	HO-462	1.7	Reference
5	HO-456	1.8	Reference
6	HO-460	1.9	Reference
7	HO-430	2.9	Survey
8	HO-453	3.2	Reference
9	HO-432	3.4	Reference
10	HO-452	4.1	Reference
11	HO-429	4.6	Survey
12	HO-448	17.1	Survey
13	HO-449	17.1	Reference
14	HO-431	18.7	Survey
15	HO-433	28.5	Survey
16	HO-459	2.5	Reference
17	HO-463	4.8	Reference
18	HO-457	4.4	Reference
19	HO-455	9.5	Reference
20	HO-454	26.6	Reference
21	HO-450	0.9	Reference
22	HO-447	2.5	Reference
23	HO-445	1.3	Reference
24	HO-444	2.9	Reference
25	HO-439	0.9	Reference
26	HO-442	1.5	Reference
27	HO-446	1.7	Reference
28	NECR1-262	1.4	Reference
29	HO-441	0.7	Reference
30	HO-438	1.3	Reference

From File: J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Soil ra226 eval2\NECR soil data north.wst

Summary Statistics for Raw Full Data Sets

Variable	NumObs	Minimum	Maximum	Mean	Median	Variance	SD	MAD/0.675	Skewness	Kurtosis	CV
Ra-226 Conc (pCi/g) (reference)	25	0.7	26.6	3.992	1.8	34.19	5.848	1.038	3.101	9.972	1.465
Ra-226 Conc (pCi/g) (red wate pond road)	5	2.9	28.5	14.36	17.1	113.2	10.64	16.9	0.171	-1.495	0.741

Wilcoxon-Mann-Whitney Comparison Test for Full Data Sets without NDs - Soil Data North

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Soil ra226 eval2\NECR soil data north.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Ra-226 Conc (pCi/g)(red wate pond road)

Background Data: Ra-226 Conc (pCi/g)(reference)

Raw Statistics

	Site	Background
Number of Valid Observations	5	25
Number of Distinct Observations	5	20
Minimum	2.9	0.7
Maximum	28.5	26.6
Mean	14.36	3.992
Median	17.1	1.8
SD	10.64	5.848
SE of Mean	4.759	1.17

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	125
WMW Test U-Stat	110
WMW Critical Value (0.050)	99
Approximate P-Value	0.00446

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs) - Soil Data North

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Soil ra226 eval2\NECR soil data north.wst
Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Ra-226 Conc (pCi/g)(red wate pond road)

Background Data: Ra-226 Conc (pCi/g)(reference)

Raw Statistics

	Site	Background
Number of Valid Observations	5	25
Number of Distinct Observations	5	20
Minimum	2.9	0.7
Maximum	28.5	26.6
Mean	14.36	3.992
Median	17.1	1.8
SD	10.64	5.848
SE of Mean	4.759	1.17

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.041)	6
Approximate K Value (0.041)	3
Number of Site Observations in 'R' Largest	3
Calculated Alpha	0.0413

Conclusion with Alpha = 0.041

Reject H0, Conclude Site Concentration > Background Concentration

Outlier Tests for Selected Variables

User Selected Options

From File	J:\1004747 UNC NE Church Rock\Data Repository\Rank Sum Tests - Red Water Pond Rd\Soil ra226 eval2\NECR soil data north.wst
Full Precision	OFF
Test for Suspected Outliers with Dixon test	1
Test for Suspected Outliers with Rosner test	1

Rosner's Outlier Test for Ra-226 Conc (pCi/g) (reference)

Number of data: 25

Number of suspected outliers: 1

#	Mean	sd	Potential outlier	Test value	Critical value (5%)	Critical value (1%)
1	3.99	5.73	26.6	3.95	2.82	3.14

For 5% Significance Level, there is 1 Potential Outlier

Therefore, Observation 26.6 is a Potential Statistical Outlier

For 1% Significance Level, there is 1 Potential Outlier

Therefore, Observation 26.6 is a Potential Statistical Outlier

ɔn's Outlier Test for Ra-226 Conc (pCi/g) (red wate pond road)

Number of data = 5

10% critical value: 0.557

5% critical value: 0.642

1% critical value: 0.78

1. Data Value 28.5 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.383

For 10% significance level, 28.5 is not an outlier.

For 5% significance level, 28.5 is not an outlier.

For 1% significance level, 28.5 is not an outlier.

2. Data Value 2.9 is a Potential Outlier (Lower Tail)?

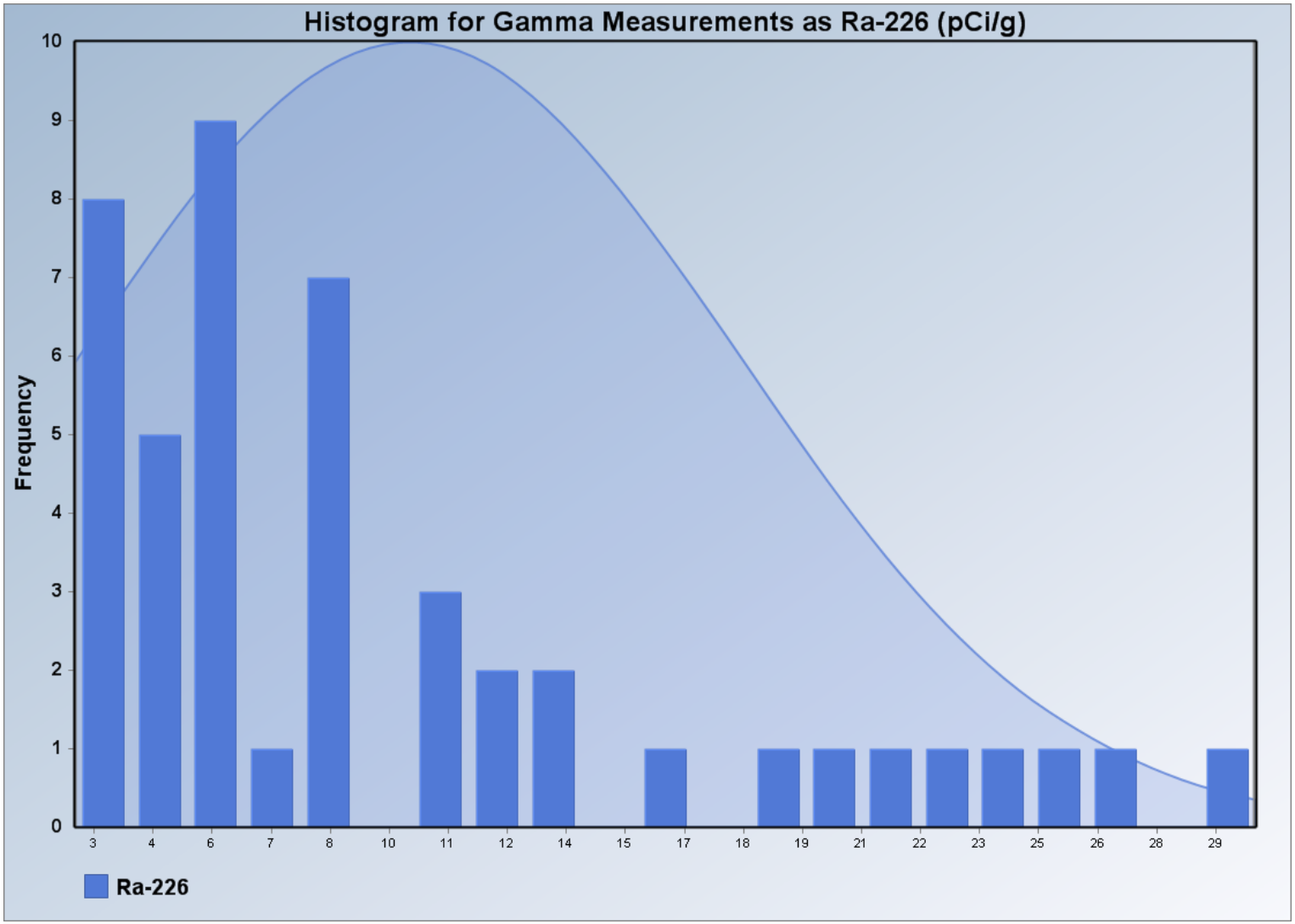
Test Statistic: 0.066

For 10% significance level, 2.9 is not an outlier.

