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RADIOLOGICAL AUDIT OF REMEDIAL ACTION ACTIVITIES AT THE PROCESSING SITE, TRANSFER SITE, AND CHENEY DISPOSAL SITE GRAND JUNCTION, COLORADO

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Prepared for
U.S. Department of Energy
UMTRA Project Office
Albuquerque, New Mexico

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
APO	RAC Albuquerque Project Office
CEDE	committed effective dose equivalent
DOE	U.S. Department of Energy
DOE-AL	DOE Albuquerque operations office
EPA	U.S. Environmental Protection Agency
HP	health physics
HPMP	Health Physics Monitoring Plan
NA	not applicable
OCS	opposed crystal system
QC	quality control
RAC	Remedial Action Contractor
RAP	remedial action plan
RGM	radon gas monitor
SOP	standard operating procedure
TAC	Technical Assistance Contractor
TLD	thermoluminescent dosimeter
UMTRA	Uranium Mill Tailings Remedial Action

1.0 SUMMARY

The Uranium Mill Tailings Remedial Action (UMTRA) Project's Technical Assistance Contractor (TAC) performed a radiological audit of the Remedial Action Contractor (RAC), MK-Ferguson and CWM Federal Environmental Services, Inc., at the processing site, transfer site, and Cheney disposal site in Grand Junction, Colorado. Jim Hylko and Bill James of the TAC conducted this audit August 9 through 11, 1993. Bob Cornish and Frank Bosiljevac represented the U.S. Department of Energy (DOE).

This report presents one programmatic finding, eleven site-specific observations, one good practice, and four programmatic observations.

Overall, the auditors concluded that the radiological aspects of the Grand Junction, Colorado, remedial action program are performed adequately. One good practice showing professional judgment and conscientiousness was noted. However, various programmatic areas need to be reviewed and addressed.

The programmatic finding is identified below:

Finding GRJ-A06-F01: The technician performing the acid spike of the bioassay samples was not required to wear a face shield based on the design of the fume hood, which conflicted with procedural requirements.

Site-specific observations are identified below:

Observation GRJ-A06-O01: Excavation control and verification sampling were in compliance with applicable procedures and were effective in meeting U.S. Environmental Protection Agency (EPA) remediation requirements.

Observation GRJ-A06-O02: Site opposed crystal system (OCS) operations were observed to be conducted in accordance with existing procedures. The Ra-226 analytical performance on blind quality control (QC) samples demonstrated the ability to meet accuracy requirements of ±30 percent at the 95-percent confidence level for individual results and ±10 percent for group data.

Observation GRJ-A06-O03: Remedial Action Plan (RAP) requirements for site water and runoff controls, and tailings embankment construction were reviewed and determined to be in compliance.

Observation GRJ-A06-O04: Various inconsistencies were noted between the instrument inventory form and various instrument/source data sheets. These were brought to the attention of and resolved by the lead health physics (HP) technician.

Observation GRJ-A06-O05: Various instrument data sheets were lacking blank fields lined out and marked not applicable (N/A).

Observation GRJ-A06-O06: The top portion of Attachment 6 (Form F6-RAC-IN-001), Precision Test Report, must be complete and filed properly. Minor inconsistencies were brought to the attention of and resolved by the lead HP technician.

Observation GRJ-A06-O07: Sampling locations for collecting environmental surface water samples were not identified in the *Health Physics Monitoring Plan* (HPMP) and the "Environmental Monitoring Program Addendum" (letter dated February 9, 1990).

Observation GRJ-A06-O08: Following receipt of an instrument to the Grand Junction site, the MK-F shipping form was initialed in the lower left-hand corner indicating that the instrument inventory data base had been updated. The location of the initials conflicted with procedural requirements. Minor inconsistencies were also noted and brought to the attention of the site HP manager.

Observation GRJ-A06-O10: The calibration of instrumentation, the site inventory list, instrument accountability, and laboratory operating conditions were reviewed and determined to be in compliance with procedural requirements.

