

ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket No.: 40-6659

License No.: SUA-551

Report No.: 40-6659/97-01

Licensee: Petrotomics Company

Facility: Former Shirley Basin Uranium Mill

Location: Carbon County, Wyoming

Dates: May 28-29, 1997

Inspector: Robert J. Evans, P.E., Health Physicist
Nuclear Materials Licensing Branch
Division of Nuclear Materials Safety

Approved By: Charles L. Cain, Chief
Nuclear Materials Licensing Branch
Division of Nuclear Materials Safety

Attachments: Partial List of Persons Contacted
Items Opened, Closed, and Discussed
List of Acronyms Used

Photographs Taken at the Shirley Basin Facility

EXECUTIVE SUMMARY

Shirley Basin Site NRC Inspection Report 40-6659/97-01

This inspection included a review of site status; management organization and controls; site operations; and the licensee's radiation protection, waste management and environmental protection programs.

Management Organization and Controls

- The licensee's organizational structure was consistent with previous inspections, and it appeared that adequate oversight had been provided for site activities (Section 2).
- Procedures had been established at the site and were found to be adequate for the staff currently assigned to the site (Section 2).

Operations Review

- Site activities were noted to have been conducted in accordance with the applicable license and regulatory requirements. No significant health or safety concern was identified during the site tour (Section 3).

Radiation Protection

- The licensee had implemented a radiation protection program that met the requirements established in 10 CFR Part 20 and the license (Section 4).
- Occupational exposures at the site were small fractions of the limits established in 10 CFR 20 (Section 4).

Radioactive Waste Management/Environmental Protection

- A review of the licensee's environmental and groundwater monitoring programs, and the annual land use survey, indicated that the licensee was in compliance with the license requirements (Section 5).
- All reports related to the groundwater and environmental monitoring programs had been submitted to the NRC as required. A review of the reports and the original laboratory documentation revealed that the radiological releases from the site to the environment during 1995 were within the limits established by 10 CFR 20 (Section 5).

REPORT DETAILS

1 SITE STATUS

The Shirley Basin uranium mill operated between 1962 and 1985. The mill was decommissioned in 1985, and cleanup of windblown material occurred during 1986. The NRC approved the licensee's reclamation plan in 1989, and the ore stockpile and mill area were subsequently reclaimed during 1991-1992.

At the time of the inspection, two evaporation ponds were located onsite. The Stage I pond was constructed during 1987, while the Stage II pond was constructed during the 1988-1989 timeframe. These ponds cover about 37 acres and were designed to receive and to evaporate precipitation and groundwater. At the time of the inspection, the two ponds were in service. Furthermore, the enhanced evaporation system was in service in the Stage I pond.

A 140-acre tailings impoundment was located at the site. A 2-foot interim cover was installed over the impoundment during 1990. The licensee began installing the final radon barrier over the tailings pile during August 1996. The licensee installed the radon cover on about 22 acres during the 1996 construction season, well below the 43 acres planned for that year. The licensee suspended the reclamation activities in late-October 1996 for the year because of changing weather conditions.

On May 20, 1997, construction of the final radon barrier recommenced. The licensee planned to install the barrier over about 70 acres of the 140-acre tailings impoundment during 1997. The licensee planned to complete the installation of the radon barrier (with the exception of the reserved area on the north end of the tailings pile and the two evaporation ponds) by October 31, 1997. The licensee has begun seeding portions of the tailings impoundment to promote vegetation growth for long-term erosion control.

However, one settlement monitor (No. 6, which was located in the western portion of the tailings impoundment) has not reached the 90 percent settlement point. The licensee previously installed additional soil on top of this area (a process called surcharging) to assist in the settlement process. If the area fails to settle in a timely manner, the licensee cannot install the final radon barrier over this portion of the tailings pile during the 1997 construction season. Consequently, the licensee will not be able to meet the October 31, 1997, deadline that is stipulated in License Condition 50.A(3). The licensee plans to continue discussions with the NRC involving their options related to the settlement of the tailings pile around settlement monitor No. 6.

Eleven groundwater extraction pumps were available on an intermittent basis. These pumps discharge groundwater into the Stage I pond. At the time of the inspection, eight pumps were in service, one pump had no power (the power line had been disconnected to support reclamation activities), while the remaining two

pump wells were dry and could not be pumped. The eight pumps were operating at an average combined flowrate of 28 gallons per minute, a flowrate that was down from previous years.

Besides construction work of the radon barrier, the licensee also was performing repair work on their former mine, Pit 4. Pit 4, an open pit mine located near the tailings pile, was drained during August-September 1996. The water, totalling roughly 43 million gallons, was temporarily relocated to the east drainage basin (formerly the mill's freshwater pond) adjacent to the tailings pile. Following the dewatering of Pit 4, the eastern slope of the pit was reworked to repair damage caused by the failure of the slope. Repair of Pit 4 began in August 1996 in accordance with a State-approved reclamation plan. The Pit 4 repair work was expected to be completed in early-June 1997. The water in the east drainage basin was being utilized in the tailings reclamation work. The licensee plans to evaporate any remaining fluid in the east drainage basin by next year.

