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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

'88 APR -7 A10:00

BEFORE THE ADMINISTRATIVE LAW JUDGE

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

In the Matter of)	
)	Docket No. 40-3453
ATLAS MINERALS DIVISION OF)	
ATLAS CORPORATION)	ASLRP No. 87-557-05 SP
)	
(Source Material License No. SUA-917))	

NRC STAFF RESPONSE TO LICENSEE'S MOTION
TO TERMINATE THE HEARING PROCEEDING

INTRODUCTION

On March 24, 1988, Atlas Minerals Division of Atlas Corporation ("Atlas" or "Licensee") filed a motion in which it withdraws its request for hearing and moves the Presiding Officer to dismiss the above-captioned proceeding. The NRC Staff supports Atlas' motion and, for the reasons set forth below, the Presiding Officer should grant Atlas' request.

DISCUSSION

This proceeding was instituted at Atlas' request. See NRC Staff Response To Order Of February 4, 1988 at 3-4 (February 29, 1988). The Commission granted Atlas' request for hearing in order to provide Atlas a forum in which to challenge the Staff's July 31, 1987 proposed denial of Atlas' application for renewal of its source materials license. Commission Order of September 25, 1987 at 2 (hereinafter "September 25, 1987 Order"). The Staff proposed to deny Atlas' license renewal application because the financial surety arrangements offered by Atlas were not adequate, appropriate, or sufficient to meet the requirements of 10

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C.F.R. Part 40, Appendix A. See July 31, 1987 Order at 4. In granting Atlas' request for a hearing, the Commission made clear that "the issue before the presiding officer shall be whether Atlas' application for renewal of its license must be denied for failure to submit satisfactory surety arrangements." September 25, 1987 Order at 2.

Subsequently, Atlas and the NRC Staff began discussions in an effort to resolve this matter without resort to litigation. In furtherance of this objective, Atlas submitted additional surety arrangements which the Staff found adequate to satisfy the requirements of 10 C.F.R. Part 40, Appendix A. See Letter from Robert D. Martin to Atlas Mineral at 1 (January 5, 1988), attached to Status Report Of The Parties (January 7, 1988). Based upon the submission of this additional information and at Atlas' request, the Staff agreed to reconsider its proposed denial of Atlas' license renewal application. Id. That review was completed in February 1988 and culminated in the Staff's decision to approve Atlas' license renewal application and to revoke its July 31, 1987 Order. See Letter from Robert D. Martin to Atlas Minerals Division at 1 (February 25, 1988), attached hereto as Attachment 1. ^{1/}

The effect of the foregoing developments is that there is no longer an issue in controversy between the Staff and Atlas. As noted above, the only issue raised in this proceeding is whether the July 31, 1987 Order, which proposed to deny Atlas' license renewal application, should

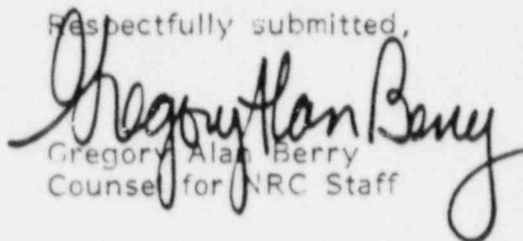
^{1/} Copies of Source Material License SUA-917, as renewed; the Safety Evaluation Report (SER) For Atlas Minerals, Moab, Utah Mill; and the Environmental Assessment Report are appended to Attachment 1 and included with this response.

be sustained. That Order has now been revoked and Atlas has withdrawn its request for hearing. Thus, there no longer remains any issue to be resolved by the presiding officer. Consequently, the proceeding should be terminated.^{2/}

CONCLUSION

For the reasons stated herein, the Presiding Officer should issue an order terminating this proceeding.

Respectfully submitted,


Gregory Alan Berry
Counsel for NRC Staff

Dated at Rockville, Maryland
this 6th day of April 1988

^{2/} As the Staff has explained previously, any person affected by the Staff's approval of Atlas' license renewal application is entitled to request a hearing pursuant to 10 C.F.R. § 2.1205 within the time periods prescribed in paragraph (c) of that proposed rule. See "Informal Hearing Procedures For Materials Licensing Adjudications," 52 Fed. Reg. 20089 (May 29, 1987) (proposed rule).

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In the Matter of)	
)	Docket No. 40-3453
ATLAS MINERALS DIVISION OF)	
ATLAS CORPORATION)	ASLPP No. 87-557-05 SP
)	
Source Material License No. SUA-917)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF RESPONSE TO LICENSEE'S MOTION TO TERMINATE THE HEARING PROCEEDING" in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class or, as indicated by an asterisk, by deposit in the Nuclear Regulatory Commission's internal mail system, this 6th day of April 1988.

John H. Frye, Chairman*
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

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Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Mr. Richard R. Weaver
President and Chief Executive
Officer
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Mr. Richard E. Blubaugh
Regulatory Affairs Manager
Atlas Minerals Division of
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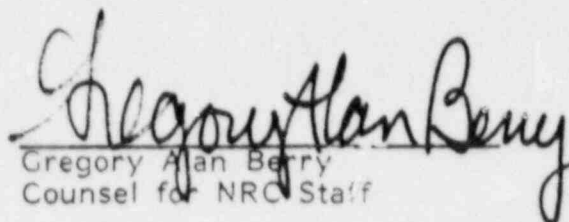
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Gregory Alan Berry
Counsel for NRC Staff

DISTRIBUTION

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FEB 25 1988

URFO:VKS
 Docket No. 40-3453
 License No. SUA-917
 040034534300

Atlas Corporation
 Atlas Minerals Division
 ATTN: R. E. Blubaugh,
 Regulatory Affairs Manager
 743 Horizon Ct., Suite 202
 Grand Junction, Colorado 81506

Gentlemen:

As detailed in our letter to Atlas dated January 5, 1988, we have found that your Letter of Credit, No. 119907 dated December 3, 1987 is an acceptable surety. Therefore, we agreed to reconsider your renewal application.

We have completed our review and in accordance with the requirements of 10 CFR 40, Subsection 40.32, we have concluded that issuance of the renewed license, subject to the conditions contained therein will not constitute an undue risk to the health and safety of the public. Therefore, please find enclosed Source Material License No. SUA-917, authorizing continued operation of the Moab Uranium Mill. By issuance of this renewed license, my Order dated July 31, 1987, issued to Atlas Minerals, is hereby revoked. Also enclosed are copies of the Safety Evaluation Report and Environmental Assessment prepared by the staff.

FOR THE NUCLEAR REGULATORY COMMISSION

151

Robert D. Martin
 Regional Administrator

Enclosures: Source Material License SUA-917, as renewed
 Environmental Assessment
 Safety Evaluation Report

Case Closed: 040034534300
 bcc: John Barke
 Moab Public Library

OFC : RIV:URFO	: URFO	: D:DRSS	: RA	: OGC	: NMSS
NAME : HPettengill	: DSmith	: RLBangart	: RDMartin	: G. Berry	: H. KNAPP
DATE : 1/24/88	: 2/22/88	: 02/25/88	: 2/25	: T. Brown	: 2/23

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OFC :	H. Peltus	H. D. Smith	D. Bonyer	R. D. Martin	:	:	:	:
NAME :	URFO	URFO	:	:	:	:	:	:
DATE :	01/27/88	:	:	:	:	:	:	:

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438) and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 40 and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

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1. Licensee Atlas Corporation		3. License number SUA-917
2. Atlas Minerals Division 743 Horizon Court, Suite 202 Grand Junction, Colorado 81506		4. Expiration date February 28, 1993
		5. Docket or Reference No. 40-3453
6. Byproduct, source, and/or special nuclear material Natural Uranium	7. Chemical and/or physical form Any	8. Maximum amount that licensee may possess at any one time under this license Unlimited

9. Authorized place of use: The licensee's uranium milling facility located at Moab, Utah.
 10. The licensee is hereby authorized to possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by the licensee's milling operations authorized by this license.
 11. For use in accordance with statements, representations and conditions contained in Sections 4.2.4, 5 and 7 (except 5.5.10 and 5.5.11) and Appendices 5.3, 5.5.6 and 6.0 of the licensee's renewal application dated May 31, 1984 and submittals dated December 17, 1984, January 18 and June 5, 1985, December 4, 1986, and January 26, 1988.
- Whenever the word "will" is used in the above referenced sections it shall denote a requirement.
12. The mill production per calendar year shall not exceed 850 MT (1,870,000 pounds) of barreled U₃O₈.
 13. Any changes in the mill circuit as described in Figures 3.1-2 and 3.1-3 of the licensee's renewal application, shall require approval of the USNRC, Uranium Recovery Field Office, in the form of a license amendment.
 14. The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the mill, provided that all entrances to the mill are conspicuously posted in accordance with Section 20.203(e)(2) and with the words, "Any area within this mill may contain radioactive material."

