

UMTRA-DOE/AL

United States Department of Energy



**Report of Final Audit
Remedial Action Construction
UMTRA Project
Shiprock, New Mexico**

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

Uranium Mill Tailings Remedial Action Project



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FINAL AUDIT REPORT
SHIPROCK, NEW MEXICO

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1.0 SUMMARY

The Final Audit Report summarizes the results of all Quality Assurance Audits, In-process Surveillances, and Radiological Surveillances conducted at the Shiprock UMTRA Project Site.

All issues documented as audit or surveillance Findings have been resolved to the satisfaction of the UMTRA Project Office.

A recommendation for certification of the site by the U.S. Department of Energy (DOE) is given.

2.0 INTRODUCTION

This Final Audit Report consists of a summary of the Quality Assurance Audit, Radiological Surveillance, and In-Process Surveillance reports prepared by the Technical Assistance Contractor (TAC), as well as a summary of the reports of others audits and surveillances conducted by the DOE or the U.S. Nuclear Regulatory Commission (NRC). The Final Audit Report provides an independent assessment by the TAC of the compliance of the remedial action with plans, specifications, and standards. A recommendation to the DOE for certification of the site is included.

2.1 QUALITY ASSURANCE AUDITS

Quality Assurance Audits are conducted periodically by the DOE, with assistance from the TAC, to verify that the procedures and systems required by the respective quality assurance programs are being implemented during remedial action. The Quality Assurance Audits are performed on the frequency of approximately one per year for each organization and subcontractor conducting UMTRA Project work. The results of the audits and followup actions for Shiprock are documented in Section 6.0; a summary is given in Table 2.1.

2.2 RADIOLOGICAL AND IN-PROCESS SURVEILLANCE REPORTS

Radiological and In-Process Surveillances are conducted by the TAC for the DOE to provide an independent assessment that the quality of remedial action work is sufficient to ensure that the EPA standards and other site-specific requirements are met. These performance surveillances complement the quality assurance programs and audits, and provide a high degree of assurance that the remedial action tasks are accomplished in compliance with relevant specifications and standards. Performance surveillances are conducted at processing sites a minimum of once per construction season, or twice per remedial action. The results of the surveillances and followup actions for the Shiprock processing site are documented in Sections 4.0 and 5.0; a summary appears in Table 2.1.

2.3 OTHER QUALITY ASSURANCE AUDITS

Summaries of Quality Assurance audits and surveillances conducted by the DOE, NRC, TAC, or other agencies are included in Sections 5.0, 6.0, and 7.0 and summarized in Table 2.1. Included in the summaries will be DOE and contractor resolutions to Observations presented in the audit report. Any other audits made at Shiprock are reported in Section 7.0; and summarized in Table 2.1.

2.4 AUDIT PROCEDURES

Criteria and procedures for conducting UMTRA Project audits and surveillances are provided in a document titled Audit/Surveillance Program Plan (JEG, 1986).

Table 2.1 Summary of audits and surveillances

Type/date	Number of Findings	Number of Observations	Date closed
TAC Radiological Surveillances			
January 15-17, 1986	3	8	05-27-86
TAC In-Process Surveillances			
October 1, 1985	1	0	11-05-85
November 5, 1985	0	0	11-05-85
April 30, 1986	0	0	05-27-86
June 24, 1986	0	0	07-22-86
August 19, 1986	0	1	10-20-86
TAC Construction Surveillances			
January 20, 1986	0	0	01-20-86
August 19, 1986	0	1	10-20-86
TAC Quality Assurance Audits			
MK-Engineering March 26-27, 1986	0	2	06-06-86
MK-F Albuquerque May 12, 1986	0	4	06-30-86
Other Audits/Surveillances			
NRC October 1, 1985	1	1	05-02-86
May 7, 1986	1	0	06-30-86

2.5 GENERAL STANDARDS

In 1978, the U.S. Congress passed Public Law 95-604, the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA), declaring uranium mill tailings a potential health hazard to the public, and requiring that certain sites be designated for remedial action. The Shiprock site was included as one of these. The U.S. Environmental Protection Agency (EPA) was directed to promulgate radiological and nonradiological standards for decontamination of the sites, the DOE was authorized to initiate and manage the remedial actions, and the NRC was charged with concurring in the remedial actions and licensing the disposal sites. The standards which apply to all UMTRA Project sites, as promulgated by the EPA, are given in two subparts of 40 CFR Part 192:

- o The standards in Subpart A are directed at controlling the stabilization of radioactive materials at the disposal sites, and are addressed by the engineering design specifications developed by the DOE Uranium Mill Tailings Remedial Action (UMTRA) Project Office for the disposal sites. Compliance with the Subpart A standards at the Shiprock site was determined indirectly during in-process surveillances which evaluated compliance with the approved final design of the disposal site.
- o Subpart B standards define the conditions under which a site has been adequately decontaminated. In-situ measurements and analyses of soil samples from excavated areas were conducted by the Remedial Action Contractor (RAC), and the results compared to the cleanup standards for verification that contaminated materials had been removed. The TAC conducted Radiological Surveillance activities at the Shiprock site to provide an independent evaluation of the RAC's verification efforts.