Observation GRJ-A06-O11: Portions of the Environmental Monitoring Program (Environmental Monitoring Program, RAC-RP-001; Radon Monitoring with Alpha Track Detectors, RP-001-1; Radon Monitoring with Radon Gas Monitors, RP-001-2; and Environmental Air Particulate Monitoring, RP-001-4) were reviewed and determined to be in compliance with procedural requirements.

The good practice observation is identified below:

Observation GRJ-A06-O12: The Grand Junction site developed and uses a checklist for performing routine checks of radon gas monitors (RGM).

Programmatic observations are identified below:

Observation GRJ-A06-013: External dosimetry, internal dosimetry, and bioassay program methods and results were reviewed. There are concerns regarding urine bioassay vendor laboratory capabilities, radon dose monitoring, and the need for external dosimeters and a bioassay program.

Observation GRJ-A06-O14: The acceptable count range for a specific instrument scaler and probe was recorded on Attachment 8, Acceptable Count Range Form, in Procedure RAC-IN-001, *UMTRA HP Instrumentation Program*, Rev. 0, ICN-01. This information was transferred to Attachment 9, Instrument Performance Log, which identified the same scaler and a different probe.

Observation GRJ-A06-O15: Contrary to procedural requirements, the site HP manger no longer receives and reviews vendor analysis results for environmental thermoluminescent dosimeters (TLD).

Observation GRJ-A06-O16: Sections of the HPMP and the "Environmental Monitoring Program Addendum" were performed in accordance with standard operating procedures (SOP). Although Section 1.0, Introduction, states in part that "When differences in methodology or routine practices occur, guidance in the RAC Health Physics Procedures shall take precedence over the guidance of this Plan," the TAC has identified inconsistencies and brought them to the attention of the site HP manager.

2.0 INTRODUCTION

The TAC conducts radiological audits for the UMTRA Project Office to provide an independent assessment of whether the safety and quality of remedial action work are sufficient to meet specified EPA standards and DOE orders. These radiological audits assure that procedures are followed, and address whether the remedial action work actually results in a site that meets EPA standards. The audits not only determine if the proper procedures are followed, but also if the procedures are effective. Specific attention is given to the contractor's occupational and environmental radiological survey techniques and procedures, sampling and measurement techniques, and data management capabilities.

In general, a radiological audit report provides two levels of conclusions: findings and observations. The findings conform to DOE Order 5482.1B, where an audit is classified as a functional appraisal (Paragraph 6.h). Findings (Paragraph 6.g) presented in a radiological audit of remedial action activities will be based on any of the following criteria (Paragraph 6.a):

- Noncompliance with published requirements of the RAP, vicinity properties management and implementation manual, engineering design, or UMTRA Project Office directives applicable to the site.

- Evidence that existing radiological measurement methods may result in residual contamination levels in excess of established limits (underexcavation).

- Evidence that existing radiological measurement methods may result in the removal of materials not contaminated in excess of established limits (overexcavation).

- Evidence that some aspects of the contractor's radiological survey plans and procedures, measurement techniques, or data management capabilities are insufficient to allow eventual site certification.

- Evidence that activities are not in compliance with applicable DOE orders.

Observations are additional comments by the auditors to acknowledge good practices, to document issues of concern, and to note areas where improvements in techniques or procedures should be made. Although observations of concern are not of an immediately critical nature, they are important points that the auditors judge to merit documentation and ultimate resolution.

A radiological audit of the Grand Junction, Colorado, processing site, transfer site, and Cheney disposal site was conducted August 9 through 11, 1993. The auditors reviewed the RAC's radiological procedures and measurements regarding access control, air sampling, respiratory protection, excavation control, contamination control, training, verification soil sampling, internal and external dosimetry, OCS analytical performance, QA control, and data management/analysis.