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License number

SUA-917

Docket or Reference number

40-3453

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15. The results of sampling, analyses, surveys and monitoring; the results of calibration of equipment; reports on audits and inspections; all meetings and training courses required by this license; and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in USNRC regulations, all such documentation shall be maintained for a period of at least five (5) years.
16. The licensee shall maintain effluent control systems as specified in Section 3.3 of the licensee's renewal application with the following additions:
 - A. Operations shall be immediately suspended in the affected area of the mill if any of the emission control equipment for the yellowcake drying or packaging area is not operating within specifications for design performance.
 - B. The licensee shall, during all periods of yellowcake drying operations, assure that the scrubber is operating within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance. This shall be accomplished by either (1) performing and documenting checks of water flow and air pressure differential hourly during operation or (2) installing instrumentation which will signal an audible alarm if either water flow or air pressure differential fall below the manufacturer's recommended levels. If an audible alarm is used, its operation shall be checked and documented daily.
 - C. Air pressure differential gauges for emission control equipment other than the wet scrubber shall be read and the readings documented once per shift during operations.
 - D. Any changes in the effluent control systems, as described above, shall require approval by the USNRC, Uranium Recovery Field Office, in the form of a license amendment.
17. Atlas shall implement a ground water detection monitoring program to ensure compliance to 40 CFR 192.32(a)(2) which includes the following elements:
 - A. Atlas shall monitor at the temporary point of compliance and background wells for the following indicator parameters: Arsenic, Selenium and pH. Atlas shall utilize analytical techniques capable of providing lower limits of detection of 0.005 mg/l and 0.001 mg/l for arsenic and selenium, respectively. Measurements of pH shall be reported to the nearest 1/10 standard unit.
 - B. The determination of compliance shall be based upon sampling Well MW-3.
 - C. The determination of background levels for the parameters specified in subsection (A) shall be defined by sampling Well ATP-3.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

- D. Atlas shall sample for those parameters specified in subsection (A) at those wells designated in subsections (B) and (C) on a monthly basis for a period of one (1) year and at least twice annually thereafter. All semiannual samples shall be taken at least four months apart.
- E. Atlas shall, within 60 days of collection of the last of the twelve monthly samples, propose for USNRC review and approval background levels for indicator parameters and a statistical procedure for identifying significant changes (95% confidence level) between data from the wells specified in subsections (B) and (C).
- F. Atlas shall report the data required by subsection (D) semiannually along with those data required by Condition No. 48 in accordance with the reporting format in the Attachment entitled, "Detection Monitoring Data Report."
- G. Atlas shall report at least annually in accordance to reporting requirements specified in subsection (F) the rate and direction of ground-water flow under the tailings impoundment.
18. Release of equipment or packages from the restricted area shall be in accordance with the attachment to SUA-917 entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" dated September, 1984.
19. The licensee shall have in operation, within ninety (90) days prior to resumption of operations, instrumentation to detect ruptures of the tailings discharge and solution return lines when these lines are being utilized. Indications of a possible rupture of these lines shall result in activation of an alarm in an occupied area of the mill. The instrumentation shall be tested daily, and the testing documented, to ensure proper operation.
20. The licensee shall conduct and document at least one inspection of the tailings embankment per day and shall immediately notify the USNRC, Uranium Recovery Field Office, by telephone and telegraph, of any failure to the tailings dam or tailings discharge and solution return system which results in a release of radioactive material and/or of any unusual conditions which if not corrected could lead to such a failure. This requirement is in addition to the reporting requirements of 10 CFR 20.
21. The licensee shall submit a detailed decommissioning plan and cost estimate for the Moab Mill Site by February 28, 1988.
22. Occupational exposure calculations shall be performed and documented within one (1) week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Routine samples taken in airborne

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

ore dust and yellowcake areas shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. Non-routine samples taken in ore dust and yellowcake areas shall be analyzed and the results reviewed by the Radiation Control Coordinator (RCC) within two (2) working days after sample collection.

23. Standard written procedures shall be established and maintained for all operational (processing) activities involving radioactive materials that are handled, processed or stored. Standard operating procedures for operational activities shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for nonoperational (non processing) activities to include in-plant and environmental monitoring, bioassay analyses, and instrument calibrations. Special written procedures shall be established for use when the plant is in an extended standby or shutdown condition. Up-to-date copies of all written procedures shall be kept in the applicable mill areas.

All written procedures, including special shutdown procedures, shall be reviewed and approved in writing by the RCC before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. The RCC shall perform a documented review of all existing procedures at least annually. At least 15 days prior to implementation of special shutdown procedures Atlas shall notify the USNRC, Uranium Recovery Field Office.

24. The personnel contamination surveys conducted, in accordance with Section 5.5.5.2 of the application, shall be documented and maintained. In addition, the licensee (RCC or qualified alternate) shall perform spot personnel surveys for alpha contamination at least quarterly on employees leaving the restricted area.
25. The licensee shall use a Radiation Work Permit (RWP) for all nonroutine work not covered by an existing procedure where the potential for significant exposure to radioactive materials exist. The RWP shall be approved by the RCC or an alternate, qualified by way of specialized radiation protection training, and shall at least describe the following:
 - A. The scope of work to be performed and the potential radiological hazards.
 - B. Any precautions necessary to minimize worker exposure to radioactive materials.
 - C. The radiological monitoring and sampling necessary prior to, during, and following completion of the work in order to assess any potential exposures.
26. Notwithstanding the representations in Appendix 5.3 to the renewal application, the licensee shall develop and implement procedures to ensure that visitors and

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

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contractors receive instruction and training in accordance with Section 19.12 of 10 CFR 19, prior to entering any restricted area.

27. The existing on-site catchment basin west of the S-X units shall be maintained in a condition and with enough remaining available capacity to assure the collection of any spillage of chemicals from hazardous chemical storage tanks within the graded area. Any storage tanks containing hazardous chemicals which are not located within the graded area shall be surrounded by individual containment dikes capable of containing all leakage.
28. Notwithstanding the representations in Section 5.5.5 of the licensee's application, the licensee shall conduct weekly alpha contamination surveys of lunch rooms, change rooms, shower rooms and offices when they are in use.
29. A copy of the report documenting the annual ALARA audit in accordance to Section 5.1.4 of the renewal application dated May 31, 1984, shall be submitted to the USNRC, Uranium Recovery Field Office, for review within 30 days of completion of the audit report.
30. In addition to the tailings embankment surveillance and inspection program specified in Section 4.2.4 of the licensee's renewal application dated May 31, 1984, the licensee shall comply with the following:
 - A. Notwithstanding any statements to the contrary, the professional responsible for the annual technical evaluation report shall ensure that all field inspectors are trained to recognize and assess signs of possible distress or abnormality.
 - B. All routine inspection reports shall be dated and maintained on file at the mill site for use in developing the annual report.
 - C. The results of ground-water sampling and piezometer and pond level measurements shall be maintained in graphical form and on file at the mill site for use in developing the annual report.
 - D. The annual technical evaluation report shall include an assessment of the hydraulic and hydrologic capacities, water quality and structural stability of the tailings impoundment.
 - E. A copy of each annual technical evaluation report shall be submitted to the USNRC, Uranium Recovery Field Office, within one (1) month of its completion.
31. In addition to the requirements in Section 5.2 of the renewal application, the Regulatory Affairs Manager (RAM) and Radiation Control Coordinator (RCC) shall

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number:

SUA-917

Docket or Reference number

40-3453

have the minimum education, training, and experience as detailed in Section 2.4.1 of Regulatory Guide 8.31 dated May 1983.