Site-specific requirements imposed in addition to the generally applicable EPA standards are described in Section 3.0.

3.0 SPECIAL CONDITIONS AT THE SITE

The remedial action alternative selected for the Shiprock processing site was stabilization in place, with consolidation of all contaminated materials in two large embankments located in approximately the same location as the original tailings piles. In order to provide a stable configuration that complied with the EPA design criteria, contaminated material was removed from the area within 300 feet of the edge of the escarpment northeast of the piles, and placed in the embankments. Areas of windblown contamination also were excavated from around the tailings piles and added to the embankments. All contaminated material excavation was conducted to ensure that residual contamination levels did not exceed the EPA cleanup standards of:

- o 5 pCi/g of Ra-226 in the top 15-cm-thick layer of soil, averaged over areas of 100 m².
- o 15 pCi/g of Ra-226 in any 15-cm-thick layer of soil more than 15 cm below the surface, averaged over 100 m², with the exception of the face of the escarpment where supplemental standards were applied.

Six potentially contaminated buildings at the site were monitored for contamination; and evaluated for demolition, or decontamination and salvaging. All six buildings were decontaminated as necessary and left standing for future use. Residual contamination was reduced to levels that were as low as possible using reasonable efforts with no contamination left that exceeded the following limits:

- o An annual average radon decay product concentration (including background) of 0.02 WL.
- o Gamma radiation levels of 20 microR/h above background.
- o Removable surface contamination levels of 1000 dpm/100 cm², and total (removable and fixed) contamination of 5000 dpm/100 cm², including contribution from alpha, beta, and gamma radiation.

4.0 RADIOLOGICAL SURVEILLANCES

Radiological surveillances are performed by the TAC for the DOE UMTRA Project Office to provide an independent assessment that the quality of remedial action work is sufficient to ensure that EPA standards are met. While quality assurance programs and audits provide a high degree of assurance that procedures are followed, radiological surveillances address whether the work actually results in a site which meets the EPA standards. Specific attention is given to the contractor's radiological survey plans and procedures, measurement techniques, and data management capabilities. The UMTRA Project laboratory and field instrumentation are used for contractor cross-calibration purposes as well as for analyzing soil samples taken from the sites.

A Radiological Surveillance was conducted at the Shiprock site in January, 1986. The surveillance involved approximately a three-day site visit by a two-person surveillance team from the Radiological Services Group of the TAC. During the site visit, measurements were made, samples were collected for analysis at the UMTRA/TAC laboratory to provide data for comparison with similar data used by the RAC for excavation control and verification, and a statistical evaluation of the RAC's data was conducted.

A detailed description of Radiological Surveillance activities is presented in the document titled Audit/Surveillance Program Plan (JEG, 1986). The following sections provide additional information regarding the surveillance and audit activities, and summarize the findings and resolutions.

4.1 SURVEILLANCE OBJECTIVES

Radiological Surveillances have three distinct objectives. The first objective is verification that remedial actions are meeting the EPA clean-up standards or other cleanup standards specified in the remedial action planning documents. The second objective is evaluation of excavation control methods used by the RAC to ensure that contaminated areas are not overexcavated, thereby preventing increased quantities of material for disposal and escalated costs. The final objective of a surveillance is to review the general data management methods and procedures of the RAC, and provide a pathway for the exchange of ideas for technological improvements in the program.

Radiological Surveillance results are documented as either Findings or Observations, as described below. Findings presented in a Radiological Surveillance are based on one of the following criteria:

- o Noncompliance with requirements of the site Remedial Action Plan (RAP), Engineering Design, or UMTRA Project Office directives applicable to the site.
- o Evidence that the existing radiological measurement techniques may result in residual contamination levels in excess of established limits (underexcavation).
- o Evidence that the existing radiological measurement techniques may result in otherwise avoidable excavation of soils not contaminated in excess of the limits (avoidable overexcavation).