Other work planned by the licensee in the near future included installation of rock for control of erosion in select areas of the tailings impoundment and reshaping the tailings dam in accordance with the NRC-approved reclamation plan. The licensee plans to lower the top of the dam by about 12 feet to comply with the requirements of the reclamation plan.

2 MANAGEMENT ORGANIZATION AND CONTROLS (88005)

2.1 Management Organization

a. Inspection Scope

The organizational structure was reviewed to ensure that the licensee had established an organization with defined responsibilities and functions.

b. Observations and Findings

Site staffing requirements are established in License Condition 11. At the time of the inspection, site staffing consisted of three full-time employees and 28 contract employees. The full-time employees included the site supervisor, the radiation/environmental coordinator, and the maintenance coordinator. The onsite contractors included 16 construction workers assigned to the tailings impoundment reclamation work, 8 construction workers assigned to the Pit 4 repair work, 2 technical workers (one technician and one engineer), and 2 laborers.

The licensee discontinued the use of security guards at the site during 1994. Personnel were on site every business day, and an inspection of the entire site was performed on a daily basis. In addition, locked gates and fences were used to keep intruders out during off-normal hours.

2.2 Management Controls

a. Inspection Scope

The site standard operating procedures were reviewed and the licensee's implementation of these procedures were assessed to evaluate the effectiveness of the licensee's control of site activities.

b. Observations and Findings

License Condition 29 states that standard operating procedures shall be established for environmental monitoring and instrument calibrations. A review of the procedures disclosed that the procedures were adequate for the site staff. Several minor procedure discrepancies were identified and were reported to the licensee: (1) one procedure had a pen-and-ink change that had not been approved by the radiation safety officer, (2) an out-of-date telephone list was identified in the master procedure manual, and (3) an out-of-date tailings dam inspection procedure was identified in the master procedure manual. The licensee's records indicate that the site procedures had been reviewed on an annual basis in accordance with License Condition 29.

2.3 Conclusions

The licensee's site organizational structure was generally consistent with structures in place during previous inspections, and it appeared that adequate oversight had been provided for the current mode of site operations.

Procedures had been established at the site. The procedures were found to be adequate for the site's staff.

3 **OPERATIONS REVIEW (88020)**

3.1 Inspection Scope

A facility tour was performed to verify that site activities were being conducted in accordance with applicable regulations and the conditions of the license, and to ensure that operational controls were adequate to protect the health and safety of the workers and members of the general public.

3.2 Observations and Findings

During the plant tour, tailings reclamation work was in progress. Earthmoving equipment was removing 5 inches of soil from the 2-foot thick interim cover as part of the remediation process, followed by the installation of the 4-5 foot (minimum) final radon barrier. The work seemed to be progressing in a safe and orderly manner.

Site buildings, fences, gates, and operating groundwater remediation equipment were also observed. Site structures in place at the time of the inspection included an office, warehouse, shop, storage/woodshop building (formerly a motel), guard shack, and several temporary sheds and pumphouses. The licensee planned to dismantle the motel structure in the near future and either salvage or dispose of the building remains. Site fences and gates were in good condition and were properly posted in accordance with License Condition 11.

During the inspection, two potential industrial safety hazards were identified. At least five compressed gas cylinders were noted to be unsecured in the shop area. Also, an oxygen resuscitator was identified in the main office. No individual at the site was qualified to operate this medical device, and the oxygen cylinders appeared to have expired in 1983. The licensee planned to remove this device from the site in the near future.

The licensee performed daily security and operations checks which included an inspection of the site gates, fences, pumps, and buildings. The licensee has maintained records of these daily inspections. Also, the licensee inspected the low volume environmental monitoring air sampler on a daily basis. The air sampler was not operating during the site tour. The air sampler apparently suffered damage caused by a lightning strike just prior to the site tour. The air sampler was replaced by the end of the inspection period.

In addition to the daily site check, the licensee performed a daily inspection of the pumpback wells in accordance with License Condition 47.C. To ensure adequate documentation of pumpback well operation, the licensee committed in their letter dated January 19, 1994, to document when, and the reason why, pumping from a well was stopped for any cause. In one recent example that was pointed out to the licensee, a pump had been secured but the reason for the pump being stopped was not clearly noted on the daily logsheet. This particular incident was determined to be an isolated oversight in the licensee's documentation of the daily site checks.