32. Radiation survey instruments shall be calibrated at least semiannually or at the manufacturer's suggested interval, and after each repair, whichever is sooner. All radiation survey instruments shall be checked for proper operation using a radiation check source prior to each day's use. Portable air sampling equipment shall be calibrated after repair and at least quarterly or at the manufacturer's suggested interval, whichever is sooner. Flow rates on portable samplers shall be checked and documented prior to each day's use. Fixed continuous air samplers shall be calibrated after repair and at least quarterly or at the manufacturer's suggested interval, whichever is sooner. Flow rates on fixed continuous air samplers shall be checked each time the sampling head is changed.
33. The licensee shall implement an interim tailings stabilization program as specified in the March 16, 1987 submittal. In addition, this program shall include written procedures which are of sufficient detail to describe inspection methodologies, management notifications and implementation of corrective actions to assure compliance to Criterion 8 of 10 CFR 40, Appendix A. As a minimum the licensee shall perform at least weekly a documented inspection to assure the effectiveness of the control methods used. Corrective actions taken shall be documented in response to inspection findings. Corrective actions shall be completed within 30 days unless a longer period is approved in writing by the USNRC.
34. The licensee is authorized to dispose of byproduct material contaminated solid wastes generated at the Moab Mill in the sump collection pond as described in the licensee's submittal dated February 29, 1984.
35. Notwithstanding representations made in Section 4.3 of the renewal application the licensee shall not dispose of materials other than uranium mill tailings, spent resins, raffinate, vanadium waste residues, liquids or residues contained in the catchment basin described in Condition No. 27, or liquid sanitary wastes in the tailings pond, without the specific authorization of the Uranium Recovery Field Office, USNRC. If liquid sanitary wastes are discharged to the tailings pond, written authorization shall first be obtained from the Utah Bureau of Water Pollution Control. A copy of the written authorization shall be submitted to the Uranium Recovery Field Office prior to the discharge of the liquid sanitary wastes.

The licensee shall not discharge any liquids or solids to the tailings impoundment during nonoperational periods other than needed to perform routine or preventative maintenance, without prior written approval of the NRC.

36. Except as authorized by Condition 40 below, the licensee shall not make any changes in the tailings retention system without specific prior approval of the

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

USNRC, Uranium Recovery Field Office, in the form of an amendment to this license.

37. Reclamation phase modifications to Moab Wash shall be as specified in the "Pilot Channel" option of the licensee's submittal dated October 13, 1983 with the following modifications:

- A. The pilot channel bottom shall be sloped at a 1% grade away from the tailings pile (i.e., to the north).
- B. Excavation material shall be used to backfill the entire length of the existing Moab Wash channel, with the fill sloped away from the tailings pile. Any remaining excavation material shall be used to construct a berm on the south side of the pilot channel to increase channel capacity.

In addition, operational phase modifications to Moab Wash shall be maintained in accordance with the licensee's submittal dated October 26, 1982.

38. Mill tailings other than samples for research shall not be transferred from the site without specific prior approval of the USNRC, Uranium Recovery Field Office. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.
39. Atlas shall, in accordance with submittals dated February 25 and June 29, 1987, develop methods and procedures prior to reclamation, to ensure that:
- A. The entire area of contaminated soil southeast of the tailings impoundment, consisting of approximately 6.6 acres with an estimated volume of 25,000 cubic yards, is placed in the tailings pond and otherwise ensure that the entire area is decontaminated consistent with 10 CFR Part 40, Appendix A, Criterion 6.
 - B. The entire area west of State Highway No. 279 identified as exceeding Ra-226 levels provided in 10 CFR Part 40, Appendix A, Criterion 6, shall be removed and placed in the tailings pond prior to final reclamation. By our letter dated February 25, 1987, background for the area west of State Highway No. 279 is 5.5 pCi/gm Ra-226.
 - C. Records of all surveys and soil analyses of the section southeast of the tailings impoundment and west of State Highway No. 279 shall be maintained until the USNRC authorizes their disposal.
40. A. Construction of the tailings embankment to elevation 4076 feet shall be in accordance with Appendix B of the submittal "Report of Stability Analyses, 18-Foot Raise of Tailings Embankment to Elevation 4076 Feet, Moab, Utah, for Atlas Minerals" dated June 4, 1981, with the following exceptions:

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

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- 1) Quality control tests shall be performed at the frequencies specified below (ASTM Standard Methods):
 - a) Compaction Test, D-698 - At least five full tests prior to construction using a range of representative borrow soils followed by one-point tests at a frequency of at least one per 5,000 cubic yards of fill placed. The family of curves developed from the full compaction tests shall be used in evaluating one-point test data.
 - b) Gradation test, D-422 - At least one test per 5,000 cubic yards of fill placed.
 - c) Nuclear moisture and density tests D-3017 and D-2922, respectively - At least one test per 2,500 cubic yards of fill placed.
 - d) Conventional moisture and density tests D-2216 and D-1556, respectively - Calibration of the nuclear tests specified in (c) above shall be performed using the tests specified in this section prior to beginning construction and at least once per 50,000 cubic yards of fill placed thereafter.
 - e) Additional gradation testing shall be performed if the gradation of material appears to differ significantly from materials previously tested. If the gradation has changed significantly, a full compaction test shall be performed.
- 2) Embankment piezometers shall be read at a weekly frequency during construction and until readings have stabilized. Thereafter, piezometers shall be read on a monthly frequency.
- 3) A report describing construction activities and containing the results of all quality control testing specified in (1) above shall be submitted to the USNRC, Uranium Recovery Field Office, within six months of completion of construction.
- B. The licensee shall maintain a minimum of six feet of freeboard and 150 feet of beach between the embankment crest and the ponded liquid.
- C. Drainage berms shall be installed over seepage areas on the embankment prior to construction of the lift. These berms shall be graded to protect against piping of the embankment material.
41. The licensee shall reclaim the tailings disposal area in accordance with the May 29, 1981 submittal "Report, Conceptual Design and Cost Estimate, Tailings Pile Reclamation, Moab, Utah, for Atlas Minerals." In addition, the licensee shall

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

July 1, 1988, provide for USNRC, Uranium Recovery Field Office, review and approval in the form of a license amendment, the following information:

- A. An engineering design for the rock layer to be placed on pile outcrops. The rock layer shall be designed assuming unconcentrated sheet flow from a Probable Maximum Flood (PMF) event if the reclamation plan is modified to include placement of rock on the pile top or a concentration of sheet flow from a PMF if the pile top remains unrocked.
- B. A design for riprap placement based on rock durability. The information shall include the results of additional laboratory testing (specific gravity, absorption, and sodium sulfate soundness tests) and a proposal for selective screening and placement of rock and/or oversizing of the rock for more frequently saturated areas to assure protection of the reclaimed pile for a 1000-year period, to the extent practicable.
- C. An analysis of alternatives for modifying the existing plan to include slopes of 5H:1V or flatter for all outcrops which receive runoff from the pile top. The information submitted shall include an evaluation of costs for various pile configurations.
42. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground water restoration as warranted and the long-term surveillance fee. Within three (3) months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within three (3) months of written NRC approval. Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to the NRC at least three (3) months prior to the anniversary of the effective date of the existing surety instrument. If the NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for one year.

Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The licensee shall also provide the NRC with all surety related correspondence submitted to the State, a copy of the State's surety review and the final approved surety arrangement, if applicable. The licensee shall also ensure that the surety, where authorized to be held by the State, expressly identifies the

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

NRC portion of the surety and covers the decommissioning and decontamination of the mill and mill site, reclamation of the tailings and waste disposal areas, soil and water sample analyses to confirm decontamination, ground water restoration as warranted and the transfer of the long-term surveillance fee to the U.S. General Treasury. The basis for the cost estimate is the NRC approved reclamation/decommissioning plan or NRC approved revisions to the plan. Attachment entitled, "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates," outlines the minimum considerations used by the NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

Atlas' currently approved surety instrument, Irrevocable Letter of Credit No. 119907, issued by the Bank of America, in favor of the NRC, shall be continuously maintained in an amount no less than \$6,000,000 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by the NRC. For the purposes of the annual update of Atlas' cost estimate required by Criterion 9, October 31 1987, is designated as the effective date of the existing surety arrangement.