On-site RAC personnel interviewed during the audit included Garth Stowe, Catherine Crabb, and Roger Geary. An exit interview was conducted at the processing site upon completion of the audit. At that meeting, all observations were discussed and a preliminary list of observations was presented.

3.0 FINDING

PROGRAMMATIC

GRJ-A06-F01: The technician performing the acid spike of the bioassay samples was not required to wear a face shield based on the design of the fume hood, which conflicted with procedural requirements.

Discussion: Step 4.3.1 of Procedure RP-004-1, *Bioassay Program*, Rev. 2, ICN-01, states that "Proper protective clothing shall be worn when preserving urine samples with nitric acid," whereby the technician must wear a face shield or goggles when spiking bioassay samples. Site personnel decided that performing this procedure using a "glove-box" style enclosure around the sink eliminates this requirement. The auditors noted that not all sites use these enclosures. Although the enclosures appear to eliminate the need for wearing a face shield or goggles, the procedure does not state that it is "optional" or unnecessary when performing spikes. All other portions to this procedure were performed in accordance with procedural requirements.

Recommendation: The RAC should consider revising the procedure to reflect that a face shield or goggles are required only if other shields or enclosures are not available to protect the technician from the accidental splash from preservative material (e.g., nitric acid).

4.0 OBSERVATIONS

4.1 SITE-SPECIFIC

GRJ-A06-001

Observation: Excavation control and verification sampling were in compliance with applicable procedures and were effective in meeting EPA remediation requirements.

Discussion: Excavation control, performed by technicians knowledgeable of the requirements (e.g., identifying and removing hot spots, cutoff limits for the applicable correlation to 5 and 15 pCi/g, etc.), appeared to minimize overexcavation and underexcavation. Verification sampling was representative of the top 6 inches of the sampling grids. Corrective actions for observation GRJ-S05-002 in the previous surveillance resolved the biased verification sampling methods used by technicians (e.g., intentionally removing rocks and cobbles without applying cobbles-to-fines protocol). No cobbles-to-fines protocol has been used since the previous audit because excavation to the designated depths in the engineering plan always produced verification sample results below the 17 pCi/g site limit (15 pCi/g plus background of 2 pCi/g).

Site verification map data were reviewed for appropriate recording of Ra-226 results, which is required for documentation to demonstrate remediation of the site to EPA standards. The HP staff received a recommendation to record the Ra-226 result units (pCi/g) and the depth of the samples relative to the final grade, which was immediately entered in the "Notes" on each map. The Colorado Department of Health concern regarding removal of all lenses at the site was discussed with the site HP manager, who stated that the remaining lenses will be removed when the shoreline property they lie within is released by the owner.

Recommendation: Use cobbles-to-fines protocol when appropriate to determine the verification grid Ra-226, Th-232 and Th-230 (when applicable) residual concentrations.

GRJ-A06-002

Observation: Site OCS operations were observed to be conducted in accordance with existing procedures. The Ra-226 analytical performance on blind QC samples demonstrated the ability

to meet accuracy requirements of ±30 percent at the 95-percent confidence level for individual results and ±10 percent for group data.

Discussion: Six blind QC reference samples were analyzed twice on the processing site's two OCS units to compare individually and collectively (averaging) with known reference values. Analytical precision (consistency) was observed to be very good for the four results on each sample. The UMTRA Project standard was met for individual results of ±30 percent of the reference value with a 95-percent confidence level. None of the 24 individual results were outside of the ±30-percent range. The overall (average) bias for the two OCS units was -2.1 percent, meeting the TAC target accuracy standard of ±10 percent for group data and showing a significant improvement from previous audit results. These performance data close observation GRJ-S05-007. The two OCS units performed with equivalent accuracy.

Two archived verification samples were selected randomly from the site verification maps for recounting. The original 20-day Ra-226 result for E-34-6 was 9.5 pCi/g and the recount was 9.0 pCi/g. The original 20-day Ra-226 result for F-13-23 was 16.5 pCi/g and the recount was 16.8 pCi/g. These differences of 6 and 2 percent are acceptable. Both recounts confirmed the original evaluation that the grids meet EPA requirements for Ra-226 concentration.