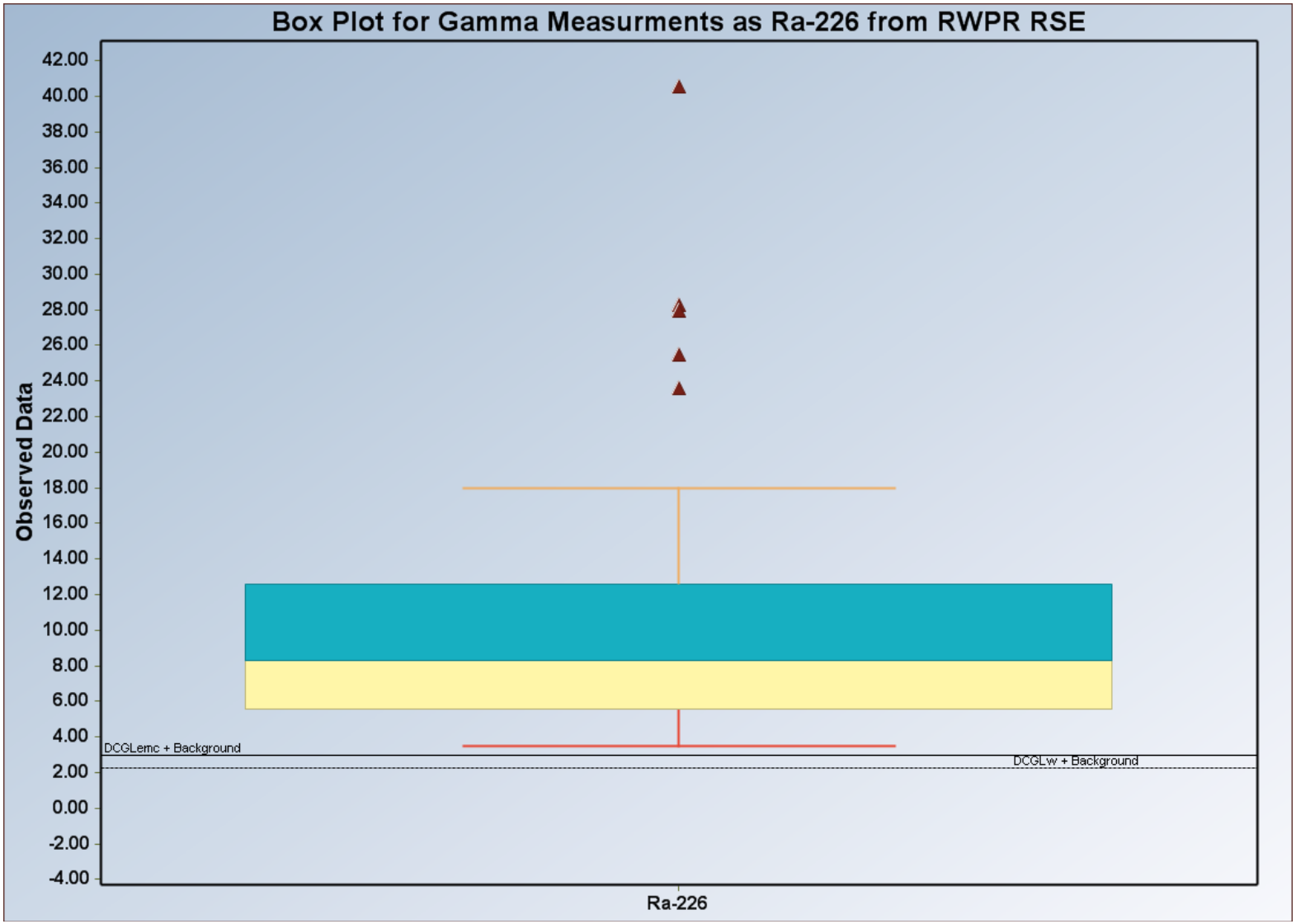
For 5% significance level, 2.9 is not an outlier.