In accordance with License Condition 11, a quarterly inspection of the impoundment retention system is required to be conducted and documented. The licensee has maintained records, with photographs, of the quarterly inspections. The inspections for 1996 and the first quarter of 1997 were reviewed and were found to be comprehensive. The individuals who performed these inspections were noted to be fully qualified to perform the inspections.

3.3 Conclusions

Site activities generally appeared to have been conducted in accordance with applicable license and regulatory requirements. Site fences were in good condition, and perimeter postings were appropriate. Structures appeared to be in good condition. No significant health or safety hazards were identified.

4 RADIATION PROTECTION (83822)

4.1 Inspection Scope

The purpose of this portion of the inspection effort was to determine if the licensee's radiation protection program was in compliance with the requirements established in the license and 10 CFR Part 20 regulations.

4.2 Observations and Findings

a. Employee Exposures

The occupational exposure requirements have been established in License Condition 11. The licensee's personnel monitoring program consisted of issuance of thermoluminescent dosimeters (TLDs) to site employees and to selected contractors. The TLDs were being exchanged on a quarterly basis. The licensee is not required to maintain an internal exposure monitoring program; therefore, the licensee did not collect bioassay samples or implement an occupational exposure air sampling program during the previous year. In addition, the licensee no longer maintains in effect a radiological respiratory protection program, although half-face respirators were available for industrial uses (mainly for painting activities).

A review of dosimetry records indicated that exposures were well within the regulatory limits. For example, the highest exposure reading recorded on a TLD during 1996 totalled 10 millirems, well below the annual 10 CFR 20.1201 limit of 5000 millirems. Based on these results, site workers received significantly less than 10 percent of the occupational dose limit established in 10 CFR 20.1201.

b. Employee Training

Site training requirements are provided in License Condition 11. In accordance with this license condition, site employees were required to receive refresher training annually. Annual training was provided to the site staff during May 1997. In addition, incoming contract personnel received basic indoctrination training during August 1996 and May 1997.

There were no females on site at the time of the inspection. The last female at the site was employed during the Summer of 1996. This individual received training related to the exposure of the fetus prior to her work on site.

The licensee held quarterly safety meetings to discuss and review current site procedures and processes. These meetings covered basic industrial safety, including safe use of electrical equipment, vehicle operation during dangerous weather, fire safety, and radiation safety. Furthermore, the construction contractors held weekly safety meetings in addition to the licensee's quarterly safety meetings.

c. Equipment Calibrations

Survey instruments were required by License Condition 29 to be calibration checked on a semi-annual basis. The licensee maintained duplicate survey instruments and rotated the survey meters to ensure that operable and calibrated instruments were always available. A contract laboratory performed the instrument calibrations for the licensee. The licensee had calibrated survey instruments available for use during the inspection.

d. Release of Equipment for Unrestricted Use and Employee Monitoring

Personnel and equipment decontamination procedure requirements are provided in License Conditions 11 and 16. Since the last inspection, the license condition requirements for contamination surveys of employees had been revised. The new guidelines essentially require worker surveys to be performed at the discretion of the radiation coordinator. At the time of the inspection, the radiation coordinator required the construction workers to survey themselves on a daily basis prior to departure from the site. According to the licensee, little if any contamination was being detected on these site workers.

In accordance with License Condition 11, the radiation coordinator is required to perform quarterly spot checks of employees. The radiation coordinator did perform these quarterly spot checks during periods of construction and reclamation. However, the documentation of these spot checks was noted to be minimal. When informed of this potential documentation weakness, the licensee stated that future quarterly spot checks would be better documented.

The licensee's equipment release records were reviewed. During 1996, the licensee released only vehicles and construction equipment that had been performing reclamation work inside of the site's restricted area. The inspector noted that the licensee performed gamma and beta radiation surveys of equipment being released.

e. Annual ALARA Audit

The licensee is not required by the license to perform an annual As Low As Reasonably Achievable (ALARA) audit. However, 10 CFR 20.1101(c) states that the licensee shall periodically (at least annually) review the radiation protection program content and implementation. The licensee fulfilled this requirement in the past through the actions of the radiation coordinator. The radiation coordinator performed the program review on an ongoing basis, including the annual review of standard operating procedures and the periodic review of all incoming data related to the radiation protection and environmental monitoring programs. According to information provided by the licensee, two audits, one of the radiation protection program and one of the entire site, were planned for the Summer of 1997.

4.3 Conclusions

The licensee had implemented a radiation protection program that met requirements established in 10 CFR Part 20 and the conditions of the license. Occupational doses for site personnel during calendar year 1995 appeared consistent with the scope of work activities ongoing at the site and were only a small fraction of the occupational dose limits established in 10 CFR 20.