43. Prior to termination of this license, the licensee shall provide for transfer of title to byproduct material and land, including any interests therein (other than land owned by the United States or the State of Utah), which is used for the disposal of such byproduct material or is essential to ensure the long term stability of such disposal site to the United States or the State of Utah, at the State's option.
44. The licensee shall minimize dispersal of dust from the ore piles by water sprinkling or other dust suppression techniques, unless a documented weekly inspection indicates that the moisture content of the ore and/or weather conditions are controlling dusting.
45. Before engaging in any activity not previously assessed by the NRC, the licensee shall prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not assessed, or that is greater than that assessed in the Final Environmental Statement (NUREG-0453), the licensee shall provide a written evaluation of such activities and obtain prior approval of the USNRC, Uranium Recovery Field Office, for the activity.
46. Prior to disturbing any presently undisturbed soils for mill related activities (including borrow areas for tailings reclamation cover) in the future, the licensee shall have an archeological survey conducted of the site(s) to be disturbed. The Utah State Department of Development Services and the U.S. Department of the Interior shall be contacted by the licensee prior to the survey to provide assistance or comment in planning such a survey. The completed survey shall be submitted to the USNRC, Uranium Recovery Field Office, for review and approval to proceed prior to any disturbance of presently undisturbed areas.

MATERIALS LICENSE
SUPPLEMENTARY SHEET

License number

SUA-917

Docket or Reference number

40-3453

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47. The licensee shall conduct an annual survey of land use (grazing, residence, wells, etc.) in the area within two miles of the mill and submit a report of this survey annually to the USNRC, Uranium Recovery Field Office. This report shall indicate any differences in land use from that described in the licensee's previous annual land use report. The report shall be submitted by March 31 of each year.
48. The results of the effluent and environmental monitoring programs required by this license shall be reported in accordance with 10 CFR 40, Section 40.65 with copies of the report sent directly to the USNRC, Uranium Recovery Field Office. Data from the effluent and environmental monitoring program shall be reported in accordance with the format in the attachment to SUA-917 entitled, "Sample Format For Reporting Monitoring Data."
49. The licensee shall conduct an environmental and effluent monitoring program as specified in the renewal application in accordance with Table 5.5-8 during normal operations and Table 5.5-9 during periods of extended shutdown with the following modifications:
- A. Air particulate samples shall be analyzed for U-nat, Ra-226, and Th-230, quarterly.
 - B. The analysis of quality control samples shall be in accordance with Section 6.3 of Regulatory Guide 4.15.
 - C. Lower limits of detection utilized for sample analysis shall be in accordance with Section 5 of Regulatory Guide 4.14.
 - D. Soil and vegetation sampling shall be analyzed annually for Ra-226 and Pb-210.
50. The licensee shall conduct a bioassay program in accordance with Section 5.5.4 of the renewal application with the following additions:
- A. Laboratory surfaces used for in-house bioassay analyses shall be decontaminated to less than 25 dpm alpha-(removable)/100 cm² prior to analysis of samples.
 - B. Anytime an action level of 15 ug/l uranium for urinalysis is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22, dated January 1987. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR 40.65 and Condition No. 48 to this license.
 - C. Anytime an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis is reached or exceeded, the licensee

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License number

SUA-917

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40-3453

shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, within thirty (30) days of exceeding the action level.

51. The installation of the ion exchange column at the Velve⁺ Mine shall be in accordance with pages 17 and 18 of the licensee's submittal dated November 1, 1983, with the exception that sampling for airborne uranium shall be performed at least monthly.

FOR THE NUCLEAR REGULATORY COMMISSION

Dated: FEB 25 1988


R. Dale Smith, Director
Uranium Recovery Field Office
Region IV

shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, within thirty (30) days of exceeding the action level.

51. The installation of the ion exchange column at the Velvet Mine shall be in accordance with pages 17 and 18 of the licensee's submittal dated November 1, 1983, with the exception that sampling for airborne uranium shall be performed at least monthly.

FOR THE NUCLEAR REGULATORY COMMISSION

Dated: FEB 25 1988

151
R. Dale Smith, Director
Uranium Recovery Field Office
Region IV

OFC	: 1A	: URFO	: URFO	: URFO	: URFO	:	:
NAME	: VScovill/db	: PJGarcia	: HJPettengill	: RDSmith	:	:	:
DATE	: 88/02/22	: 2/24/88	: 2/25/88	: 3/24/88	:	:	:

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GUIDELINES FOR DECONTAMINATION OF FACILITIES AND EQUIPMENT

PRIOR TO RELEASE FOR UNRESTRICTED USE

OR TERMINATION OF LICENSES FOR

BYPRODUCT OR SOURCE MATERIALS

U. S. Nuclear Regulatory Commission
Uranium Recovery Field Office
Region IV
Denver, Colorado 80225

SEPTEMBER 1984

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The instructions in this guide in conjunction with Table I specify the radioactivity and radiation exposure rate limits which should be used in accomplishing the decontamination and survey of surfaces or premises and equipment prior to abandonment or release for unrestricted use.

1. The licensee shall make a reasonable effort to eliminate residual contamination.
2. Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels, as determined by a survey and documented, are below the limits specified in Table I prior to applying the covering. A reasonable effort must be made to minimize the contamination prior to use of any covering.
3. The radioactivity on the interior surfaces of pipes, drain lines, or ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.
4. Upon request, the Commission may authorize a licensee to relinquish possession or control of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but would not be limited to, special circumstances such as razing of buildings, transfer of premises to another organization continuing work with radioactive materials, or conversion of facilities to a long-term storage or standby status. Such requests must:
 - a. Provide detailed, specific information describing the premises, equipment or scrap, radioactive contaminants, and the nature extent, and degree of residual surface contamination.
 - b. Provide a detailed health and safety analysis which reflects that the residual amounts of materials on surface areas, together with other considerations such as prospective use of the premises, equipment or scrap, are unlikely to result in an unreasonable risk to the health and safety of the public.

5. Prior to release of premises for unrestricted use, the licensee shall make a comprehensive radiation survey which establishes that contamination is within the limits specified in Table I. A copy of the survey report shall be filed with the Uranium Recovery Field Office, Region IV, P.O. Box 25325, Denver, CO 80225. The survey report shall:
 - a. Identify the premises.
 - b. Show that reasonable effort has been made to eliminate residual contamination.
 - c. Describe the scope of the survey and general procedures followed.
 - d. State the findings of the survey in units specified in the instruction.

Following review of the report, the NRC will consider visiting the facilities to confirm the survey. The licensee shall not release the premises for unrestricted use without the written approval of the USNRC staff.

TABLE I

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDES ^a	AVERAGE ^{b c f}	MAXIMUM ^{b d f}	REMOVABLE ^{b e f}
U-235, U-238, and associated decay products	5,000 dpm /100 cm ²	15,000 dpm /100 cm ²	1,000 dpm /100 cm ²
Transuranics, Ra-226, Ra-228, Th-230, Th-232, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm ²	300 dpm/100 cm ²	20 dpm/100 cm ²
Th-232, Th-230, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000 dpm/100 cm ²	3,000 dpm/100 cm ²	200 dpm/100 cm ²
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5,000 dpm /100 cm ²	15,000 dpm /100 cm ²	1,000 dpm /100 cm ²

Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

The maximum contamination level applies to an area of not more than 100 cm².

TABLE I

- 2 -

The amount of removable radioactive material per 100 cm² of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/hr at 1 cm and 1.0 mrad/hr at 1 cm, respectively, measured through not more than 7 milligrams per square centimeter of total absorber.

RECOMMENDED OUTLINE FOR SITE SPECIFIC RECLAMATION AND STABILIZATION COST ESTIMATES

As required under Criteria 9 and 10 of 10 CFR Part 40, Appendix 1, the licensee shall supply sufficient information for NRC to verify that the amount of coverage provided by the financial assurance accounts for all necessary activities required under the license to allow the license to be terminated. Cost estimates for the following activities (where applicable) should be submitted to NRC with the initial license application or reclamation plan and updated annually as specified in the license. Cost estimates must be calculated on the basis of completion of all activities by a third party. Unit costs, calculations, references, assumptions on equipment and operator efficiencies, etc., must be provided.

Detailed Cost Information Breakdown for Mills and In-Situ Facilities

The detailed cost information necessary to verify the cost estimates for the above categories of closure work is described in the following outline.

I. FACILITY DECOMMISSIONING

Mill Site Decommissioning. - Dismantling, decontamination and/or disposal of all structures and equipment. - Excavation and burial of contaminated earth (in vicinity of mill site, ore storage area, access roads around the perimeter of the tailings disposal site, evaporation pond residues, etc.) - Reclamation of disturbed areas from the above clean up activities.