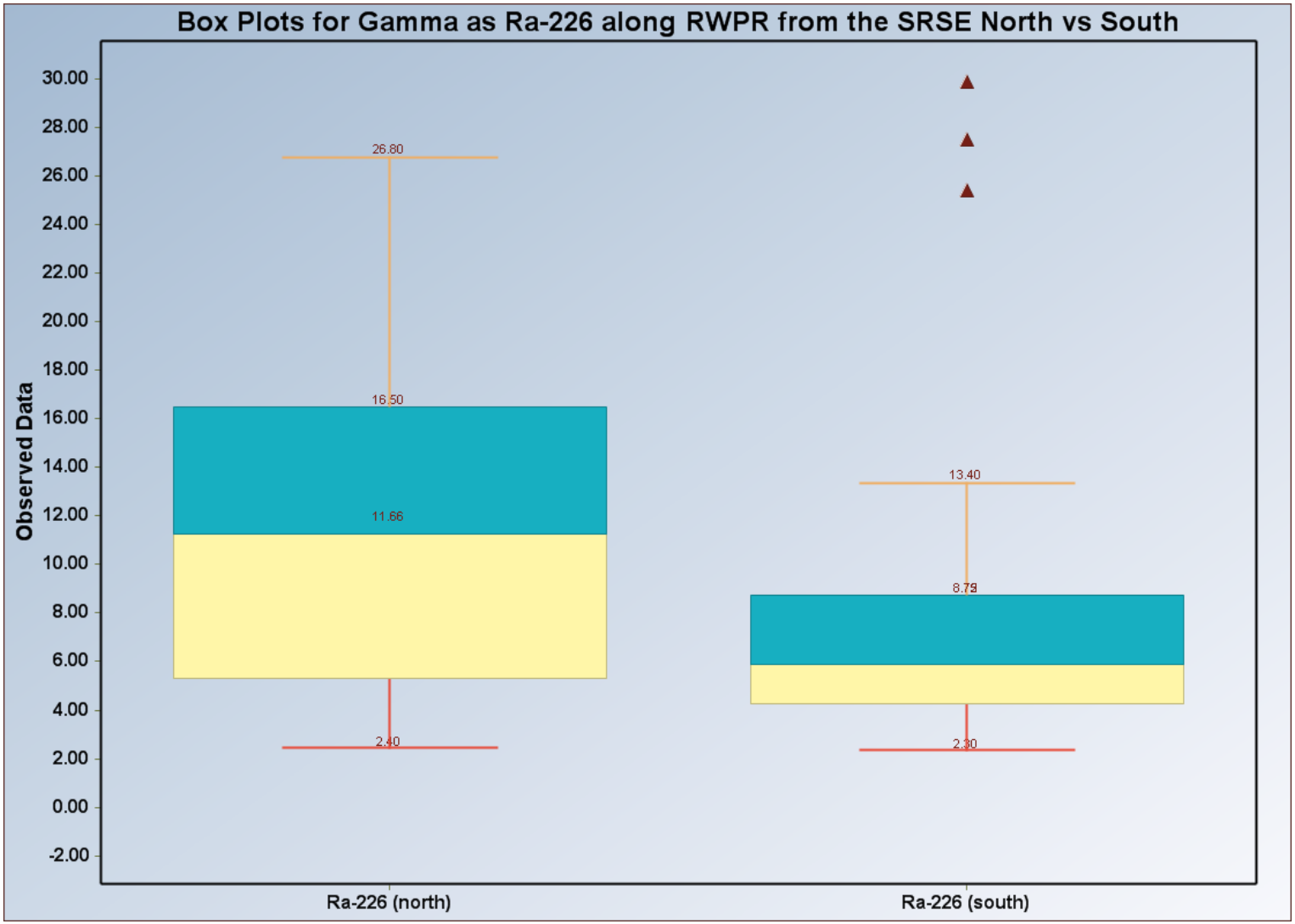
STATISTICAL PLOTS

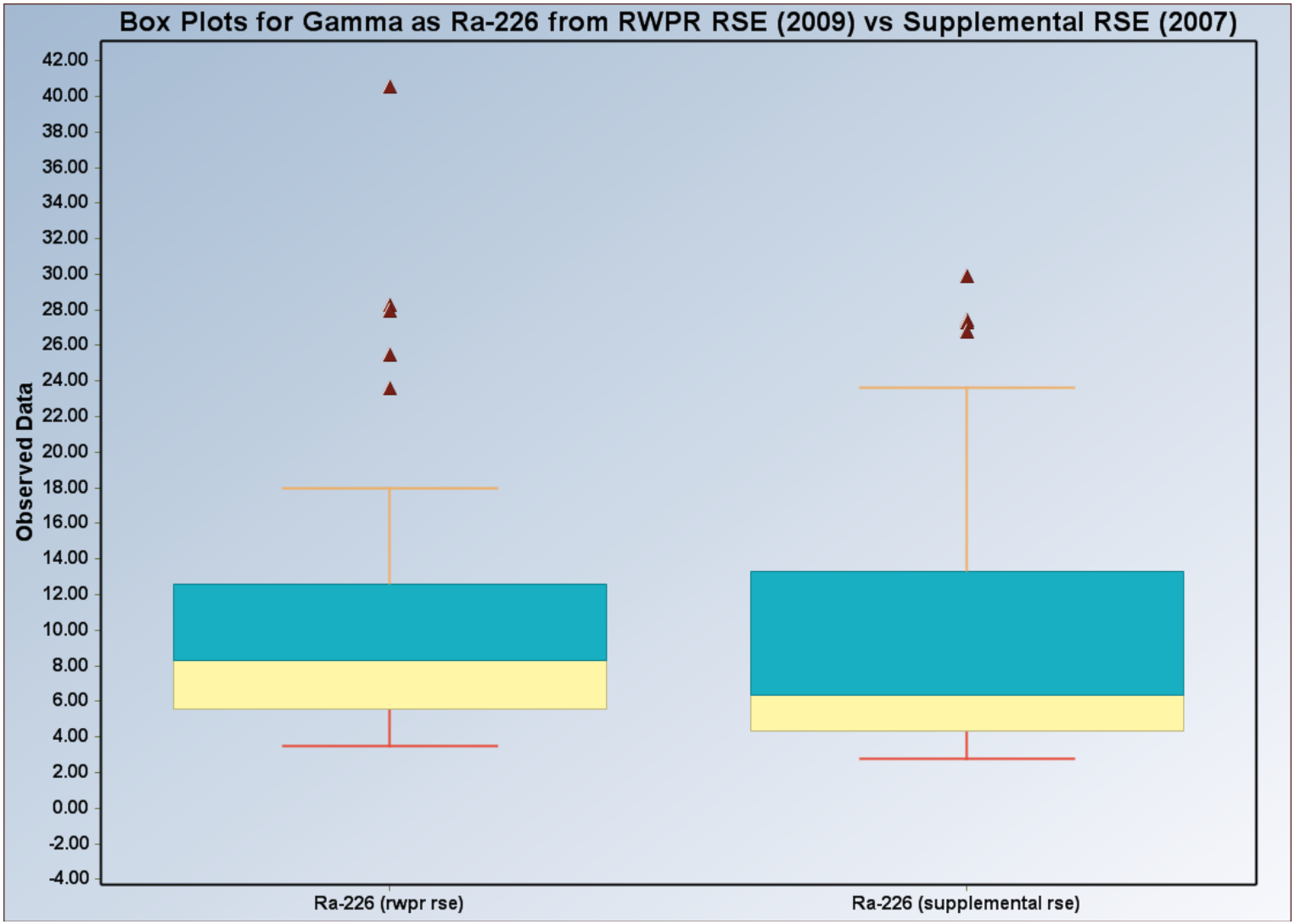
STATIC GAMMA RADIATION MEASUREMENTS

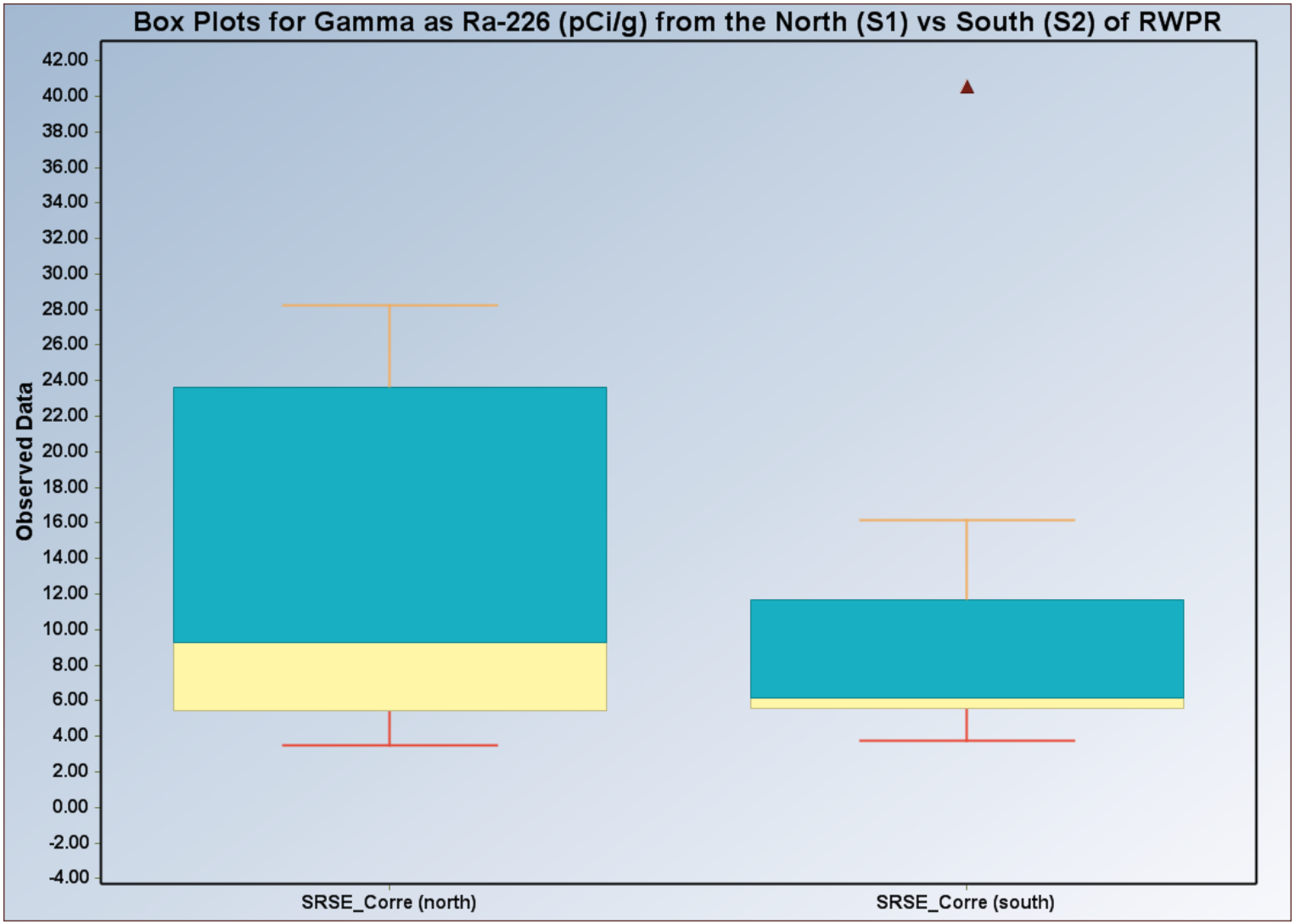


Static Gamma Measurements as Ra-226 from the RWPR RSE

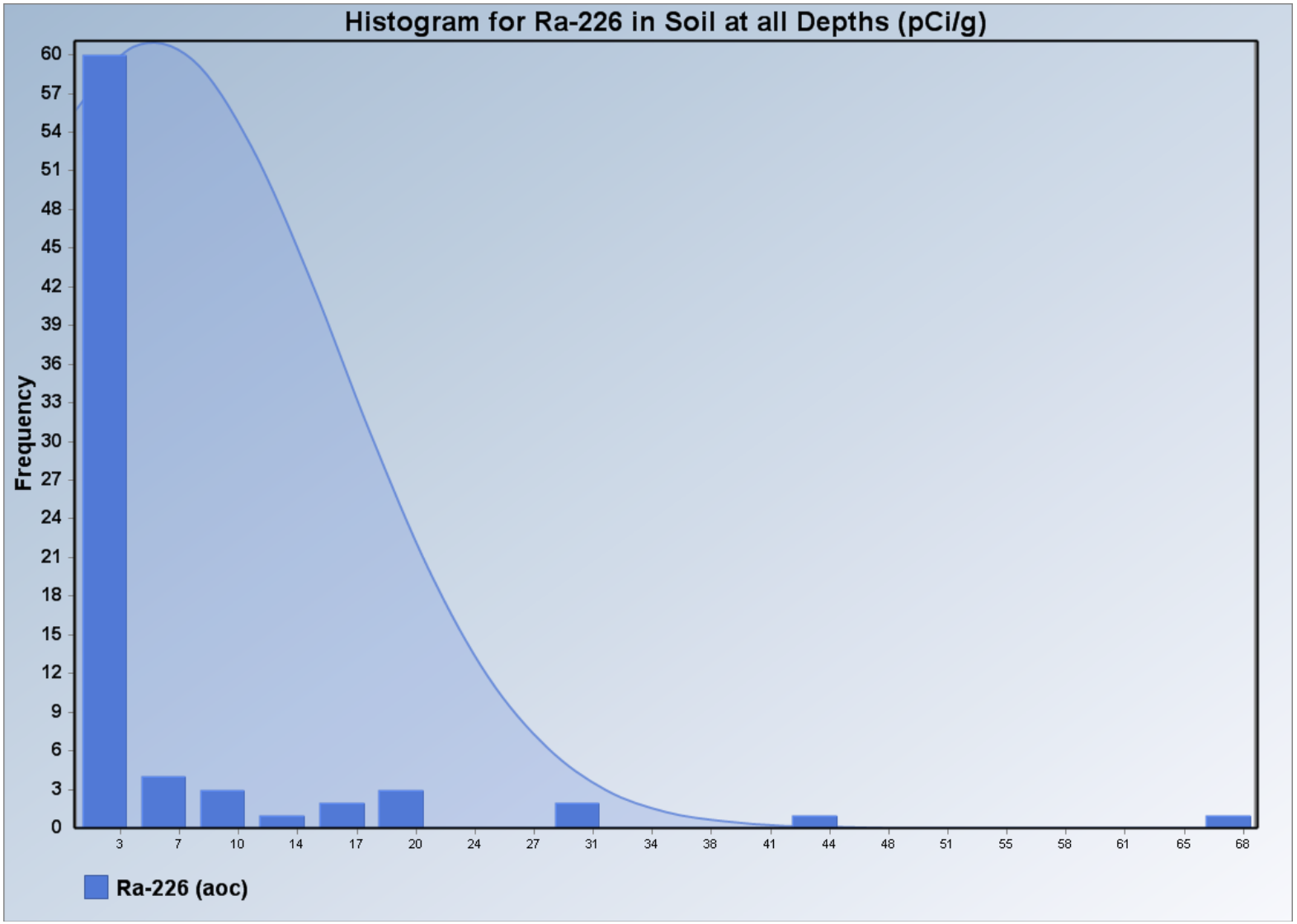

Box Plot for Gamma Measurments as Ra-226 from RWPR RSE
Observed Data
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
DCGLemc + Background
DCGLw + Background
Ra-226