5 **RADIOACTIVE WASTE MANAGEMENT (88035) And ENVIRONMENTAL PROTECTION (88045)**

5.1 Environmental Protection

a. Inspection Scope

The environmental monitoring program at the site was reviewed to assess the effectiveness of the licensee's program and to evaluate the effects, if any, of site activities on the local environment.

b. Observations and Findings

Environmental monitoring program requirements are identified in License Condition 41. This condition states that the licensee shall implement the revised environmental and effluent monitoring program as stipulated in their license amendment request dated February 10, 1994. The environmental monitoring program in place at the site consisted of air particulate sampling, radon sampling, and measurement of the ambient gamma exposure rates at two sample stations. (Air particulate sampling was only required at one of two sample stations.) The upwind/background station was located about 7800 feet west-northwest of the former mill site, while the downwind station was located about 2000 feet northeast of the former mill site. Vegetation, soil, surface water, and sediment sampling were no longer required at the site.

In addition, License Condition 20 states that the results of all effluent and environmental monitoring required by this license shall be reported to the NRC. The two semi-annual reports for 1996 were reviewed during the inspection as well as the original data used to develop the semi-annual reports. Overall, the licensee had obtained and reported the environmental monitoring samples as required by the license. However, the reports used terminology ("maximum permissible concentration") associated with the superseded 10 CFR 20 requirements. This observation was also made during the previous inspections. In addition, several minor data or reporting errors were identified in the reports.

Air particulate sampling was continuously performed at one location downwind of the tailings pile. The composite samples were analyzed on a quarterly basis for their natural uranium, thorium-230, and radium-226 content. The results indicated that all radionuclides were less than one percent of the respective effluent concentration limits established in 10 CFR 20, Appendix B, Table 2.

License Condition 29 states that standard operating procedures shall be established for instrument calibrations. The licensee performed a calibration of the low-volume environmental air sampler on a quarterly basis, or following maintenance, using vendor-supplied instructions. The licensee had performed the quarterly calibrations of the sampler during 1996 and the first quarter of 1997.

Radon monitoring was performed at three locations, the site's office as well as the two sample stations. The sample results indicated that the maximum radon concentration, 3.8 E-9 microcuries per milliliter ($\mu\text{Ci/ml}$), was measured in the office during the fourth quarter of 1996. The highest concentration measured outdoors, $3.7 \text{ E-9 } \mu\text{Ci/ml}$, was measured at the upwind sample station during the third quarter of 1996. The downwind station measured $3.5 \mu\text{Ci/ml}$ of radon-222 during the same quarter. The results at the sample stations were 37 percent or less of the radon-222 effluent concentration limit established in 10 CFR 20, Appendix B.

Ambient gamma exposure rates were measured at the two sample stations. The upwind station measured 184.2 millirems during 1996 while the downwind station measured 204.8 millirems for the same year. The downwind station measured an ambient gamma exposure rate of 20.6 millirems higher than the upwind station during 1996. The difference in exposure rates was down in 1996 from the difference measured in 1995 (80 millirems).

The lower limits of detection for the environmental monitoring sample results were reviewed and were found to be in accordance with guidance provided in Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills." (Regulatory Guide 4.14 is referenced in License Condition 41.)

A review of the 1994-1996 data indicated that the environmental sampling results for 1996 were comparable to the 1994-1995 sample results.

5.2 Groundwater Compliance Monitoring Program

a. Inspection Scope

The groundwater compliance monitoring program was reviewed to verify that the program was consistent with the requirements specified in the license.

b. Observations and Findings

A groundwater compliance monitoring program is required to be implemented by License Condition 47. The program consisted of sampling 24 wells (6 were dry at the time of the inspection and could not be sampled) on a routine basis and analyzing the sample results for a number of radionuclides and chemical constituents. In addition, a number of pumpback wells were in service as part of the corrective action program.

The licensee had 11 groundwater pumpback wells available for operation. The actual number of pumps in service at any one time depended on whether groundwater was available in the well for pumping, or if power was available to the respective pump motor. At the time of the inspection, 8 pumpback wells were in service with 6 pumps in service in the upper sand layer and 2 pumps in service in the lower sand layer. Overall, the licensee had implemented a compliance monitoring program and a corrective action program that met the intent of the license.

A review of the two semi-annual reports for 1996 indicated that some of the chemical and radionuclide constituents in the point-of-compliance wells remained above the protection standard limits. The chemical constituents still above the limits included chromium, nickel, cadmium, and lead. The radionuclide constituents above the limits included radium-226, radium-228, thorium-230, and natural uranium. The licensee continues to operate the pumpback system as part of the corrective action program in an attempt to clean up the groundwater.

One groundwater lower limit of detection (LLD) discrepancy was identified for the chemical constituent cadmium. The laboratory's LLD was higher than the protection standard limit. With the LLD value above the protection standard limit, the licensee could not determine if they were in compliance with the protection standard if the measured value for cadmium was between the protection standard limit and the LLD value. The licensee planned to contact the laboratory that performed their groundwater analyses to correct this discrepancy (which has apparently occurred before in the past).