Recommendation: None.

GRJ-A06-003

Observation: RAP requirements for site water and runoff controls, and tailings embankment construction were reviewed and determined to be in compliance.

Discussion: The requirements for drainage ditches, waste water retention basins, and contaminated water treatment and disposal were observed to be met. All materials designated for disposal in the disposal cell appear to be handled appropriately. Tailings embankment (disposal cell) construction was reviewed with RAC QC personnel and was determined to be in compliance with requirements for the disposal sequence and for limitations on organic materials and large objects.

Recommendation: None.

GRJ-A06-004

Observation: Various inconsistencies were noted between the instrument inventory form and various instrument/source data sheets. These items were brought to the attention of and resolved by the lead HP technician.

Discussion 1: The following instruments were not recorded on the instrument inventory data base: Ludlum 2000 (serial numbers 39359, 90990, and 37989), Ludlum 177 (serial numbers 29120, 36071, 50210, and 36105), and ESP-1 (serial numbers 1682, 1704, 1697, and 1716). These sheets were removed from the instrument file and filed in the binder labeled "Old Calibration Sheets." The MK-Ferguson shipping files were reviewed and verified that these instruments had been sent to the RAC Albuquerque Project Office (APO). Also verified was that the responsible technician removes instruments from the instrument inventory data base when they are sent off the site to the APO.

The following instruments had duplicate certificates of calibration: Ludlum 2000, serial number 90972 (1/5/93 and 7/20/93); Ludlum 177, serial number 27403 (6/1/94 and 4/20/94); ESP-1, serial number 1685 (5/4/94 and 11/5/93); and ESP-1, serial number 1658 (3/23/94, 11/16/93, and 3/1/94). The expired calibration sheets were removed from the instrument file.

Recommendation 1: The RAC should consider revising Procedure RAC-IN-001, *UMTRA HP Instrumentation Program*, Rev. 0, ICN-01, to include the removal and separate filing, as necessary, of all expired calibration sheets including those corresponding to instrumentation in transit to the APO.

Discussion 2: The certificate of calibration for the Ludlum 177, serial number 50208 (dated 8/10/93), did not have a post-calibration value listed for the 10k cpm category. This was brought to the attention of the lead HP technician who called the APO, which corrected the error and faxed a revised and initialed certificate of calibration to the Grand Junction site. The auditor was also informed that the hard copy of the certificate of calibration will be sent to the Grand Junction site.

Recommendation 2: None.

GRJ-A06-O05

Observation: Various instrument data sheets were lacking blank fields lined out and marked N/A.

Discussion: This issue was resolved as noted in the memo "Blank Fields on Survey Forms DC-93-33" (dated June 25, 1993), written from D. Carlson of the RAC to site HP managers.

Recommendation: None.

GRJ-A06-O06

Observation: The top portion of Attachment 6 (Form F6-RAC-IN-001), Precision Test Report, must be complete and filed properly. Minor inconsistencies were brought to the attention of and resolved by the lead HP technician.

Discussion: Step 5.5.4.a of Procedure RAC-IN-001, *UMTRA HP Instrumentation Program*, Rev. 0, ICN-01, states, "Complete the top portions of the Precision Test Report (Attachment 6)." Contrary to this requirement, four sheets did not have the postcalibration or troubleshooting identification label circled properly. Furthermore, one Precision Test Report (Attachment 6) was found in the Ludlum 43-10 HV Plateau file.

Recommendation: The site HP manager should issue a memo similar to the "Blank Fields on Survey Forms DC-93-33" memo (see GRJ-A06-O05) reminding site HP personnel to complete and properly file all instrumentation data sheets.

GRJ-A06-O07

Observation: Sampling locations for collecting environmental surface water samples were not identified in the HPMP and the "Environmental Monitoring Program Addendum."