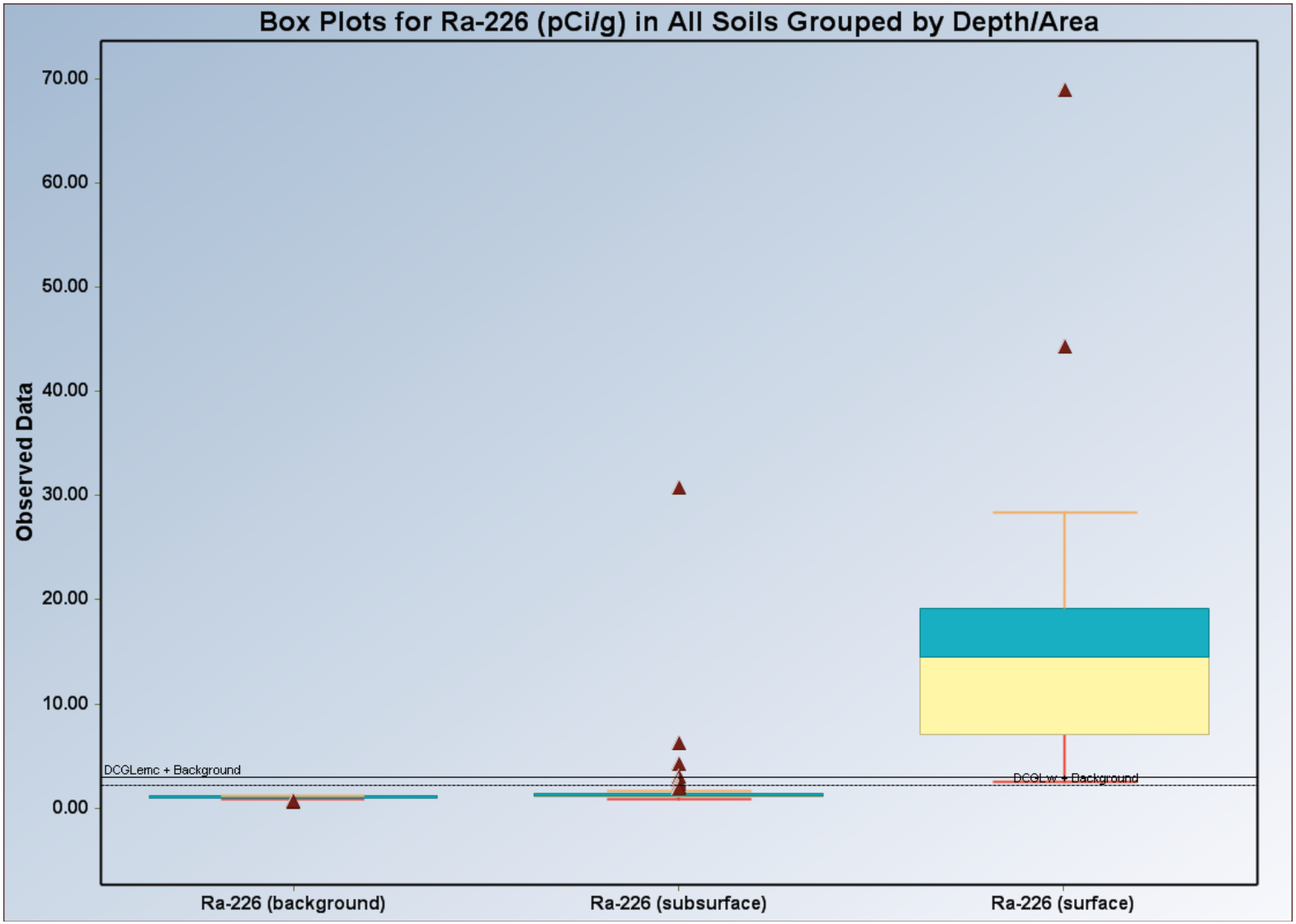

Box Plots for Gamma as Ra-226 along RWPR from the SRSE North vs South
Observed Data
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
26.80
16.50
11.66
2.40
13.40
8.79
2.30
Ra-226 (north)
Ra-226 (south)


Box Plots for Gamma as Ra-226 from RWPR RSE (2009) vs Supplemental RSE (2007)
Observed Data
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
Ra-226 (rwpr rse)
Ra-226 (supplemental rse)

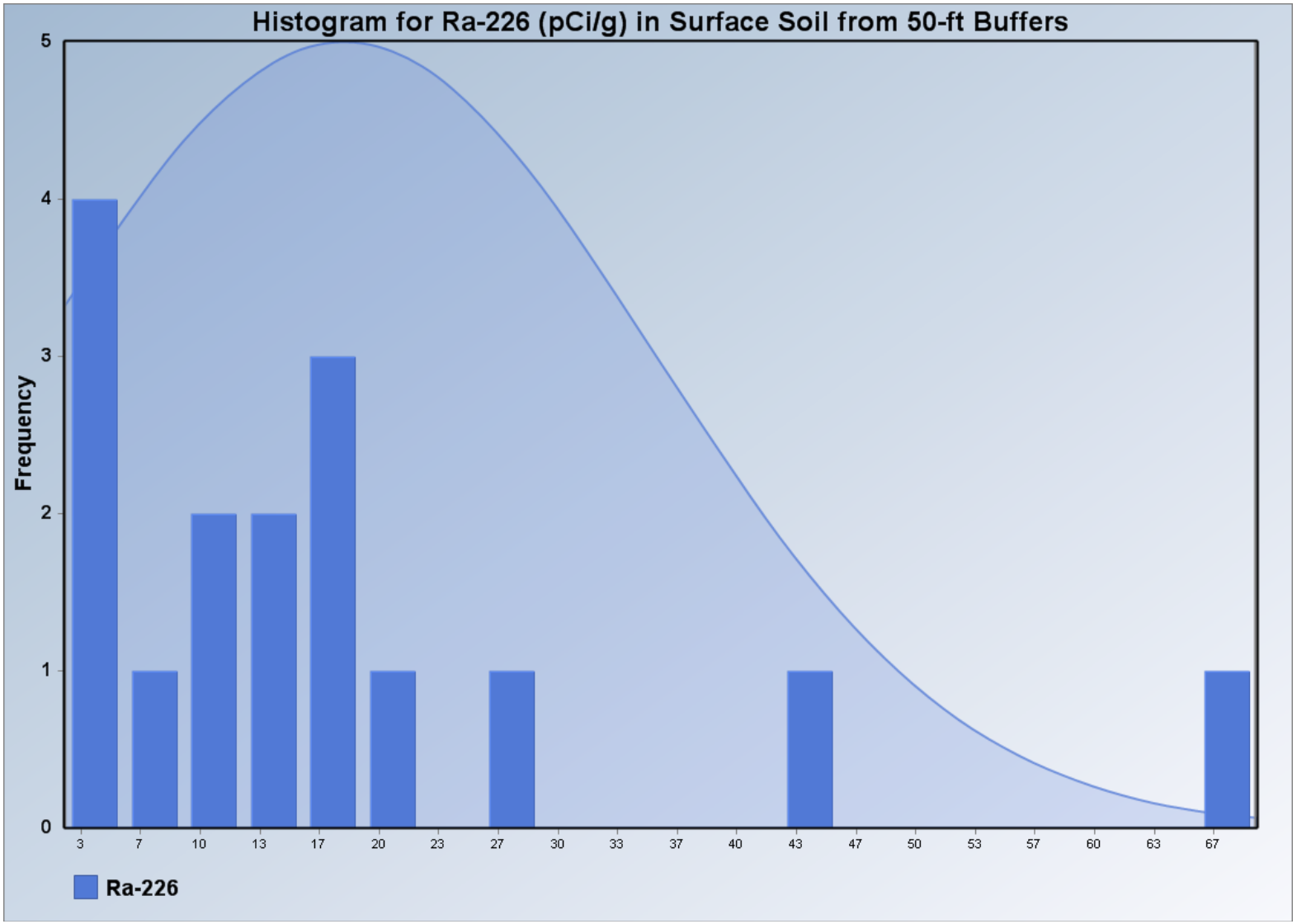

Box Plots for Gamma as Ra-226 (pCi/g) from the North (S1) vs South (S2) of RWPR
Observed Data
42.00
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
-4.00
SRSE_Corre (north)
SRSE_Corre (south)