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

The soil contamination limits are those specified by EPA standards, including site-specific modifications agreed to by the NRC or mandated by UMTRA Project Office directives. The probable impact of each Finding is indicated, as well as the TAC's recommended action for resolving the issue.

Observations are comments considered appropriate by the auditors to document topics of concern to the UMTRA Project Office, and to note non-critical areas where improvements in techniques or procedures could be made. Comments on proficiency, favorable comparisons, or developmental activities may be included as Observations.

4.2 SURVEILLANCE RESULTS

The results of the surveillance of remedial actions at the Shiprock site included two Findings of deficiency, one Finding of proficiency at a critical task, one Observation noting a non-critical deficiency, and seven Observations indicating proficiency at less critical tasks. All of the Findings and Observations of deficiency were corrected to the satisfaction of the UMTRA Project Office. The two Findings and one Observation of deficiency addressed the following conditions:

- o An inability to confirm complete verification of excavated areas in a timely manner (SHP-RS1-F01). Detailed site maps showing verification grids were not maintained up to date allowing some excavated areas to be backfilled before it was observed that verification samples had not been collected from some of the grids in the area. The same shortcoming resulted in unintentional duplicate sampling of some grids. In response to this Finding the RAC updated the verification grid maps, and committed to preparing site maps for each area prior to commencing verification and transposing data to the maps in a timely manner. Grids that were not sampled prior to backfilling were sampled using an auger to provide the missing data.
- o The need for a documented correlation of the shielded probe counting rate to soil Ra-226 concentration as determined by delta measurements or OCS analyses of soil samples (SHP-RS1-F02). Area-specific cutoff counting rates were established by the RAC; however it was not documented which cutoff was used in each area. The RAC recorded the available data to adequately document to correlations.
- o The large volume of radiological data and the cumbersome manual data management methods limited the usefulness of the information to site personnel (SHP-RS1-001). The RAC was considering on-site microcomputing capability, but had not yet acquired the necessary equipment.

The seven Observations documenting proficiency addressed the following topics:

- o Acceptable results from cross-check samples analyzed by the TAC and the RAC OCS (SHP-RS1-002).
- o Confirmation that RAC OCS analytical results met the analytical accuracy requirement of 30 percent at the 95 percent confidence interval (SHP-RS1-003).
- o Acceptable agreement between RAC sample measurements and QA sample analyses conducted by EDA (SHP-RS1-004).
- o Reasonable agreement between RAC & TAC verification sample analyses (SHP-RS1-005).
- o Confirmation that EPA cleanup standards for Ra-226 in soil were being met (SHP-RS1-006).
- o Adequacy of RAC excavation techniques in areas containing cobbles (SHP-RS1-007).
- o Adequacy of quarterly frequency for updating the OCS initial count correction factor (SHP-RS1-008).

4.3 SUMMARY

RAC responses to the Findings and Observations have been rapid and effective. Operational and procedural changes as noted in the separate discussions above were implemented in a timely fashion and verified by the TAC before each issue of the surveillance was considered closed.

5.0 QUALITY ASSURANCE IN-PROCESS SURVEILLANCES

In order to ensure that the approved construction plans and specifications were being properly followed, the DOE/TAC/NRC team performed five in-process surveillances at the Shiprock site during remedial action activities. These surveillances were independent of the contractor performing the work and do not relieve the contractor from any inspection or checking responsibilities that are required under the approved Remedial Action Inspection Plan (RAIP). These surveillances were performed by a team with members from different disciplines headed by the TAC Quality Assurance Department. Quality Assurance surveillances were conducted at the Shiprock site in October, 1985, November, 1985, April, 1986, June, 1986, and August, 1986.

Each surveillance conducted by the TAC involved a one-day site visit by a team headed by the TAC Quality Assurance Department and supported by other TAC disciplines as necessary. Surveillances were also conducted by an NRC team. These surveillances also involved a one-day visit. During the TAC surveillances, materials, records, and construction activities were verified using the approved RAIP, RAP, and plans and specifications for the Shiprock site. The following sections provide additional information regarding the surveillance activities and summarize the surveillance findings and resolutions.

A subset of the in-process surveillances is scheduled specifically to evaluate the engineering construction of certain features which are critical to the design of the disposal area. This subset is termed "Construction Surveillances." A separate section (Section 5.4) on the two Construction Surveillances conducted by the TAC is included below.