In-Situ Facility Decommissioning - This includes dismantling, decontamination and disposal of all structures and equipment. This may be accomplished in two phases. In the first phase, only the equipment not used for ground-water restoration is removed. The remaining equipment would be removed in a second phase, when ground-water restoration and well plugging is complete. The buildings used for the in-situ operations may be decontaminated and released for unrestricted use.

A. Salvageable building and equipment decontamination (list). For each building or pieces of equipment listed, the following data should be provided.

1. Labor for dismantling and decontamination
 - a. Person-hours and categories of labor
 - b. Average hourly wage for each category

- c. Total labor cost (benefits, insurance, etc., and all labor overhead must be included here or calculated on the basis of total project labor)
 - 2. Equipment and material for dismantling and decontamination
 - a. Itemization of equipment and material to be used for decontamination
 - b. Itemized cost for material and equipment cost per hour listed in (a) above (equipment costs must include hourly operating, ownership and overhead expenses)
 - c. Operating hours for each piece of equipment
 - d. Total equipment and material cost
- B. Non-salvageable building and equipment disposal
 - 1. List of major categories of building and equipment to be disposed of and their corresponding quantities
 - a. Structures (list each major) (tons of material and building volume cubic feet)
 - b. Foundation concrete (cubic yards)
 - c. Process Equipment (tons)
 - d. Piping & Insulation (lump sum)
 - e. Electrical & Instrumentation (lump sum)
 - 2. Unit cost of disposal for each item above (include equipment, labor, material, transportation, and disposal costs)
 - 3. List and state how each chemical solution within the mill area will be disposed of along with the associated cost of disposal
 - 4. Total cost
- C. Restoration of contaminated areas (ore storage pad, access roads, process area, affected ground water, evaporation pond residues, etc.)

Removal and Disposal of Evaporation Pond and Residues - These materials should be transported to a licensed tailings area or licensed disposal site. The quantity of material to be removed and the distance to the disposal site and the fees charged by the receiving facility are important considerations in determining the costs of disposal.

Reclamation - This entails recontouring the well fields and evaporation ponds and placing top soil or other materials acceptable to NRC. This may also include revegetation.

1. Removal

- a. Area, depth and quantity of material to be removed (area, feet and cubic yard--or size of liner if appropriate)
- b. Unit cost (include excavation, loading, transportation and deposition)
- c. Total cost (equipment and labor)

2. Revegetation

- a. Area to be revegetated (acre)
- b. Unit cost (include fill material replacing topsoil, and revegetation cost)
- c. Total cost (equipment, labor and materials)

II. GROUND-WATER RESTORATION AND WELL PLUGGING

Mill Site Ground-Water Restoration - A major concern in the termination of a mill license is the restoration of aquifers that have been contaminated by the operation of a tailings impoundment. As this concern is added to the site-specific reclamation plans, the licensee should include these costs in their surety until the licensee is released from further ground water restoration activities.

In-Situ Site Ground-Water Restoration - In most cases, ground-water restoration consists of ground water sweeping and water treatment with partial reinjection. The water treatment equipment used during the uranium recovery phase of the operation is generally suitable for the restoration phase. The capital cost of this equipment is usually absorbed during the initial stages of the operation leaving

only the costs of operation, maintenance and replacement filters for the restoration phase. However, if additional equipment will be required for restoration, associated costs should be detailed here.

- A. Method of restoration
- B. Volume of aquifer required to be restored - area and thickness of aquifer -- number of required pumping cycles -- cycling time
- C. Equipment associated with aquifer restoration (e.g., RO unit)
- D. Verification sample analysis
 - 1. number of samples
 - 2. unit cost for sample collection and analysis (per sample)
 - 3. total cost for verification sample analysis
- E. Well plugging
 - 1. number of drill holes to be plugged
 - 2. depth and size of each drill hole
 - 3. material to be used for plugging--include acquisition, transportation, and plugging
 - 4. Total cost for well plugging
- F. Total cost for ground-water restoration

III. INTERIM STABILIZATION OF TAILINGS DURING THE DRYING OUT PHASE

Interim Stabilization of the Tailings During Drying - Placement of soil, chemical spraying, snow fences or other control measures over dry tailings to minimize dusting or dispersal of particulates.

- A. Drying time
- B. Area of dry exposed tailings for each year during the drying period (acres for ____ years)
- C. Unit cost for placement of soil, chemical spraying or other methods (Price per acre) (Include material, labor, and equipment)

D. Cost for an enhanced evaporation system, where included in the reclamation and stabilization plan. - Capital costs, labor and operating costs

E. Total cost of interim tailings stabilization

IV. TAILINGS IMPOUNDMENT AREA RECLAMATION

Tailings Impoundment Area Reclamation - Earthwork necessary to recontour the tailings in order to prepare for cover placement. - Placement of cover materials - Revegetation and/or placement of riprap. - Construction of diversion channels or other measures required for long-term stability.

- A. Area and quantity of cover material (acres, cubic yards)
- B. Location and size of borrow area that serves as a source of cover material. (Include distance from borrow area to tailings impoundment, grade and quantity of material from each borrow area)
- C. Labor and equipment unit cost for each type of material (include excavation, loading, transportation, depositing, spreading, and compacting; detailing costs and equipment types and calculations for each function)
- D. Estimated costs for revegetation of tailings pile, if applicable, and borrow areas (labor, equipment and materials)
- E. Estimated costs for riprap/rock armor, if applicable (labor, materials, transportation and equipment)
- F. Estimated costs for special engineered features - diversion channels, spillways, etc. (in unit costs) (labor, materials and equipment)
- G. Estimated costs for a quality assurance program including field and laboratory testing to assure that the "as built" system conforms to design specifications. Indicate number and type of tests, labor and equipment costs.
- H. Fencing costs (unit costs for labor and materials) total length and type of material
- I. Additional control measures, if necessary (guard service, etc.)
- J. Total cost

If the reclamation plan calls for different layers of soil, such as clay, etc., Items IVA. through IVF. above should be provided for each layer. Reclamation estimates may not always have to include the entire project area (i.e., operations which involve phased reclamation need only include coverage for the maximum area impacted during the period of the license.)

V. RADIOLOGICAL SURVEY AND ENVIRONMENTAL MONITORING

Radiological Survey - Gamma surveys and soil samples for radium in areas to be released for unrestricted use. Soils around the mill building, tailings piles, well field, evaporation ponds and process buildings should be analyzed for radium content. A gamma survey of all areas should be made prior to release for unrestricted use. All equipment released for unrestricted use should be surveyed and records maintained.

- A. Soil samples for radium
- B. Decommissioning equipment and building smear samples
- C. Gamma survey
- D. Environmental monitoring

Costs of labor, materials and analysis for continuation of environmental monitoring program throughout reclamation

- E. Total cost 1. Number of each kind sample listed above
 - 2. Unit cost for sample and analysis (price per sample)
 - 3. Total cost for radiological survey

VI. PROJECT MANAGEMENT COSTS AND MISCELLANEOUS

Itemize estimated costs associated with project management, engineering changes, mobilization costs, legal expenses, power costs during reclamation, quality control radiological safety costs, etc.

VII. LABOR AND EQUIPMENT OVERHEAD, CONTRACTOR PROFIT

Overhead costs for labor and equipment and contractor profit may be calculated as separate items or loaded into hourly rates. If included in hourly rates, the unit costs must identify the percentages applied for each area.

VIII. LONG-TERM SURVEILLANCE AND CONTROL (FOR MILLS ONLY) CRITERION 10 SPECIFIES A MINIMUM OF \$250,000 IN 1978 DOLLARS (\$407,960 IN DECEMBER 1986 DOLLARS)

Long-term surveillance and control fund to cover the cost of federal government agency site inspection, monitoring, and control measures, if necessary.

IX. CONTINGENCY

The licensee should include a contingency amount to the total cost estimate for the final site closure. The staff currently considers a 15% contingency to be an acceptable minimum amount.

X. ADJUSTMENTS TO SURETY AMOUNTS

The licensee is required by 10 CFR 40, Appendix A, Criteria 9 and 10 to adjust their cost estimates annually to account for inflation and changes in reclamation plans. The submission should be in the form of a request for amendment to the license.