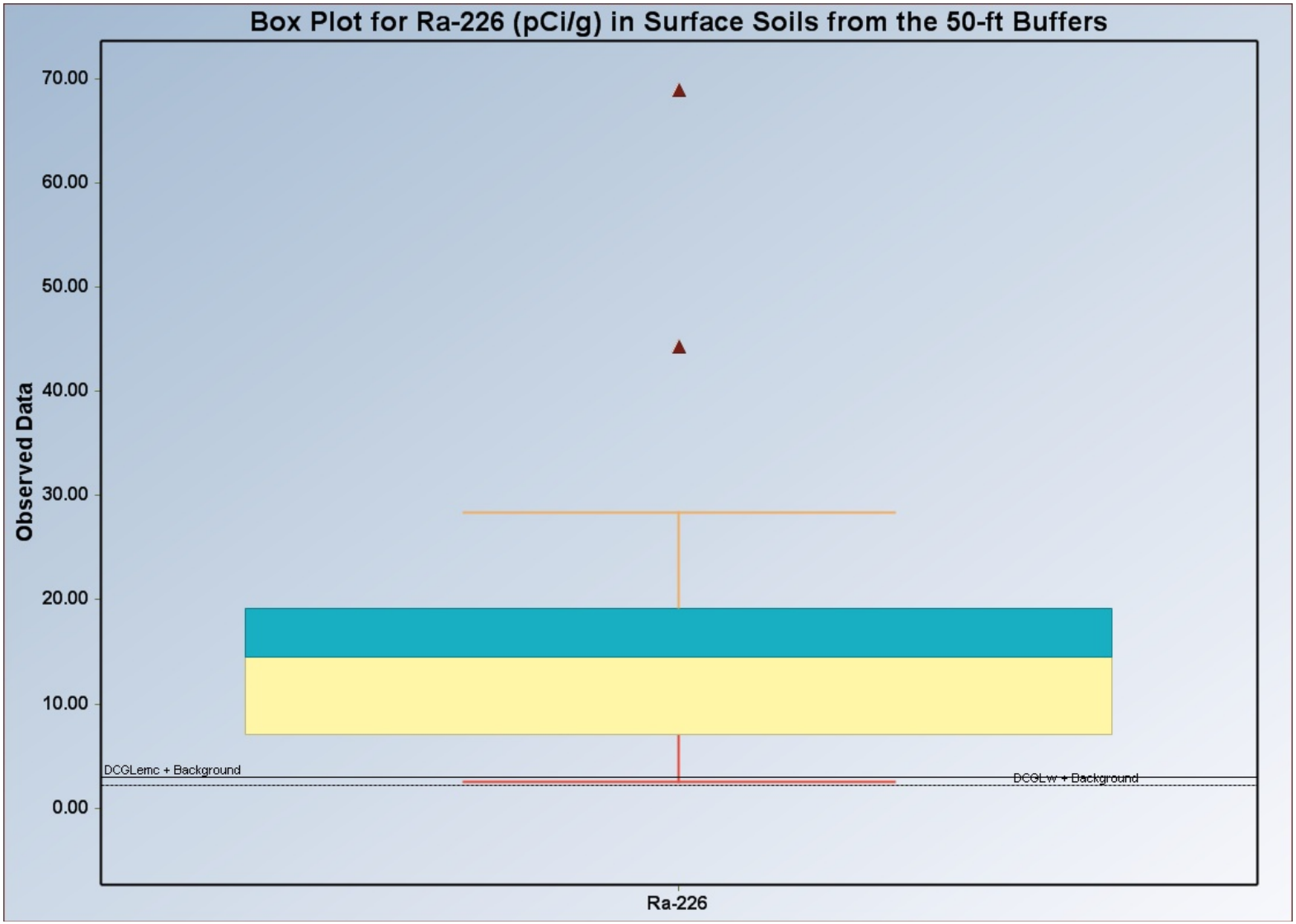
SOIL SAMPLES FROM ALL DEPTHS

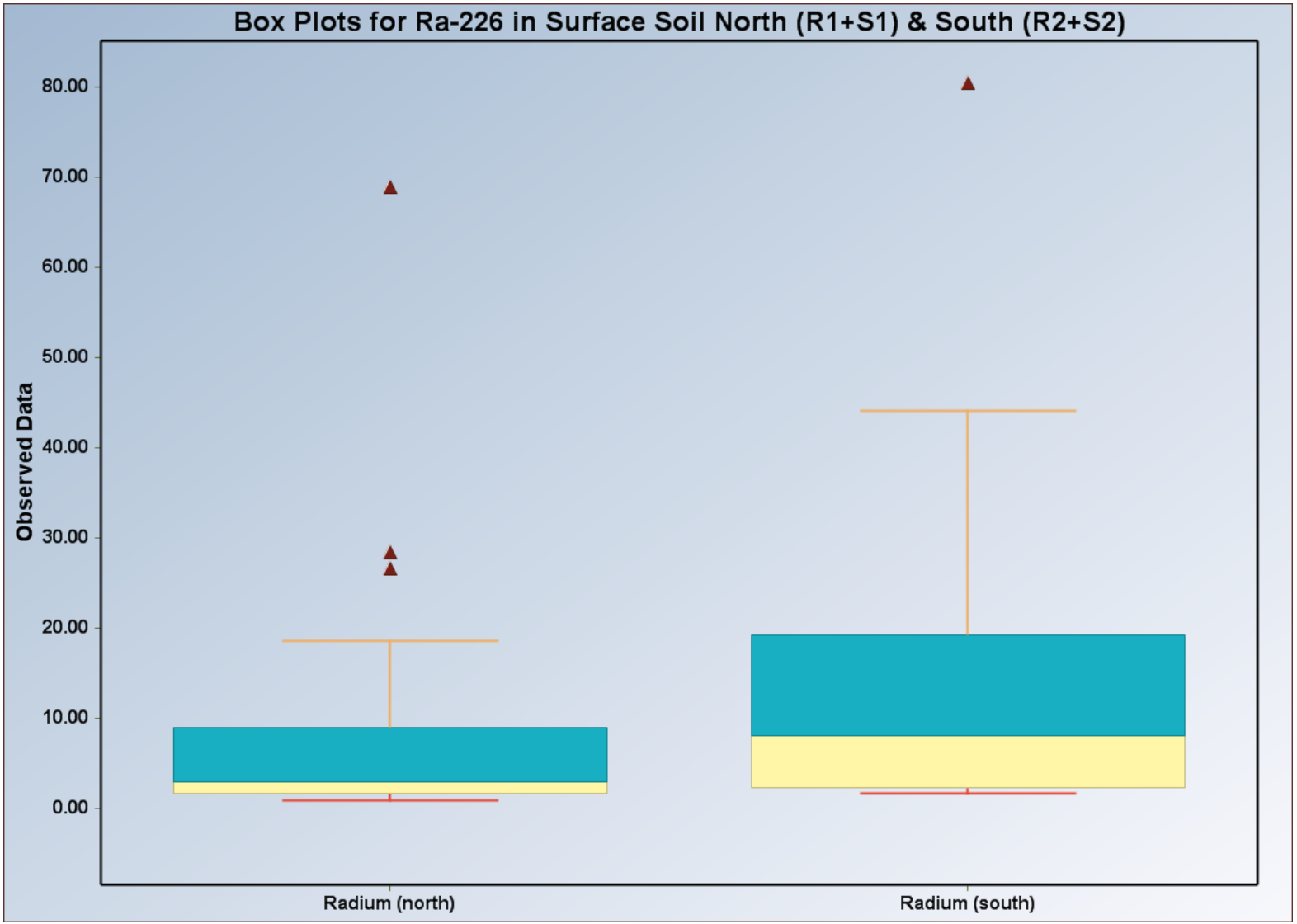

Histogram for Ra-226 in Soil at all Depths (pCi/g)
Frequency
60
57
54
51
48
45
42
39
36
33
30
27
24
21
18
15
12
9
6
3
0
3
7
10
14
17
20
24
27
31
34
38
41
44
48
51
55
58
61
65
68
Ra-226 (aoc)

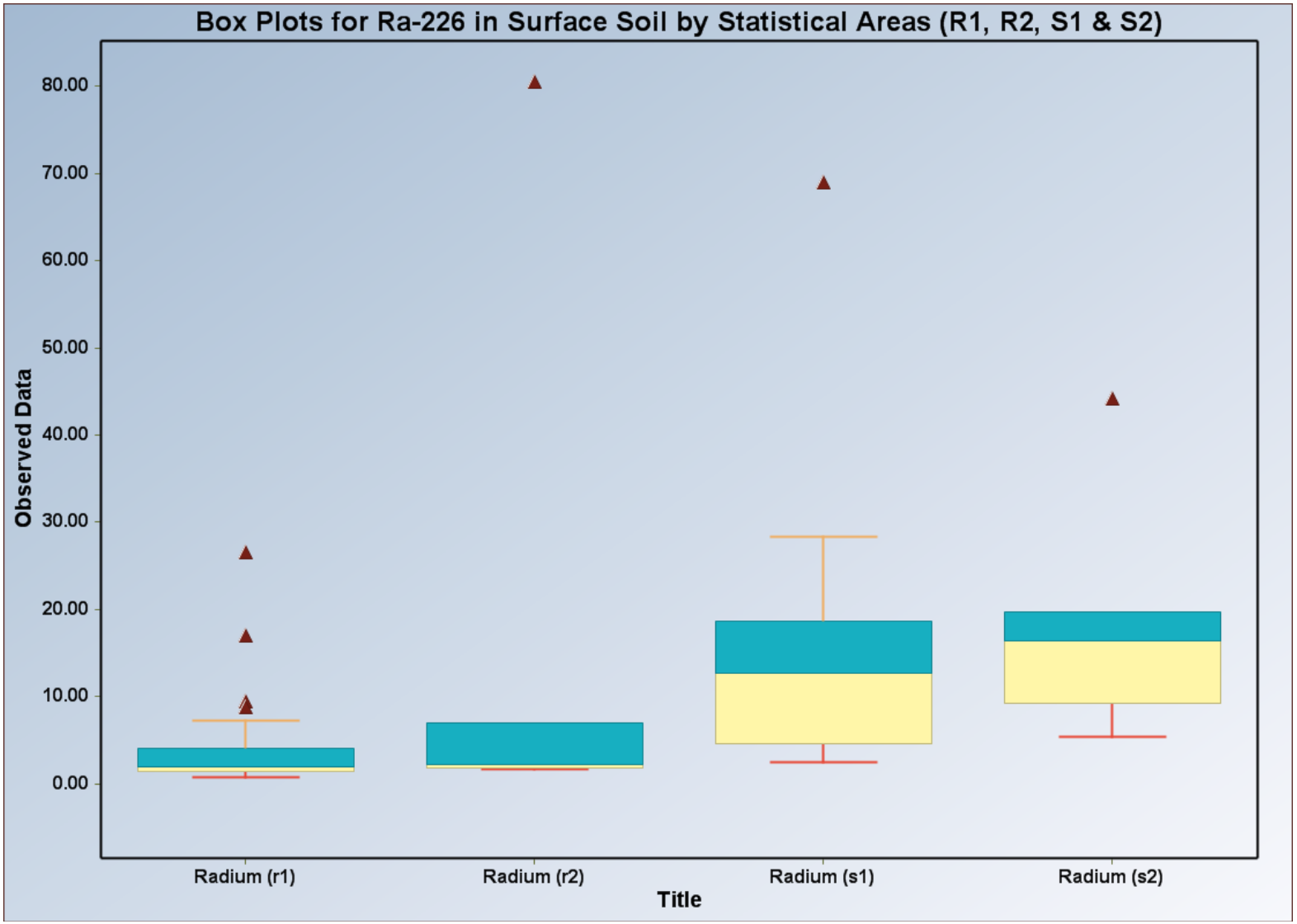

Box Plots for Ra-226 (pCi/g) in All Soils Grouped by Depth/Area
Observed Data
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
DCGLemc + Background
DCGLw + Background
Ra-226 (background)
Ra-226 (subsurface)
Ra-226 (surface)