On September 10, 1996, the licensee submitted a license amendment request to the NRC for approval of alternate concentration limits for the groundwater protection standards. At the time of the inspection, the NRC had not approved the licensee's request, and a meeting between the NRC and the licensee was planned in the near future to discuss the licensee's standing request.

In accordance with License Condition 47, the licensee is required to submit a corrective action program review to the NRC at the end of each calendar year. The last corrective action program review was submitted to the NRC on June 6, 1996. The report was noted to provide a clear explanation of trends involving the groundwater sample results.

5.3 Annual Land Use Survey

License Condition 19 stipulates that a land use survey be performed annually. The most recent annual land use survey dated August 6, 1996, was reviewed during the previous NRC inspection (documented in NRC Inspection Report 40-6659/96-01). A spot check was performed during the previous inspection to confirm the accuracy of the report. No discrepancies were identified during the spot check.

5.4 Conclusions

A review of the annual land use survey, groundwater, and environmental monitoring programs indicated that the licensee was in compliance with license and regulatory requirements. All reports related to the groundwater, annual land use survey, and environmental monitoring programs had been submitted to the NRC as required.

EXIT MEETING SUMMARY

The inspector presented the inspection results to the representatives of the licensee at the conclusion of the inspection on May 29, 1997. Licensee representatives acknowledged the findings as presented.

Attachment 1

PARTIAL LIST OF PERSONS CONTACTED

Licensee

M. Franko, Project Manager, Texaco Exploration and Production, Inc.
R. Juday, Site Supervisor
S. Pfaff, Radiation/Environmental Coordinator
G. Thayer, Maintenance Coordinator

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

None

Closed

None

Discussed

None

LIST OF ACRONYMS USED

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
LLD	Lower Limit of Detection
$\mu\text{Ci/ml}$	Microcuries per Milliliter
TLD	Thermoluminescent Dosimeter

Attachment 2

PHOTOGRAPHS TAKEN AT THE SHIRLEY BASIN FACILITY



Photo 1 Collection of clay from borrow area for installation on tailings pile.

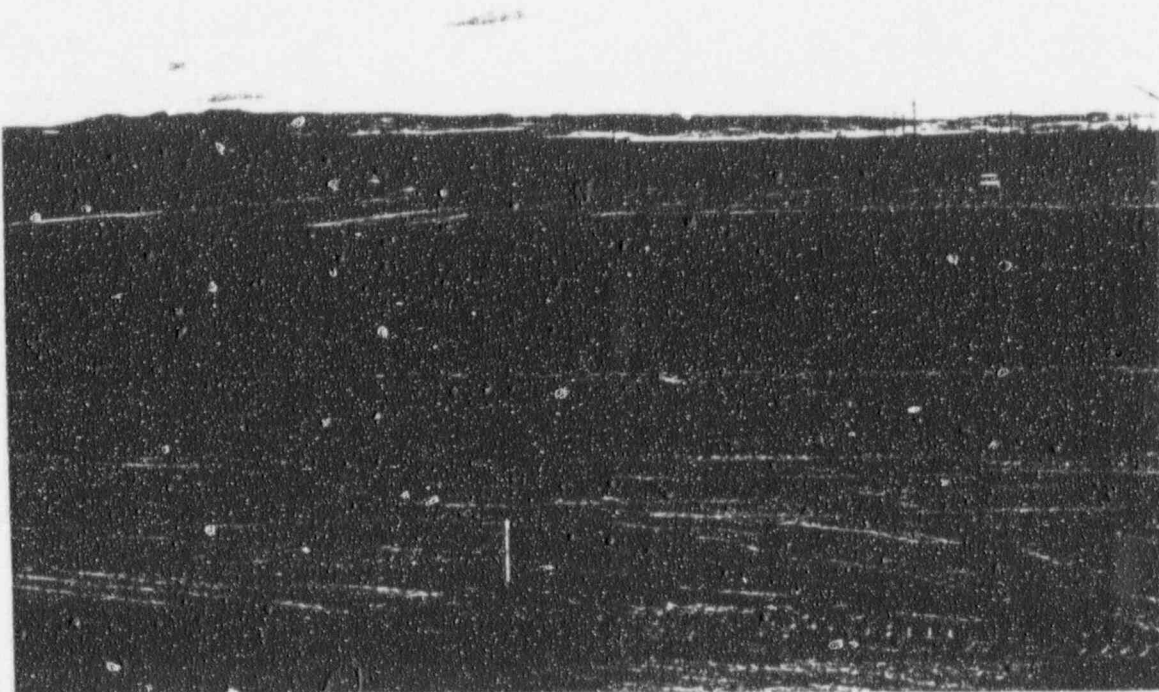


Photo 2 Surcharged area around Settlement Monitor No 6; reclamation of tailings in progress in background.