Discussion: Step 5.1.2 of Procedure RP-001-5, *Environmental Water Monitoring*, Rev. 0, ICN-01, states that "Sample locations for environmental surface water samples mandated in the HPMP shall be submitted by each site for approval from the Albuquerque Project Office (APO)." Contrary to this requirement, maps found in the HPMP and the "Environmental Monitoring Program Addendum" identified the environmental monitoring/sampling stations as out of date and did not include locations for collecting upstream and downstream water samples. The lead HP technician

provided a revised map prepared at the Grand Junction site for identifying existing environmental monitoring locations, but it too excluded water sampling locations. Note that this map did not indicate a revision number and date. All other portions of this procedure were performed in compliance with procedural requirements.

Recommendation: Grand Junction site HP personnel should be recognized for developing the map, which designates current environmental monitoring locations. However, the site HP manager should consider revising this map to include upstream and downstream water sampling locations, revision number, and date.

GRJ-A06-O08

Observation: Following receipt of an instrument to the Grand Junction site, the MK-F shipping form was initialed in the lower left-hand corner indicating that the instrument inventory data base had been updated. The location of the initials conflicted with procedural requirements. Minor inconsistencies were also noted and brought to the attention of the site HP manager.

Discussion: Step 5.1.4.b. states in part that "When an instrument shipment is received...the Data Technician/Warehouse Clerk shall initial the "project manager" signature block (i.e., lower-right-hand corner) indicating that the inventory database has been updated." Contrary to this requirement, the responsible person was initialing the "warehouseman" signature block (i.e., lower left-hand corner).

Recommendation: Since this is a common problem identified at other UMTRA sites, the RAC should consider revising the procedure to allow initials in one common location on the MK-F shipping form following update of the instrument inventory data base.

GRJ-A06-O09

Observation: Two items on the monitor baseline training sheet for an HP monitor trainee were signed, but not dated properly. This was brought to the attention of and resolved by the lead HP technician.

Discussion: The lead HP technician contacted the HP monitor, who dated the proper locations of the monitor baseline training sheet.

Recommendation: None.

GRJ-A06-O10

Observation: The calibration of instrumentation, the site inventory list, instrument accountability, and laboratory operating conditions were reviewed and determined to be in compliance with procedural requirements.

Discussion: Records and data sheets associated with the calibration of radiation measurement and detection instrumentation, the site inventory list, instrument accountability, and laboratory operating conditions were performed in accordance with Procedure RAC-IN-001, *UMTRA HP Instrumentation Program*, Rev. 0, ICN-01.

Recommendation: None.

GRJ-A06-O11

Observation: Portions of the Environmental Monitoring Program (Environmental Monitoring Program, RAC-RP-001; Radon Monitoring with Alpha Track Detectors, RP-001-1; Radon Monitoring with Radon Gas Monitors, RP-001-2; and Environmental Air Particulate Monitoring, RP-001-4) were reviewed and determined to be in compliance with procedural requirements.

Discussion: Environmental monitoring records and data sheets were reviewed and determined to be in compliance with existing procedures. However, the environmental air samplers were observed to be housed in structures that may cause nonrepresentative particulate air sampling from wake and/or plating effects. One sampler (#27) was surrounded by a building and other large structures that also could cause nonrepresentative particulate sampling from these effects. Auditors at the Mexican Hat, Utah, and Monument Valley, Arizona, sites have noted these concerns (observation HAT-A03-001). Refer to DOE EH/0173T (Effluent Monitoring and Environmental Surveillance) to assess the technical design of air sampling stations.

Recommendation: Review the location and structures of existing environmental monitoring stations to determine if their ability to obtain representative samples is affected by adjacent obstructions. Document the review and justify continued sampling at suspect locations based on cost/benefit consideration or an analysis of existing site data.

4.2 GOOD PRACTICE

GRJ-A06-012

Observation: The Grand Junction site developed and uses a checklist for performing routine checks of RGMs.