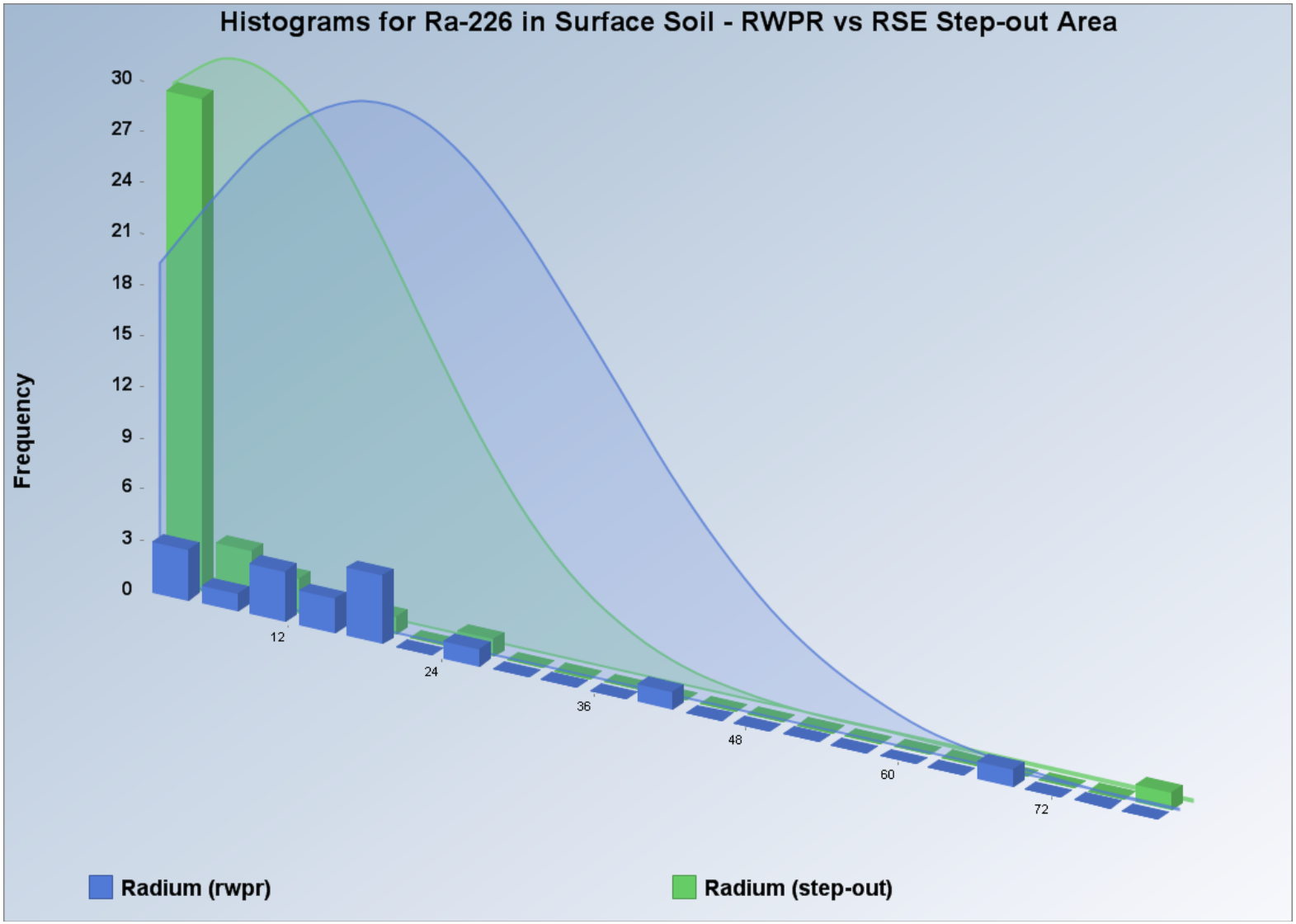
SURFACE SOIL SAMPLES WITHIN 50-FOOT BUFFERS


Histogram for Ra-226 (pCi/g) in Surface Soil from 50-ft Buffers
Frequency
0
1
2
3
4
5
3
7
10
13
17
20
23
27
30
33
37
40
43
47
50
53
57
60
63
67
Ra-226

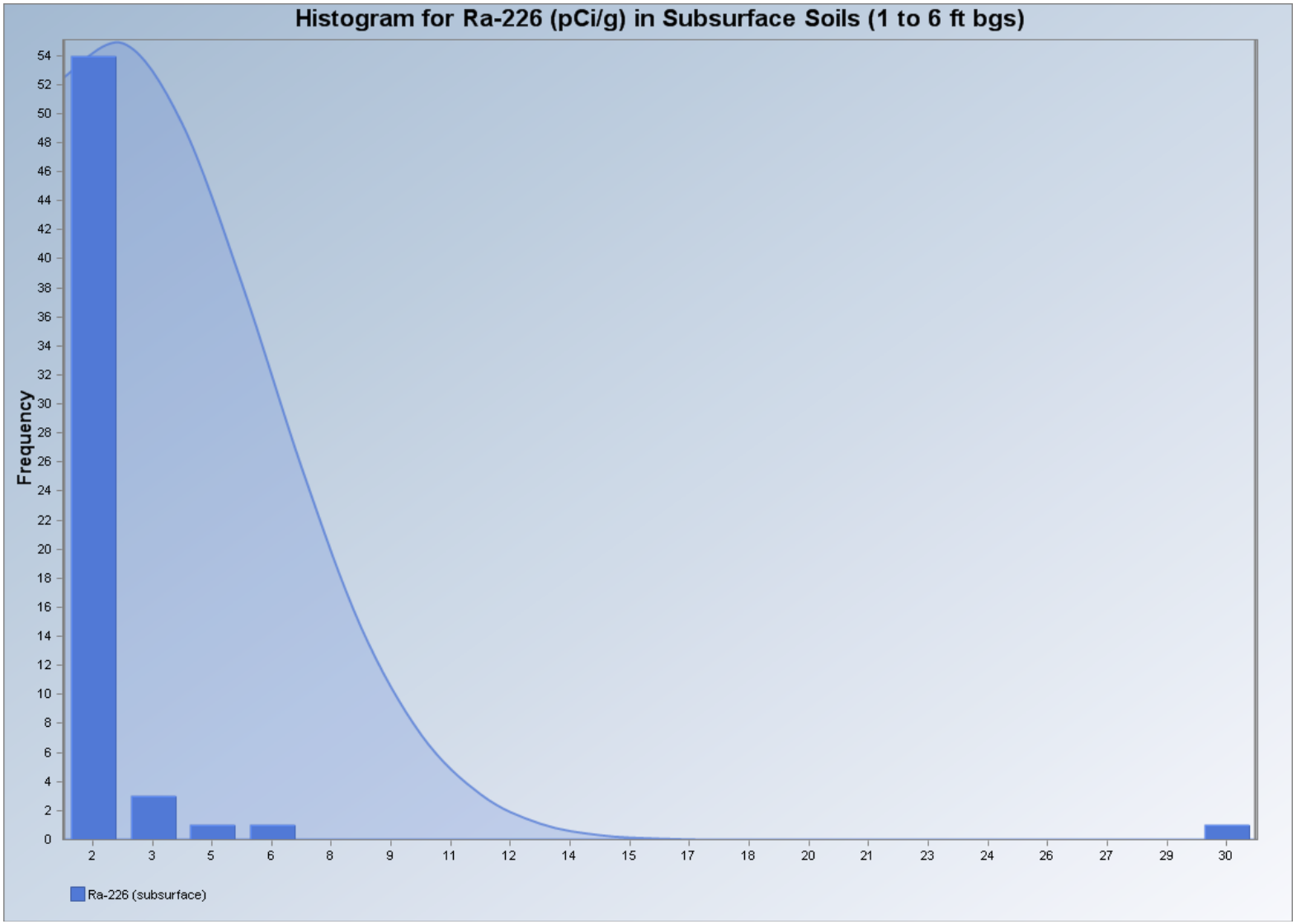

Box Plot for Ra-226 (pCi/g) in Surface Soils from the 50-ft Buffers
Observed Data
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
DCGLemc + Background
DCGLw + Background
Ra-226