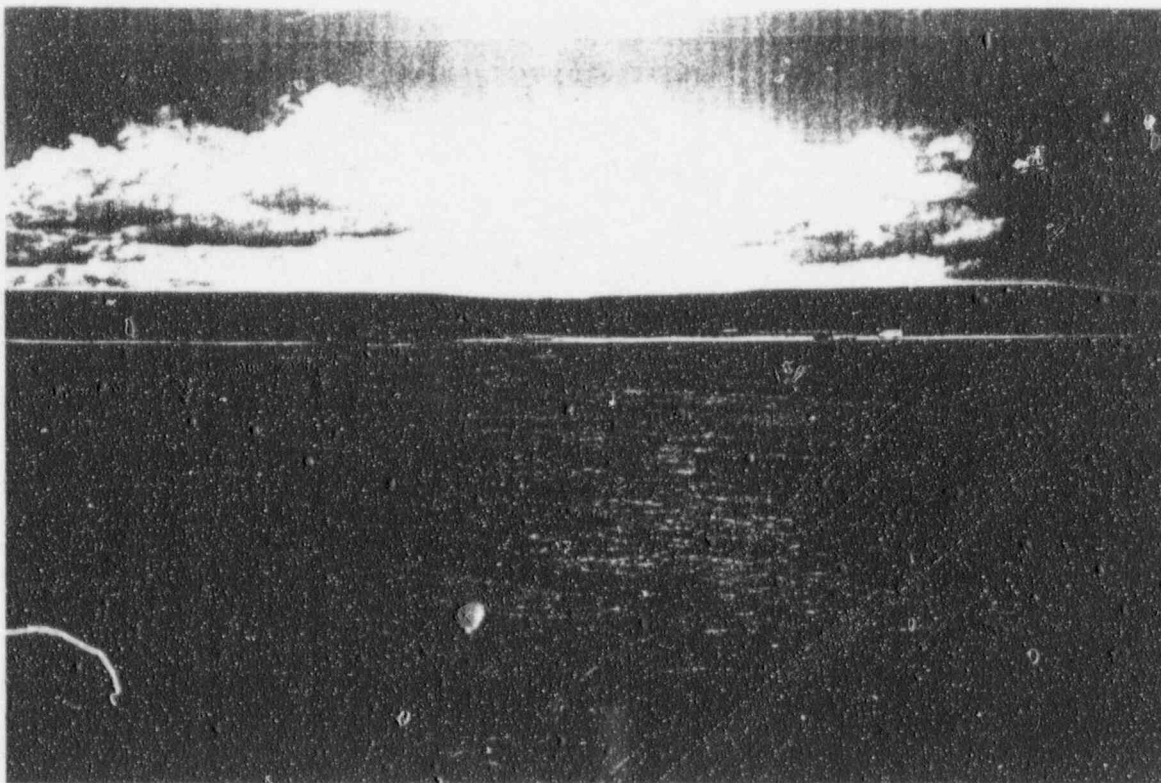


Photo 3 Area of tailings impoundment recently seeded for vegetation growth.