Discussion: During environmental air sample exchanges and RGM checks, the auditors noted that technicians use a checklist for recording the operating status of RGMs. The checklist is not required by procedure but appears useful, especially if various technicians perform the check.

Recommendation: The RAC should consider having other UMTRA sites use an RGM checklist for recording routine checks of the RGMs.

4.3 PROGRAMMATIC

GRJ-A06-013

Observation: External dosimetry, internal dosimetry, and bioassay program methods and results were reviewed. There are concerns regarding urine bioassay vendor laboratory capabilities, radon dose monitoring, and the need for external dosimeters and a bioassay program.

Discussion: The previous quarter's external dosimetry data produced by the TLD processing vendor were reviewed at both the Grand Junction and Rifle sites. The typical whole body external dose equivalent recorded for workers was 0 mrem. A very small percent of the total workers badged had doses between 10 and 32 mrem. From these data, it is apparent that a large majority of workers (or possibly all) at these sites is not expected to receive an annual external whole body dose greater than 100 mrem. From discussions with site HP personnel, the auditors noted that workers with the potential for exceeding 100 mrem are easily identifiable by their work assignments. These data confirmed the TAC's assumption that external doses on the UMTRA Project are typically very low, leading to concern over whether the external dosimetry program is necessary.

The method for determining which 10 percent of the workers submit urine samples for quarterly uranium analysis was reviewed and discussed with the site HP manager. Random selection by the APO appears questionable because it does not consistently focus on and track potential intakes of the workers most likely to receive significant exposures.

It was noted, however, that the site HP manager has tried proactively to obtain quarterly samples from personnel wearing respiratory protection at the disposal cell, performing what is suspected to be the highest potential exposure work. The site HP manager also requires truck drivers to give entry (baseline) and termination samples, although this is not required by procedure. This also is proactive because these workers appear to have as much exposure potential as many routinely selected worker categories.

The site's bioassay results for the past year were reviewed with the assistance of a DOE-Albuquerque operations office (DOE-AL) HP consultant. The results indicated very low levels (<0.50 μg/l uranium in urine) in the workers. The results were produced by the standard fluorimetry method (ASTM-D2907) for uranium in urine, which typically has a detection limit between 5 and 10 μg/l. Because the laboratory reports "detected" results approximately 1 to 2 orders of magnitude below the detection limit for analysis by fluorimetry, the TAC is concerned that the data's validity is highly questionable. The APO HP program manager was questioned about QC investigations to ensure that the vendor laboratory can meet the required sensitivity for the bioassay. The RAC's QC investigations apparently are inadequate to verify this.

The discussion between TAC auditors and the DOE-AL consultant led to a concern that the bioassay program may not be necessary for the UMTRA Project. From a group review of the recently published methodology ["Health Physics," 63(4), 1992] that the RAC plans to use to interpret committed effective dose equivalent (CEDE) to the workers from their bioassay results, it appears unlikely that workers will receive greater than 100 mrem CEDE annually. Any DOE project that can adequately verify this should not waste resources on a bioassay program. As determined by recent UMTRA field studies of radon decay products exposure to workers, an effort to improve dose estimation from radon appears much more important than dose estimates from radionuclides interpreted from bioassays. The current routine grab working level measurements for radon decay products exposure is inadequate to determine doses for worker dosimetry records.

Recommendation: Review and determine the need to continue the personnel external dosimetry program.

Provide QC data to the DOE and TAC demonstrating that the vendor laboratory analysis for uranium in urine can meet contractual requirements.

Review and determine the need to continue the bioassay program. Discontinue the program if workers are not likely to receive 100 mrem CEDE from nonradon internal exposures. If the program is continued, consider sampling mainly (or only) the highest exposed personnel, instead of 10 percent chosen randomly.

Perform more extensive personnel radon exposure monitoring to improve and record radon dose estimates for workers.

The TAC will assist in performing any of these reviews.