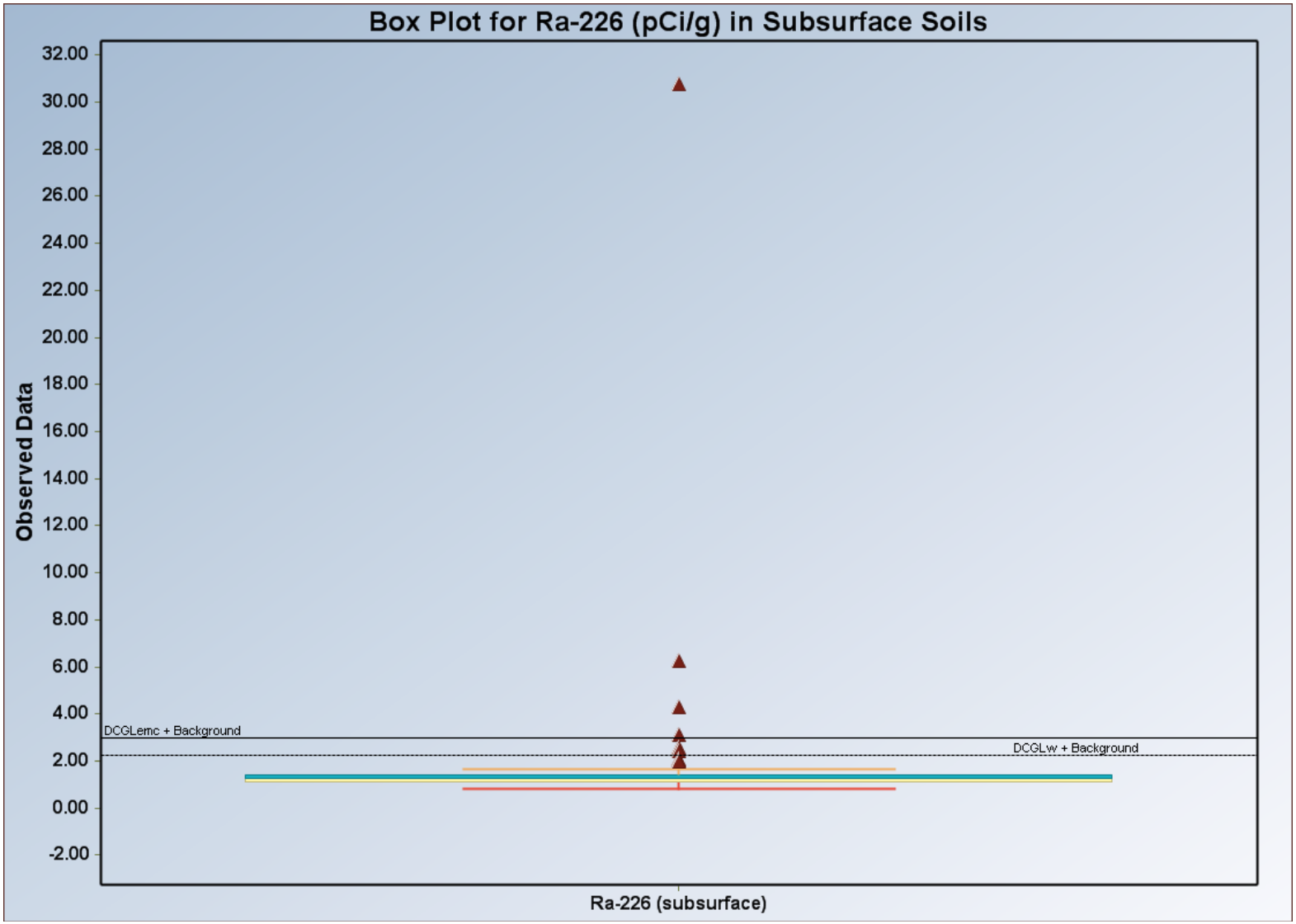

Box Plots for Ra-226 in Surface Soil North (R1+S1) & South (R2+S2)
Observed Data
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Radium (north)
Radium (south)

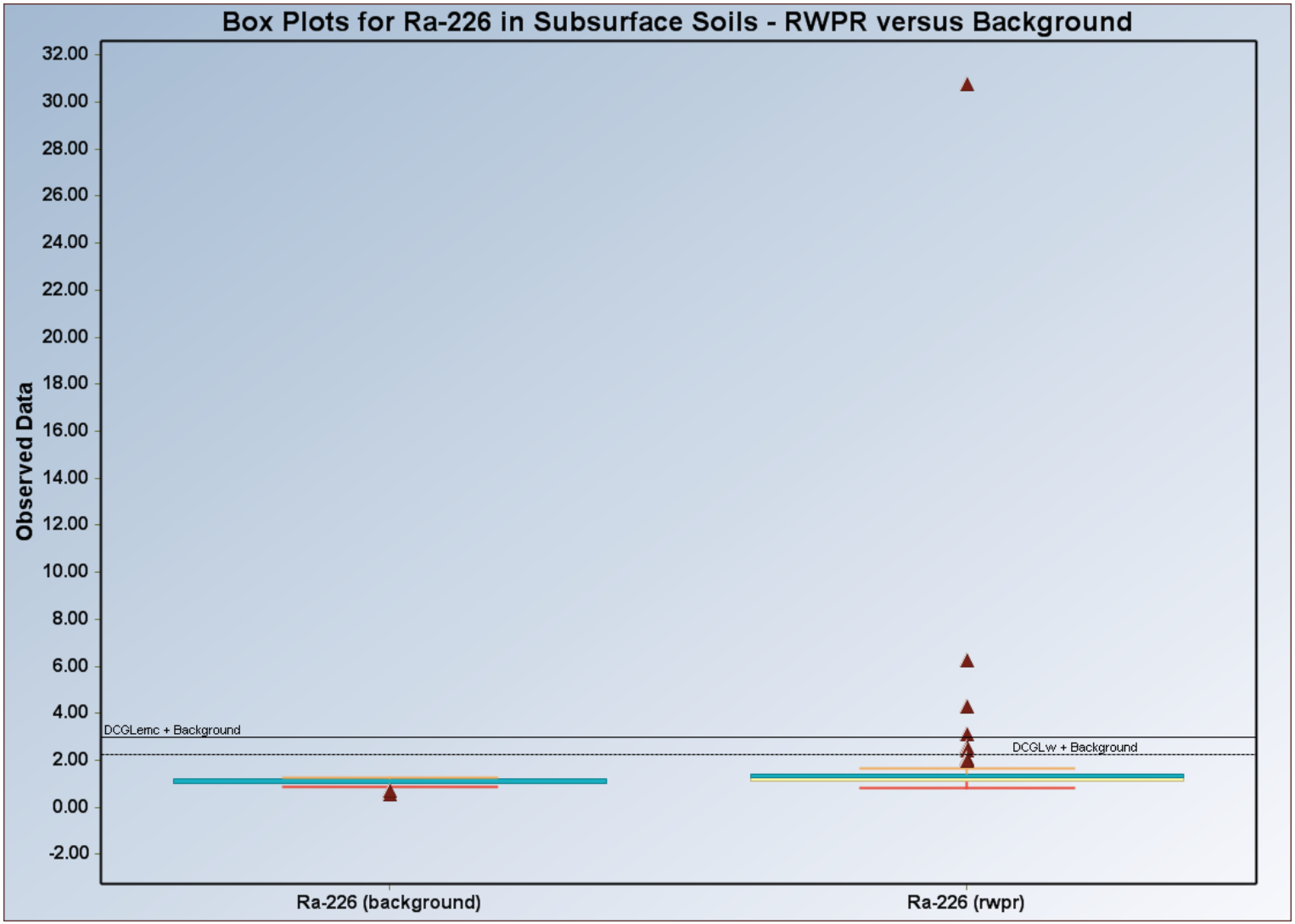

Box Plots for Ra-226 in Surface Soil by Statistical Areas (R1, R2, S1 & S2)
Observed Data
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
Radium (r1)
Radium (r2)
Radium (s1)
Radium (s2)
Title


Histograms for Ra-226 in Surface Soil - RWPR vs RSE Step-out Area
Frequency
30
27
24
21
18
15
12
9
6
3
0
12
24
36
48
60
72
Radium (rwpr)
Radium (step-out)