A. Adjustments for inflation

The licensee should submit a revised surety incorporating adjustments to the cost estimates for inflation ninety (90) days prior to each anniversary of the date on which the first reclamation plan and cost estimate was approved. The adjustment should be made using the inflation rate indicated by the change in the Consumer Price Index published by the U.S. Department of Labor, Bureau of Labor Statistics.

B. Changes in Plans

- Changes in the process such as size or method of operation.
- Licensee initiated changes in reclamation plans or reclamation/decommissioning activities performed.
- Adjustments to reclamation plans required by the NRC.
- Proposed revisions to reclamation plans must be thoroughly documented and cost estimates and the basis for cost estimates detailed for NRC review and approval. Where a licensee is authorized by the NRC to secure a surety arrangement with the state, no reduction to the surety amount shall be initiated without prior NRC approval. Copies of all correspondence relating to the surety between the licensee and the State shall

be provided to the NRC. If authorized by the NRC to maintain a surety with the State as the beneficiary, it is the responsibility of the licensee to provide the NRC with verification of same, ensure that the agreement with the State specifically identifies the financial surety's application to the mill facility, ISL facility, tailings and related area decommissioning/reclamation and transfer of the long-term surveillance and control fee to the U.S. Department of the Treasury prior to license termination.

All costs (unit and total) are to be estimated on the basis of independent contractor costs (include overhead and profit in unit costs or as a percentage of total). Equipment owned by the licensee and the availability of licensee staff should not be considered in the estimate to reduce cost calculations. All costs should be based on current year dollars. Credit for salvage value is generally not acceptable on the estimated costs.

The NRC staff review may include a comparison of unit cost estimates with standard construction cost guides (e.g., Dodge Guide, Data Quest) and discussions with appropriate state or local authorities (highway cost construction). The licensee should provide supporting information on the basis for their selection of the unit cost figures used in their estimates.

SAMPLE FORMAT FOR REPORTING

MONITORING DATA

REGULATORY GUIDE 4.14

TABLE 3(a)

SAMPLE FORMAT FOR REPORTING MONITORING DATA

Page 1 of 3

STACK SAMPLES

For each sample analyzed, report the following information:

- Date sample was collected
- Location of sample collection
- Stack flow rate (m^3/sec)

<u>Radionuclide</u>	<u>Concentration</u> ($\mu Ci/ml$)	<u>Error Estimate (b)</u> ($\mu Ci/ml$)	<u>Release Rate</u> (Ci/qr)	<u>Error Estimate</u> (Ci/qr)	<u>LLD (c)</u> ($\mu Ci/ml$)	<u>1 MPC (c)</u>
U-nat						
Th-230						
Ra-226						
Pb-210						

AIR SAMPLES

For each sample analyzed, report the following information:

- Date sample was collected
- Location of sample collection

<u>Radionuclide</u>	<u>Concentration</u> ($\mu Ci/ml$)	<u>Error Estimate</u> ($\mu Ci/ml$)	<u>LLD</u> ($\mu Ci/ml$)	<u>1 MPC</u>
U-nat				
Th-230				
Ra-226				
Pb-210				
Rn-222				

- 1) This table illustrates format only. It is not a complete list of data to be reported. (See text of guide and Tables 1 and 2.)
- 2) Error estimate should be calculated at 95% uncertainty level, based on all sources of random error, not merely counting error. Significant systematic error should be reported separately. See Sections 6.1, 7.1.4, and 7.3.
- 3) All calculations of lower limits of detection (LLD) and percentages of maximum permissible concentration (MPC) should be included as supplemental information.

TABLE 3 (Continued)

SAMPLE FORMAT FOR REPORTING MONITORING DATA

3. LIQUID SAMPLES

For each sample analyzed, report the following information:

- Date sample was collected
- Location of sample collection
- Type of sample (for example: surface, ground, drinking, stock, or irrigation)

Radionuclide	Concentration ($\mu\text{Ci}/\text{ml}$)	Error Estimate ($\mu\text{Ci}/\text{ml}$)	LLD ($\mu\text{Ci}/\text{ml}$)
U-nat (dissolved)			
U-nat (suspended)(d)			
Th-230 (dissolved)			
Th-230 (suspended)(d)			
Ra-226 (dissolved)			
Ra-226 (suspended)(d)			
Pb-210 (dissolved)			
Pb-210 (suspended)(d)			
Po-210 (dissolved)			
Po-210 (suspended)(d)			

4. VEGETATION, FOOD, AND FISH SAMPLES

For each sample analyzed, report the following information:

- Date sample was collected
- Location of sample collection
- Type of sample and portion analyzed

Radionuclide	Concentration ($\mu\text{Ci}/\text{kg wet}$)	Error Estimate ($\mu\text{Ci}/\text{kg}$)	LLD ($\mu\text{Ci}/\text{kg}$)
U-nat			
Th-230			
Ra-226			
Pb-210			
Po-210			

(d) Not all samples must be analyzed for suspended radionuclides. See Sections 1.2 and 2.2 of this guide.

TABLE 3 (Continued)

SAMPLE FORMAT FOR REPORTING MONITORING DATA

SOIL AND SEDIMENT SAMPLES

For each sample analyzed, report the following information:

- Date sample was collected
- Location of sample collection
- Type of sample and portion analyzed

<u>Radionuclide</u>	<u>Concentration</u> <u>($\mu\text{Ci/g}$)</u>	<u>Error Estimate</u> <u>($\mu\text{Ci/g}$)</u>	<u>LLD</u> <u>($\mu\text{Ci/g}$)</u>
U-nat			
Th-230			
Ra-226			
Pb-210			
Po-210			

DIRECT RADIATION MEASUREMENTS

For each measurement, report the dates covered by the measurement and the following information:

<u>Location</u>	<u>Exposure Rate</u> <u>($\mu\text{R/hr}$)</u>	<u>Error Estimate</u> <u>($\mu\text{R/hr}$)</u>
-----------------	--	---

RADON FLUX MEASUREMENTS

For each measurement, report the dates covered by the measurement and the following information:

<u>Location</u>	<u>Flux</u> <u>($\text{pCi/m}^2\text{-sec}$)</u>	<u>Error Estimate</u> <u>($\text{pCi/m}^2\text{-sec}$)</u>
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40-3453/VRS/88/01/27/0

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URFO:VRS
Docket No. 40-3453
License No. SUA-917
04003453432E

MEMORANDUM FOR: Docket File No. 40-3453
FROM: Van R. Scovill, Project Manager
Licensing Branch 2
Uranium Recovery Field Office, Region IV
SUBJECT: ENVIRONMENTAL ASSESSMENT FOR ATLAS MINERALS MOAB
URANIUM MILL

Attached is the Environmental Assessment prepared in support of the
renewal of Source Material License SUA-917 for Atlas Minerals Moab
Uranium Mill located in Grand County, Utah.

151
Van R. Scovill, Project Manager
Licensing Branch 2
Uranium Recovery Field Office
Region IV

Approved by: 151
Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office
Region IV

Attachment: Atlas Environmental Assessment

bcc: John Darke
Moab Public Library

Case Closed: 04003453432E

OFC	UBEO	UBEO	UBEO				
NAME	VScovill/db	PJGarcia	HJPettengill				
DATE	88/02/22		88/02/22				

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UNITED STATES NUCLEAR REGULATORY COMMISSION

ENVIRONMENTAL ASSESSMENT

PREPARED BY THE

URANIUM RECOVERY FIELD OFFICE

IN CONSIDERATION OF THE RENEWAL OF

SOURCE MATERIAL LICENSE NO. SUA-917

FOR THE

ATLAS MINERALS

MOAB URANIUM MILL

DOCKET NO. 40-3453

Dated FEB 22 1988

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1 Description of and Need for the Proposed Action	1
1.2 Background Information	1
1.3 Review Scope	2
2.0 ENVIRONMENTAL AND RADIOLOGICAL IMPACTS	2
2.1 Land Use	2
2.2 Operating Data	4
2.2.1 Air Particulate Monitoring	4
2.2.2 Stack Effluent Sampling	5
2.2.3 Radon Gas Monitoring	5
2.2.4 Ground Water and Surface Water Monitoring	5
2.2.5 Direct Gamma Exposure	6
2.3 Radiological Assessment	7
2.3.1 Introduction	7
2.3.2 Estimated Releases	7
2.3.3 Exposure Pathways	7
2.3.4 Radiation Dose Commitments to Individuals	7
2.3.5 Radiation Dose Commitments to Populations	8
2.3.6 Evaluation of Radiological Impacts to the Public..	8
2.3.7 Radionuclide Concentrations at Site Boundaries ...	9
2.3.8 Summary	9
3.0 EFFLUENT AND ENVIRONMENTAL MONITORING PROGRAMS	10
3.1 Effluent Monitoring (Process Stacks)	10
3.2 Airborne Particulate Monitoring	11
3.3 Radon Gas and Direct Radiation Monitoring	11
3.4 Soil and Vegetation Sampling	11
3.5 Groundwater and Surface Water Sampling	12
3.5.1 Groundwater	12
3.5.2 Surface Water	12
3.6 Quality Assurance for Environmental Monitoring	12
3.7 Summary	13
4.0 TAILINGS MANAGEMENT	14
4.1 During Operations	14
4.2 Interim Stabilization	16
4.3 Reclamation	16
4.3.1 Surety Arrangements.....	18
4.3.2 Land Ownership.....	19
5.0 CONCLUSION	20