5.1 SURVEILLANCE OBJECTIVES AND CHECKLIST

The Quality Assurance surveillances had three distinct objectives. The first objective was to verify compliance by the RAC to the approved RAP for the Shiprock site. To accomplish this, the approved RAP with any modifications was reviewed by the TAC Quality Assurance Department surveillance team leader and members, and a checklist was prepared made up of key construction activities and the methods used to perform them.

The second objective was to verify that the RAC was in compliance with the approved plans and specifications. The surveillance team accomplished this objective by review of documentation, and by observing construction activities as they were being performed.

The final objective of the surveillances was to verify that the approved RAIP for the Shiprock site was being implemented. This was accomplished by qualified personnel witnessing the performance of testing and inspection activities by staff in the field.

5.2 SURVEILLANCE RESULTS

In-process surveillance results are documented as either Findings or Observations with the former relating to non-compliance items and the latter relating to items of a non-critical nature. The results of the surveillances performed at the Shiprock site included one Finding and one

Observation. The Finding and Observation were corrected to the satisfaction of the UMTRA Project and the NRC. The Finding and Observation noted during the surveillance activities addressed the following conditions:

- o Failure to report or to follow up with corrective action on test results which indicated that moisture contents of relocated tailings and contaminated material were not in conformance with specification requirements.
- o The need to expedite laboratory test results to aid in assessing the status of a potential non-conforming condition concerning select bedding material absorption requirements.

5.3 CONSTRUCTION SURVEILLANCE OBJECTIVES AND PROCEDURES

Two Construction Surveillances were conducted at Shiprock in January and August, 1986. The objective of a construction surveillance is to review the construction process and sequencing as related to field conditions, and to evaluate these against the intent of the remedial action design. It also provides review of the implementation of the approved final design for the disposal area, and evaluates design and construction problems and resolutions.

Construction Surveillances vary from site to site and are adjusted to site-specific conditions. In general, the engineer who visits the site observes that the materials being used at the site are as anticipated in the original design, and that the design as formulated fits in with conditions as revealed by the excavation work or construction activities. Examination of the soils and tailings to observe if the variations in their parameters are within the range anticipated in the design may be necessary. Construction procedures are observed to note that they are in conformance with design requirements, intentions, and specifications.

Records of tests on the soils and tailings are examined. While these data may have been obtained strictly in accordance with standard operating procedures, they may not be in accordance with what may reasonably be anticipated or expected.

5.4 CONSTRUCTION SURVEILLANCE RESULTS

A construction surveillance was conducted at Shiprock in January, 1986, to witness excavation of contaminated materials, embankment construction, and site grading activities. Construction test records were reviewed during this visit and visual inspection of construction activities was performed. No areas of non-compliance with approved plans and specifications were identified. It was noted that frost was affecting embankment construction although it was verified that appropriate construction procedures had been implemented which alleviated concern over this matter.

A second construction surveillance was scheduled in conjunction with an in-process quality assurance surveillance at Shiprock in August, 1986, to coincide with the placement of erosion protection materials. A visual

inspection of erosion protection material processing and placement activities was performed, a general inspection of embankment, floodplain, and escarpment conditions was conducted, field testing was witnessed, and settlement monument data were reviewed. The resulting surveillance report was generally favorable with the exception of the following Observation:

- o It was noted during review of laboratory test results for five samples of the select bedding material that the specified absorption requirement of "less than one percent" had been exceeded. The test reports in question exhibited absorption results of 1.0 to 1.4 percent, with the average test results exceeding the specification requirements by 0.2 percent. Sample splits of the failing samples were subsequently re-tested with two of the re-tested samples exhibiting results within the specified requirements, although the results of all retested samples had not yet been received. It was recommended that an effort be made to expedite receipt and analysis of select bedding material absorption re-test results in order to determine whether non-conforming materials have been placed.

6.0 QUALITY ASSURANCE AUDITS

During the performance of remedial action activities at the Shiprock site, there was one audit of the M-K Engineering activities in San Francisco and one audit of the MK-F Albuquerque Operations Office activities. These audits were performed by the TAC with support from the UMTRA Project Office and the DOE/AL Quality Engineering Department (QED) Group.

6.1 AUDIT OBJECTIVES

Quality assurance audits have two objectives. The first objective is to verify compliance by M-K Engineering and MK-F Albuquerque to their approved QAPPs and supporting procedures. The second objective is to provide objective evidence of the effectiveness of the implementation of the approved QAPPs and supporting procedures.