GRJ-A06-O14

Observation: The acceptable count range for a specific instrument scaler and probe was recorded on Attachment 8, Acceptable Count Range Form, in Procedure RAC-IN-001, *UMTRA HP Instrumentation Program*, Rev. 0, ICN-01. This information was transferred to Attachment 9, Instrument Performance Log, which identified the same scaler and a different probe.

Discussion: Since components of the instrumentation are operated under similar conditions, there should not be a significant difference between the responses from various combinations of scalers and probes. This could be verified by reviewing the results from daily source checks. Furthermore, this interchangeability of components should be verified to avoid conflict with recommendations from the American National Standards Institute (ANSI N323-1983) and regulatory guidance documents.

Recommendation: At a minimum, the site HP manager should collect data for three combinations of scalers and probes, as indicated on Attachment 8. Furthermore, if data available from the RAC indicate that the acceptable count range does not differ significantly using a variety of instrument combinations (e.g., scalers and probes), the RAC should consider revising this procedure. This should clarify the practice of determining an acceptable count range using one combination of scalers and probes and using that count range for other combinations of scalers and probes.

GRJ-A06-015

Observation: Contrary to procedural requirements, the site HP manger no longer receives and reviews vendor analysis results for environmental TLDs.

Discussion: Step 6.3 of Procedure RP-001-3, *Environmental Gamma Radiation Monitoring*, Rev. 0, ICN-01, states that "The Site HP Manager or designee shall review and maintain (in the site HP filing system) all Environmental TLD Location Logs, vendor analysis reports, and memos as needed for site operations." Contrary to this requirement, the APO no longer forwards environmental TLD results to the site HP manager. Since environmental TLD results generate an environmental monitoring report issued by the APO, this auditor was informed that this procedure will be revised to reflect current APO practices. All other aspects of this procedure were performed in accordance with procedural requirements.

Recommendation: The RAC should consider revising this procedure to reflect current practices regarding environmental TLD results.

GRJ-A06-016

Observation: Sections of the HPMP and the "Environmental Monitoring Program Addendum" were performed in accordance with SOPs. Although Section 1.0, Introduction, states in part that "When differences in methodology or routine practices occur, guidance in the RAC Health Physics Procedures shall take precedence over the guidance of this Plan," the TAC has identified inconsistencies and brought them to the attention of the site HP manager.

Discussion: Section 3.1, Boundary Establishment and Posting, identifies controlled areas that include, but are not limited to, work areas meeting the following conditions, as noted in the plan. However, the following bulleted items have been revised and are different from other HPMPs:

- Bullet 2: Yearly and weekly dose rates have been revised from 500 mrem/yr (240 μR/hr, 40 hours per week) to 100 mrem/yr (50 μR/hr, 40 hours per week).

- Bullet 3: Regulatory guidance for airborne concentrations limits have been revised from DOE Order 5480.1A, Attachment II, to DOE Order 5480.11, Attachment 1, Table 1, for most restricted radionuclides known to be present in the area.

- Bullet 4: Surface contamination limits have been revised from 600 dpm per 100 cm^2 (transferable) or total contamination (fixed and smearable) of 3300 dpm per 100 cm^2 to release limits defined on Attachment 1, ALARA Release Limits, and Attachment 2, Regulatory Release Limits of Procedure RP-003-3, *Equipment Monitoring and Release Criteria*, Rev. 1, ICN-06.

Section 3.3, Respiratory Protection, states in part that "Respiratory protection shall be required when airborne contamination projected exposure in an area may exceed 40 MPC hours per week." Contrary to this requirement, the formula for determining the fraction rule is provided in step 5.4.2 of Procedure RAC-RP-002, *Workplace Monitoring and Exposure Control*, Rev. 1, ICN-01.