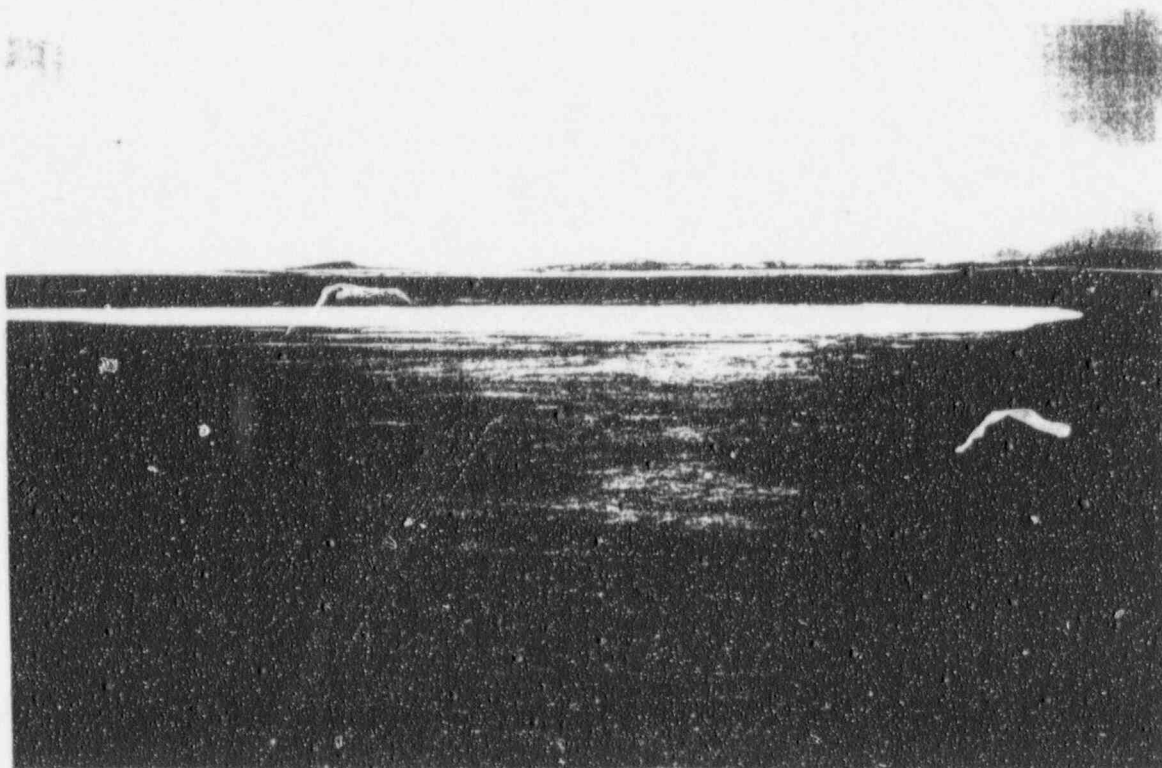


Photo 4 Stage II evaporation pond.

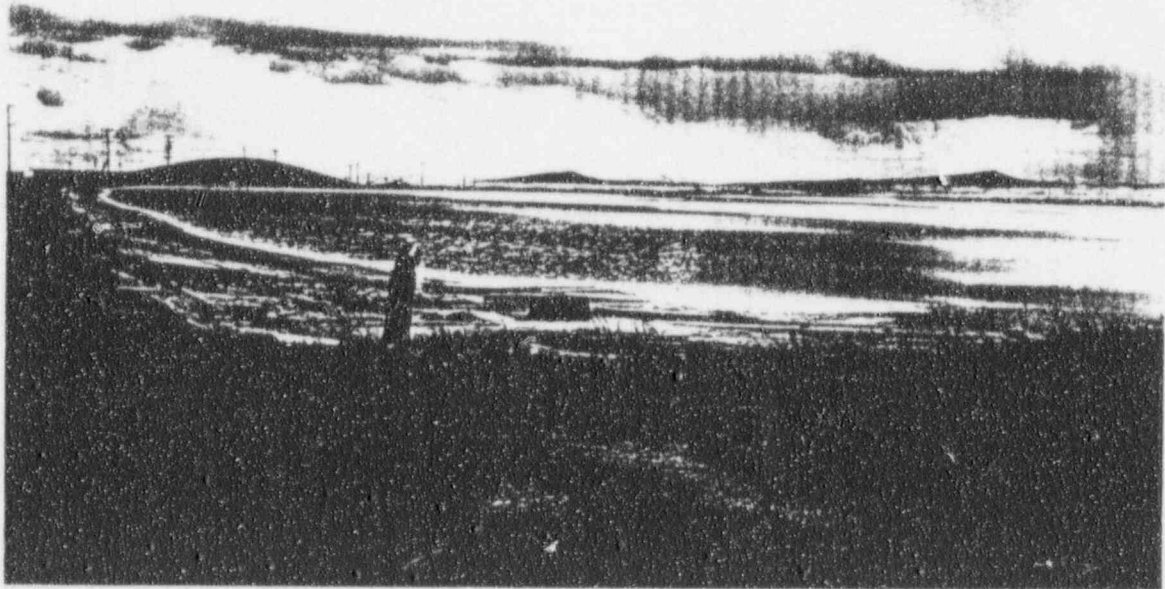


Photo 5 Stage I evaporation pond; enhanced evaporation system in service on right.