LIST OF APPENDICES

Appendix A	Tables and Figures
Appendix B	Detailed Radiological Assessment
Appendix C	Calculation of Gamma Radiation Attenuation for Reclaimed Tailings Impoundment
Appendix D	Calculation of Thickness of Required Cover Material

1.0

INTRODUCTION

1.1

Description of and Need for the Proposed Action

By application dated May 31, 1984, Atlas Minerals Division (Atlas) of Atlas Corporation requested renewal of Source Material License No. SUA-917 authorizing uranium milling operations at the Moab, Utah facility. The proposed action is to grant a renewal of the subject license for operation of the Moab, Utah facility at the previously authorized production rate of 850 metric tons of uranium concentrate (yellowcake) per year. Although the mill is currently in a standby mode and is expected to remain so for an indefinite period, the licensee has requested a license which would authorize production of yellowcake. Therefore, the staff has reviewed both the proposed operational and nonoperational environmental monitoring programs. Nonoperational status has been defined as periods of mill shutdown exceeding 1 month.

The need for the Atlas mill was discussed in Section 10 of the Final Environmental Statement for the Moab Uranium Mill, NUREG-0453, dated January, 1979. The need for license renewal is essentially the same as discussed in the FES.

1.2

Background Information

The Moab Mill has been licensed since its startup in October 1956 and is now in timely renewal. The mill is located three miles northwest of the city of Moab in Grand County, southeastern Utah. The mill and tailings impoundment occupy 200 acres of the 400 acre site owned by Atlas Minerals (Atlas). The mill has produced copper, vanadium and uranium. Uranium has been produced through parallel acid and alkaline leach circuits. The alkaline leach circuit was designed to recover uranium and copper while the acid leach circuit was designed to recover uranium and vanadium. The alkaline circuit was shut down in January 1982 due to a lack of suitable ore. The acid leach circuit remained in operation until April 1984 when all operations at the Moab Mill ceased.

The tailings retention system at the Moab Mill consists of a ring embankment. Due to constraints imposed by the Colorado River and Moab Wash, three of the sides were constructed using the upstream method of construction. Recent raises to the western embankment have been constructed utilizing the downstream construction method. The licensee submitted a plan for a 36-foot raise to the tailings embankment system on March 21, 1978. The staff reviewed the plan and authorized a 6 foot raise. Additional information was submitted by Atlas and a single 12-foot lift was approved on October 29, 1979. By letter dated July 10, 1981, Atlas requested a final 18-foot lift to the tailings impoundment to a final elevation of 4076 feet. The proposal was reviewed and approved under Amendment No. 7 dated June 30, 1982. The lift has not been constructed due to the current status of the mill.

The staff recommends therefore that the license condition from the previous license which detailed construction specifications for this lift be carried over as a condition of the renewed license with the exception of Condition 18 C that had been completed and deleted in Amendment No. 25 dated February 14, 1986. Except as described above, the licensee shall not make any changes to the tailings retention system without specific approval in the form of a license amendment. The staff will also require that mill tailings other than samples for research not be transferred from the site without NRC approval. The licensee will also be required to maintain a permanent record of all such transfers.

1.3 Review Scope

The environmental review of Atlas' request for renewal included evaluations of the May 31, 1984 renewal application; an accompanying environmental report; supplements to the renewal application contained in submittals dated December 17, 1984; January 18 and June 5, 1985, December 4, 1986, and January 26, 1988; as well as routine monitoring and inspection reports.

Atlas' proposed programs were evaluated against NRC regulations as specified in 10 CFR 20, 10 CFR 40, and NRC staff policy as specified in the following: (1) Regulatory Guide 4.14, "Radiological Effluent and Environmental Monitoring at Uranium Mills," (2) Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment," and (3) Regulatory Guide 3.11.1, "Operational Inspection and Surveillance of Embankment Retention Systems For Uranium Mill Tailings."

2.0 ENVIRONMENTAL AND RADIOLOGICAL IMPACTS

2.1 Land Use

Operations have been conducted at the Moab site since October 1956. All operations to be authorized by the renewed license will be conducted within the confines of the existing site boundary. Issuance of the renewed license will not result in any increase in land disturbance beyond activities previously evaluated in the Final Environmental Statement (NUREG-0453) issued in January 1979.

The current land use in the vicinity of the mill has not changed significantly since publication of the FES. The major industry in the area is tourism, due to the proximity to Arches and Canyonlands National Parks. Cattle are grazed from May to November across the river from the mill site. The closest permanent residence is considered to be Tex's Tour Center located approximately 0.5 miles (0.8 km) northeast of the mill site. The only hospital in the area is 2.3 miles (3.7 km) from the mill in Moab, Utah. Ninety percent of the surrounding land within

5 miles (8.05 km) lies in the public domain and is managed by agencies of the Federal and State governments. The remainder is privately owned.

In their application for renewal, Atlas has recognized that the tailings impoundment is continually leaking tailings solution into the surface alluvium, which ultimately discharges to the Colorado River. Ground water data from environmental monitoring reports indicate that the chemical parameters associated with seepage (i.e., chloride, sulfate, TDS and conductivity) are elevated downgradient of the tailings impoundment. Similarly, one or more of the monitored radionuclides are also slightly elevated in all downgradient monitoring wells. Monitoring of these two families of parameters show conclusively that arterial seepage is entering the Colorado River.

In response to this seepage situation, a ground water study was conducted. The study indicated that a brine layer exists approximately 85 feet (25.9 M) below the land surface. The water in this zone is in intimate contact with evaporite deposits. Due to this, TDS concentrations often exceed 100,000 mg/l. The alluvium directly above this zone typically has TDS concentrations of 6,000 to 20,000 mg/l. To a measurable extent, the latter TDS concentrations represent dissolved constituents associated with seepage from the tailings impoundment.

In response to these elevated chemical and radiological parameters in the alluvium, a critical look at the ground water situation was initiated by the licensee. Due to the proximity of the tailings impoundment to the Colorado River and the intimate association of the brine layer with both of these features, mitigative action in the form of seepage recovery via pumping from the alluvium was not considered a viable option. A further staff review of the situation indicates that no other acceptable mitigative action exists to effectively control tailings derived seepage which is entering the Colorado River. The staff has concluded the best course of action is to minimize the driving hydrolic head and thereby minimize the effective seepage rates. The staff will therefore require by license condition that the licensee shall not discharge any liquids or solids to the tailings impoundment during nonoperational periods other than needed to perform routine or preventative maintenance, without prior written approval of the NRC.

The staff will require that the licensee conduct an annual survey of land use (grazing, residence, wells, etc.) in the area within two miles of the mill and submit a report of this survey annually to the USNRC, Uranium Recovery Field Office. This report shall indicate any differences in land use from that described in the licensee's previous annual land use report. The report shall be submitted by March 31 of each year. This will assure that significant changes in land use do not go undetected and also, that the environmental monitoring program in effect at the mill is adequate to evaluate the radiological impact of milling activities on the nearby population.

An archeological evaluation of the site was made by the state of Utah's Historic Preservation Officer and published in the FES 1979. The survey indicated that the site did not have any known historic areas within its boundaries. Archeological clearance was therefore granted with a provision that should any buried cultural deposits be unearthed, all excavation work will cease in the immediate area, until approval to proceed is received from the USNRC. This requirement will be included in the renewed license.