Section 4.1, Employee Thermoluminescent Dosimetry, states in part that "Personnel requiring access to controlled areas for more than 120 hours in any three consecutive months shall be issued uniquely numbered thermoluminescent dosimeter badges (TLDs)." Contrary to this requirement, other plans require wearing a TLD to access a controlled area for more than 40 hours in any 3 consecutive months.

Section 4.2, Self-Reading Dosimeters (SRDs), states in part that "Visitors may be issued SRDs prior to entry into radiologically controlled areas." Contrary to this requirement, SRDs are not used on the UMTRA Project.

Section 4.3, Bioassay Requirements, states in part that "Additional bioassay samples may be required on a quarterly basis for certain radiation workers, or if weekly average radionuclide air concentrations exceed any radionuclide MPCa. This section also provides various action levels for collecting additional urinalysis samples. Contrary to these requirements, MPCa limits have been replaced by derived air concentrations, and bioassay action levels have been replaced by action levels identified in Procedure RP-004-1, *Bioassay Program*, Rev. 2, ICN-01.

Section 6.2, Air Samples (1st paragraph), states in part that "Samples with at least a 72-hour decayed gross alpha activity...will be sent to an offsite laboratory for analysis..." Contrary to this requirement a 48- to 96-hour decay time is allowed as stated in step 4.4.3 of Procedure RP-002-1, *Long-Lived Gross Alpha and Th-230 Monitoring*, Rev. 2, ICN-01.

Section 6.2, Air samples (2nd paragraph), states in part that "Quarterly, all air sample filters from each sampling location (work area) shall be sent to an off-site laboratory as a group composite analysis for Th-230, Ra-226, and gross alpha." Contrary to this requirement, the off-site laboratory also analyzes the occupational air samples for gross beta concentrations.

Section 6.2, Air Samples (3rd paragraph), states in part that "Samples shall be uniquely marked as per the RAC Systematic Sample Numbering System." Contrary to this requirement, all guidance for sample identification is provided in Procedure RP-006-4, *Sample Identification and Vendor Analysis*, Rev. 0, ICN-02.

Section 7.2, Soil Sampling (2nd paragraph), references the *Draft Remedial Action Plan*, of which the *Final Remedial Action Plan* has since been issued.

Section 8.0, Environmental Monitoring (which includes Section 8.1, Airborne Particulate Monitoring, and Section 8.2, Radon Monitoring), and the "Environmental Monitoring Program Addendum" reference Figure 6.0, Environmental Air Monitoring Locations, and Figure 6.1, Cheney Reservoir Disposal Site Environmental Monitoring Locations. These figures have since been revised by site personnel. Furthermore, three track-etch cups for radon monitoring are now placed at designated locations, and Figure 6.0 and 6.1 do not indicate upstream and downstream water sampling locations as indicated by Section 8.3, Water Monitoring.

The HPMP does not reference instrumentation and emergency response requirements, as identified in other plans.

Section II.A., Radiological Dust Monitoring (1st paragraph) of the "Environmental Monitoring Program Addendum" states in part that "These (air particulate) monitors operate 24 hours/day, 7 days/week and are collected every 2 days." Contrary to this requirement, the guidance should indicate that the air particulate samples are collected 3 days/week.

Section II.A.4., Particulate Radioactivity Limits of the "Environmental Monitoring Program Addendum" states in part that "The limits for Th-230 in allowable dust generated from radioactive work site are as follows: Occupational work area 2×10^{-12} μCi/ml and Environmental boundaries 8×10^{-12} μCi/ml." Contrary to this requirement, the limits have been revised as follows: Occupational work area

$7x10^{-12}$ μCi/ml and Environmental boundaries $5x10^{-14}$ μCi/ml.

Recommendation: Identifying inconsistencies among the HPMP, the "Environmental Monitoring Program Addendum," and SOPs may not justify revisions. However, the RAC should note and be aware of inconsistencies and use the information to develop more accurate and consistent HPMPs.

5.0 LIST OF CONTRIBUTORS

The following individuals contributed to the preparation of this audit report.

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END

DATE FILMED

11/01/93