Photo 6 Enhanced evaporation system in service at Stage I pond

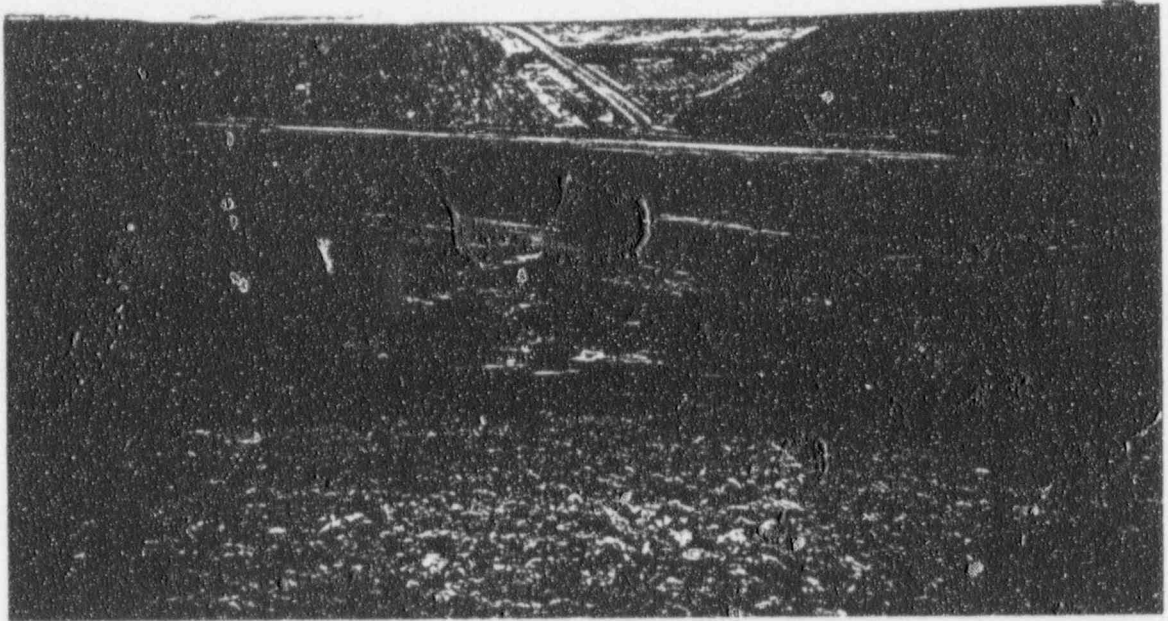


Photo 7 Former Pit 4 mine being reworked in accordance with state-approved reclamation plan.

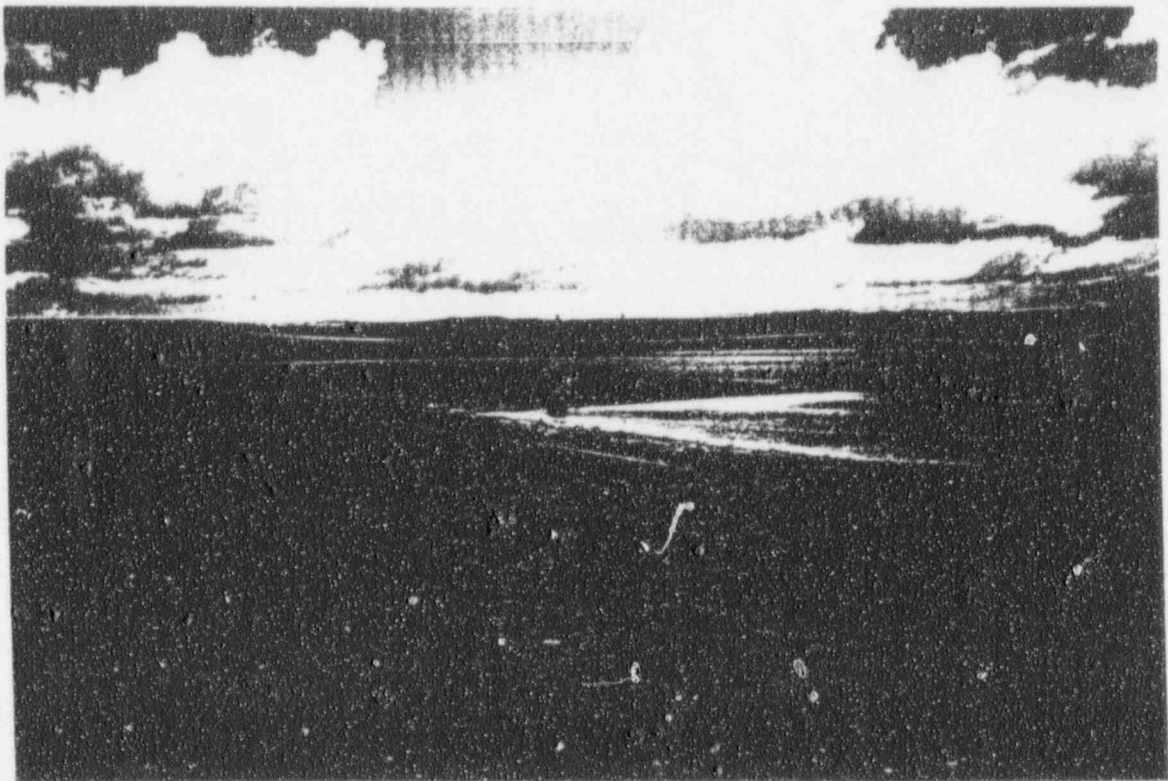


Photo 8 East Drainage Basin location where Pit 4 water was pumped in 1996; water truck collection point can be seen.