6.2 AUDIT RESULTS

Audit results are documented as either Findings or Observations with the former relating to non-compliance items and the latter relating to items of a non-critical nature. The results of the audits included no Findings and six Observations. The Observations noted during the audits required the following:

- o The need to develop a more adequate system of providing objective evidence of QA reviews of revisions to previously approved design documents.
- o The need to implement recently completed revisions to the Quality Assurance Program Plan concerning equipment calibration and control.
- o The need to review, and revise as required, Quality Assurance Audit Files and Schedules.
- o The need to ensure greater control and/or traceability of quality documents transferred from project sites to the MK-F Project Office.
- o The need to direct greater attention toward the checking of design calculations.
- o The need to prepare, review, and approve site reliability reports in a more timely fashion.

6.3 SUMMARY AND CONCLUSIONS

One quality assurance audit was conducted of the M-K Engineering activities in San Francisco and one audit was conducted of the MK-F Albuquerque Operations Office activities. A total of six Observations were noted. Followup of Observations confirmed that all required actions have been taken by either M-K Engineering or MK-F Albuquerque and all Observations have been resolved to the satisfaction of the TAC UMTRA Project Office and DOE/AL-QED.

7.0 OTHER AUDITS/SURVEILLANCES

In order to ensure that the approved construction plans and specifications and the RAIP for the Shiprock site were being properly followed, the NRC performed two surveillances of Shiprock site activities. These surveillances were independent of the contractor performing the work and do not relieve the contractor from any inspection or checking responsibilities that were required. The NRC surveillances were performed in October, 1985, and May, 1986.

Each surveillance conducted by the NRC involved a one-day site visit. During these surveillances, materials, records, and construction activities were verified using the approved RAIP, RAP, and Plans and Specifications for the Shiprock site.

7.1 SURVEILLANCE OBJECTIVES

The surveillances had three distinct objectives. The first objective was to verify compliance to the approved RAP and any approved modifications.

The second objective was to verify compliance with the approved plans and specifications. This objective was accomplished by review of documentation and by observing construction activities as they were being performed.

The final objective was to verify that the approved RAIP for the Shiprock site was being implemented. This was accomplished by qualified personnel witnessing the performance of testing and inspection activities by staff in the field.

7.2 SURVEILLANCE RESULTS, NRC

Surveillance results in the NRC reports are documented as recommendations. The results of the surveillances performed at the Shiprock site included two recommendations. The two recommendations are as follows:

- o The DOE must qualitatively and quantitatively assess the RAC's failure to report and to take corrective measures regarding the relocated tailings and contaminated material which were compacted at moisture contents not in compliance with specifications and provide proposed corrective action and resolution of this issue to the NRC for review.
- o Gradation testing will be conducted on rock type(s) B and B1 (two samples of each type) to acquire a more representative gradation measurement for the described rock type(s).

7.3 SUMMARY AND CONCLUSIONS

Two surveillances were performed by the NRC during remedial action activities at the Shiprock site. Two recommendations were made by the NRC. Followup of the recommendations by the NRC confirmed that all required actions have been taken by the RAC, and the recommendations have been satisfactorily resolved.

8.0 SUMMARY AND CONCLUSIONS

One Radiological Surveillance, two Construction Surveillances (one by TAC Engineering and one by TAC Engineering in conjunction with TAC Quality Assurance), and five Quality Assurance In-Process Surveillances were conducted at the Shiprock UMTRA Project site during remedial action activities. A total of four Findings and 10 Observations were noted. Followup of Findings and Observations confirmed that all required actions have been taken by the RAC, and all Findings have been satisfactorily resolved.

In addition to the above noted audit and surveillance activities, a final inspection was conducted at the Shiprock site on January 9, 1987, by representatives of the DOE's UMTRA Project Office Operations and Technical Support groups and the TAC's Engineering, Quality Assurance, and Surveillance and Maintenance/Licensing groups. This visual inspection of the completed construction activities identified no conditions which would preclude recommendation for site certification, and provided assurances that the completed site conditions were consistent with RAP and specification requirements.

As a result of the previously referenced audit/surveillance activities, the TAC concludes that the remedial action was conducted in accordance with the approved Remedial Action Plan, that the site conforms to the applicable EPA standards or to the agree-upon deviations from those standards, and recommends the site for certification by the DOE.

REFERENCES

- JEG (Jacobs Engineering Group Inc.), 1986. "Audit/Surveillance Program Plan," prepared by JEG, Albuquerque, New Mexico.
- 40 CFR Part 192, 1983. Code of Federal Regulations, "Standards for Remedial Actions at Inactive Uranium Processing Sites," in Federal Register, Volume 48, No. 3, Washington, D.C.