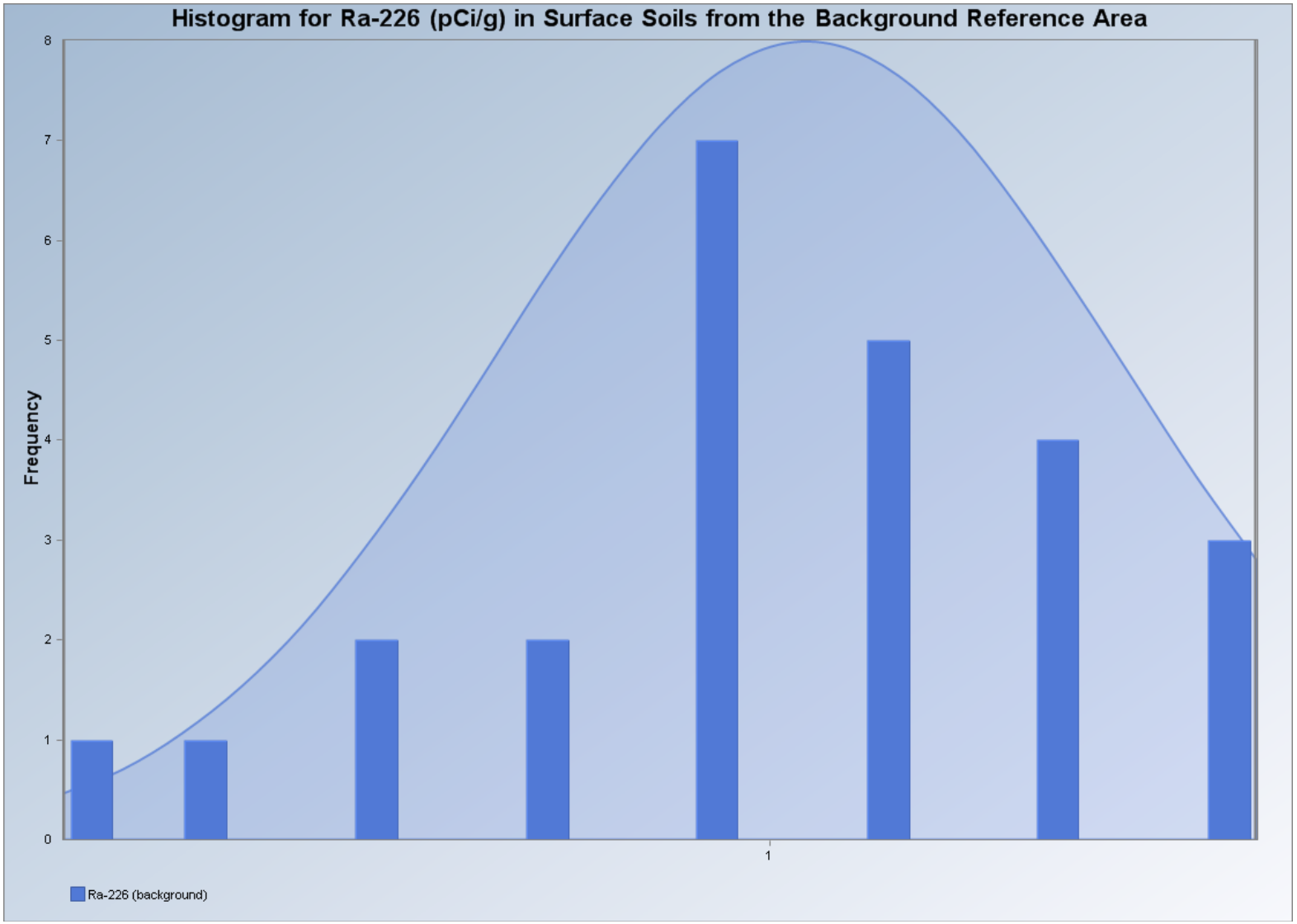
SUBSURFACE SOIL SAMPLES

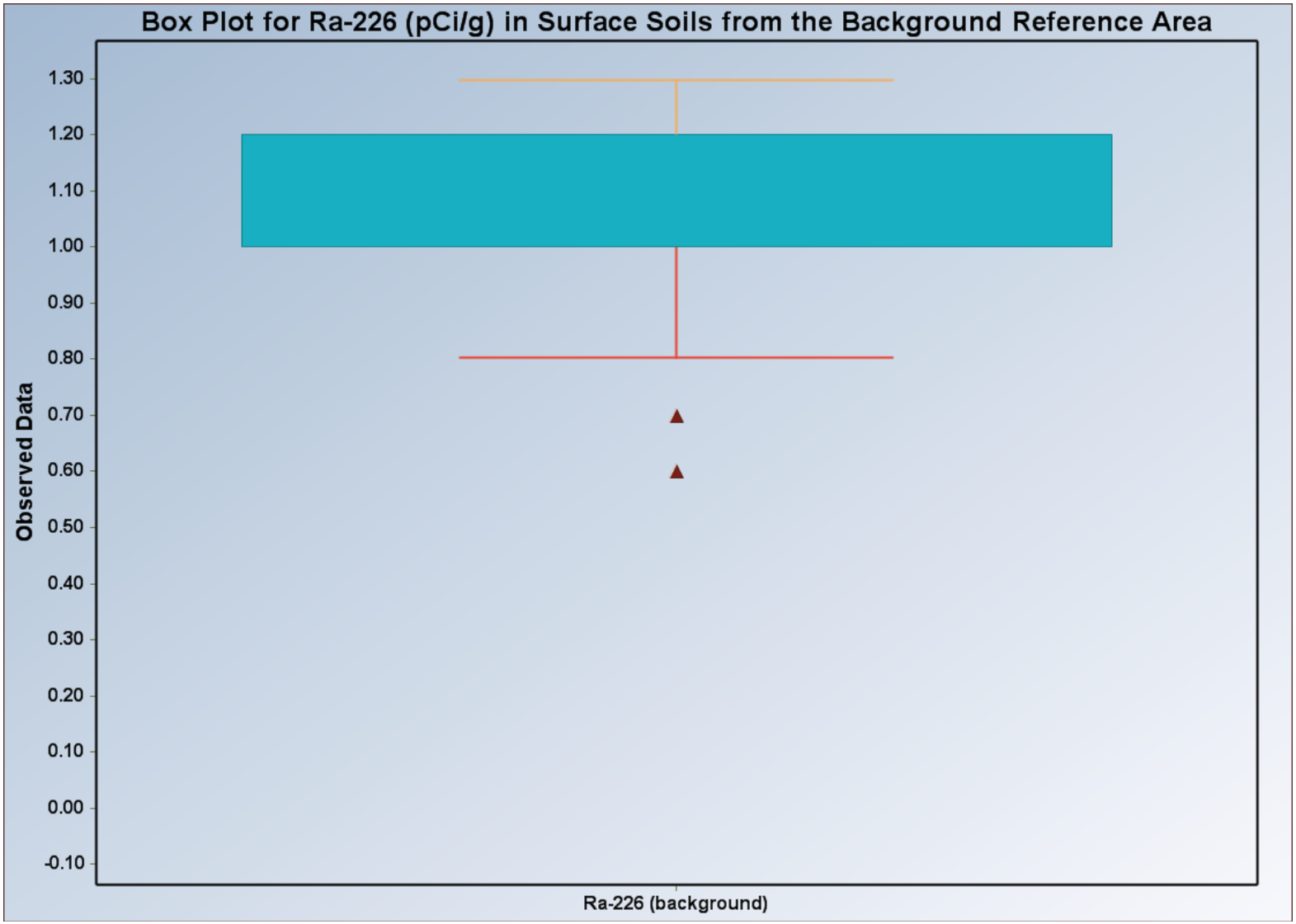

Histogram for Ra-226 (pCi/g) in Subsurface Soils (1 to 6 ft bgs)
Frequency
54
52
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
2
3
5
6
8
9
11
12
14
15
17
18
20
21
23
24
26
27
29
30
Ra-226 (subsurface)


Box Plot for Ra-226 (pCi/g) in Subsurface Soils
Observed Data
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
DCGLemc + Background
DCGLw + Background
Ra-226 (subsurface)


Box Plots for Ra-226 in Subsurface Soils - RWPR versus Background
Observed Data
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
DCGLemc + Background
DCGLw + Background
Ra-226 (background)
Ra-226 (rwpr)

SURFACE SOIL SAMPLES FROM THE BACKGROUND REFERENCE AREA


Histogram for Ra-226 (pCi/g) in Surface Soils from the Background Reference Area
Frequency
8
7
6
5
4
3
2
1
0
1
Ra-226 (background)


Box Plot for Ra-226 (pCi/g) in Surface Soils from the Background Reference Area
Observed Data
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
Ra-226 (background)

STATISTICAL HYPOTHESIS TEST RESULTS

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Red Water Pond Rd.
Background Data: NECR-1 Step-out Area

Raw Statistics

	Site	Background
Number of Valid Observations	16	37
Number of Distinct Observations	15	27
Minimum	2.38	0.7
Maximum	69	80.5
Mean	18.04	5.997
Median	14.5	2
SD	17.25	13.54
SE of Mean	4.313	2.226

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	651.5
WMW Test U-Stat	4.243
WMW Critical Value (0.050)	1.645
P-Value	1.10E-05

Conclusion with Alpha = 0.05

Reject H0, Conclude Site > Background
P-Value < alpha (0.05)

Non-parametric Quantile Hypothosis Test for Full Dataset (No NDs)

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Null Hypothesis	Site or AOC Concentration Less Than or Equal to Background Concentration (Form 1)
Alternative Hypothesis	Site or AOC Concentration Greater Than Background Concentration

Area of Concern Data: Red Water Pond Rd.
Background Data: NECR-1 Step-out Area

Raw Statistics

	Site	Background
Number of Valid Observations	16	37
Number of Distinct Observations	15	27
Minimum	2.38	0.7
Maximum	69	80.5
Mean	18.04	5.997
Median	14.5	2
SD	17.25	13.54
SE of Mean	4.313	2.226

Quantile Test

H0: Site Concentration <= Background Concentration (Form 1)

Approximate R Value (0.058)	6
Approximate K Value (0.058)	4
Number of Site Observations in 'R' Largest	4
Calculated Alpha	0.0602

Conclusion with Alpha = 0.058

Reject H0, Conclude Site Concentration > Background Concentration

t-Test Site vs Background Comparison for Full Data Sets without NDs

User Selected Options

Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean Less Than or Equal to Background Mean (Form 1)
Alternative Hypothesis	Site or AOC Mean Greater Than the Background Mean

Area of Concern Data: Red Water Pond Rd.
Background Data: NECR-1 Step-out Area

Raw Statistics

	Site	Background
Number of Valid Observations	16	37
Number of Distinct Observations	15	27
Minimum	2.38	0.7
Maximum	69	80.5
Mean	18.04	5.997
Median	14.5	2
SD	17.25	13.54
SE of Mean	4.313	2.226

Site vs Background Two-Sample t-Test

H0: Mu of Site - Mu of Background <= 0

Method	DF	t-Test Value	Critical t (0.050)	P-Value
Pooled (Equal Variance)	51	2.732	1.675	0.004
Satterthwaite (Unequal Variance)	23.4	2.48	1.714	0.01

Pooled SD 14.730

Conclusion with Alpha = 0.050

* Student t (Pooled) Test: Reject H0, Conclude Site > Background
* Satterthwaite Test: Reject H0, Conclude Site > Background