The staff will further require that before engaging in any activity not previously assessed by the NRC, the licensee shall prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not addressed, or that is greater than that assessed in the Final Environmental Statement (NUREG-0453), the licensee shall provide a written evaluation of such activities and obtain prior approval of the USNRC, Uranium Recovery Field Office, for the activity.

Several rare or endangered species were identified in NUREG-0453 as transient in the area. The FES concluded that the mill would have no effect on these species.

2.2 Operating Data

2.2.1 Air Particulate Monitoring

Atlas has performed continuous air particulate monitoring at six locations since its previous license renewal. Sites S-2 and S-3 are on-site or at the site boundary, on the east and west sides, respectively. Site S-1 is also at the site boundary and is located just west of the nearest residence, Tex's Tour Center. Sites S-4 and S-5 are located at Arches National Monument Headquarters and Moab, respectively. The deletion of one sampling station (S-5) was previously approved in Amendment No. 16 dated August 14, 1984, thereby reducing the sample stations to five. Site S-6 is the background site located approximately 5 miles (8 km) south of the mill.

Composite air particulate samples have been analyzed quarterly for U-natural, Th-230, Ra-226 and Pb-210. Data from 1981, 1982 and 1983 have been reviewed in conjunction with the renewal as operations were conducted during those years. Atlas has provided a summary of airborne concentrations for 1981 through 1983 in Appendix 5.5 of the renewal application. The data provided shows the average yearly range of

reported gross concentrations, irrespective of location, to be as follows:

U-nat	0.1	-	1.7% MPC
Th-230	1.8	-	36.7% MPC
Ra-226	0.1	-	3.0% MPC
Pb-210	0.4	-	1.9% MPC

Site 3 (Tailings Impoundment) exceeded the MPC for Th-230 twice during the second and third quarter of 1983. No other values exceeded MPC and were generally low in value.

2.2.2 Stack Effluent Sampling

Atlas had performed quarterly sampling at the ore crusher stacks, ore sample tower stack, fine ore bin stack, and the yellowcake scrubber and dust collector stacks since 1982. The data for 1982 to 1984 was reviewed in conjunction with the license renewal. The samples were analyzed for U-natural, Th-230 and Ra-226. The data from the four ore exhaust stacks of the crusher and ore storage bins did not exceed 17 percent MPC for U-nat, 13.4 percent of MPC for Th-230 and 46 percent of MPC for Ra-226. The yellowcake scrubber stack and yellowcake dust collector for the same period ranged from a high of 15.3 percent to a low of 7 percent for U-natural, from a high of 387 percent to a low of 2.3 percent for Ra-226 and a high of 14 percent to a low of 2.8 percent for Th-230 of the respective restricted area MPC. Review of the data revealed a decreasing trend in values for the period covered. The latter values are comparable to those reported at other mills. Radon monitoring has been conducted continuously at the six air particulate monitoring locations.

2.2.3 Radon Gas Monitoring

Radon-222 samples have been collected and analyzed quarterly. The radon-222 concentration ranged from 3.0 to 18.0 percent of the unrestricted area MPC. The high Rn-222 value occurred during the third quarter of 1983 at Site 3.

2.2.4 Ground Water and Surface Water Monitoring

Atlas is required to monitor ground water at seven monitor wells. A single well is located upgradient of the tailings impoundment, while the remaining six are located downgradient. The ground water monitoring program consists of quarterly sampling and analysis for six radionuclides and eight chemical species.

The radionuclides which are sampled are gross beta, U-nat, Th-230, Ra-226, Pb-210 and Po-210. Review of the data provided by Atlas, which covered the years 1981 through 1983, indicates that the highest quarterly

average concentration for these constituents was generally below 10 percent of MPC for unrestricted areas. However, when analyses for individual wells are considered, radionuclide concentrations often reach 30 to 50 percent of MPC.

The most recent quarterly reports indicate that radionuclides are elevated in downgradient wells relative to the background well. These elevated concentrations do indicate that tailings derived seepage is carrying dissolved radionuclides into the monitored zones which ultimately discharge to the Colorado River.

The chemical parameters which are sampled are arsenic, selenium, nitrate, sulfate, chloride, total dissolved solids, pH and conductivity. These parameters are good indicators of seepage movement. The near surface monitor wells indicate that the chemical parameters are elevated with respect to the background location. The deeper wells indicate a similar situation; however, the interaction of a brine layer of very poor quality relative to the seepage masks the effect of seepage.

Both the chemical and radiological parameters monitored at the site indicate that tailings derived seepage is taken from the tailings impoundment and discharging directly to the Colorado River. A staff review of the hydrological conditions at the site indicate that a seepage recovery system would have the potential to aggravate the ground water situation by drawing the underlying brine into the upper zone, which discharges to the Colorado River. However, to reduce and minimize the seepage from entering the Colorado River, the staff will require by license condition that the licensee shall not discharge any liquids or solids to the tailings impoundment during non-operational periods other than needed to perform routine or preventative maintenance, without prior written approval of the NRC.

2.2.5 Direct Gamma Exposure

Direct gamma exposures were determined quarterly via TLDs at the six air particulate monitoring and three additional locations during 1981 and seven additional locations during the period 1982 through 1983.

Review of the data provided in Appendix 5.5 of the renewal application reveals that during 1983, the cumulative exposures ranged from 50 to 128 millirems. The staff concludes that the external exposure levels are within expected background ranges for western locations.

2.3 Radiological Assessment

2.3.1 Introduction

This section addresses the radiological impacts from milling operations at the Moab mill. In Atlas' renewal application, the licensee indicated that the mill would produce a maximum of 850 MT per year of barreled yellowcake (U_3O_8) at a daily processing rate of 1162 MT with 0.25% uranium ore feed. Although Atlas has been shut down since April 1984, this assessment presents a state-of-the-art evaluation of the impact of milling 1162 MT/day of ore by both mill circuits.

Components of the radiological analysis presented in this section include estimates of the following: (1) annual release of radioactive materials from the mill and tailings retention system, (2) resulting concentrations at the restricted area boundaries, and (3) resulting dose commitments to nearby individuals and the population within 80 km (50 miles) of the mill. The calculated results are compared to measured background radiation and applicable regulatory requirements.

2.3.2 Estimated Releases

A summary of the information and data assumptions used to calculate the annual releases of radioactive materials from the mill and tailings retention system is presented in Table 1 (Appendix A). The estimated annual releases are presented in Table 2 (Appendix A). More detailed descriptions of release estimates from the tailings pond, ore pad and ore stockpile areas as well as the description of the models and assumptions used by the staff to perform the radiological impact assessment are provided in Appendix B. Release rates from the tailings retention system are based on the tailings management plan presented in Section 4.0.

2.3.3 Exposure Pathways

Potential environmental pathways by which people could be exposed to radioactive effluents from the Moab Mill are the inhalation of radioactive materials in the air, external exposure to radioactive materials in the air or deposited on ground surfaces, and ingestion of contaminated food products (i.e., vegetables, meat and milk).

2.3.4 Radiation Dose Commitments to Individuals

The nearest permanent residence to the mill is considered to be Tex's Tour Center, located approximately 0.5 miles (0.9 km) east of the mill and in the prevailing wind direction from the mill. The town of Moab, Utah is 1.68 miles (2.7 km) southeast. In addition to calculating dose commitments to individuals residing at Tex's Tour Center, Moab, and

Arches National Park located 1.5 miles (2.4 km) northwest of the mill, the staff has also calculated dose commitments for individuals residing at 6.0 miles (9.6 km) east-southeast of the mill. Meat ingestion doses were not always calculated because cattle are not grazed in all vicinities. Table 3 presents a summary of individual dose commitments calculated for these locations. These doses result from releases during the fifth year of mill operation, when environmental concentrations are expected to be near their highest level.

For the purposes of this assessment, the staff has assumed that ingestion doses of residents in Moab and Academy result from the consumption of meat from cattle grazed within 3.11 miles (5 km) of the mill center. There are presently no milk cows or vegetable gardens in the vicinity of the mill.

Table 4 presents a comparison of the annual dose commitment resulting from mill operations with the EPA radiation protection standard (40 CFR Part 190).

2.3.5 Radiation Dose Commitments to Populations

Projected environmental population dose commitments are presented in Tables 5 and 6. Table 5 presents 100 year dose commitments to the regional population within 80 km of the Moab mill. The analysis for the fifth year of mill operations indicated that the values are to be near their highest level.

Table 6 presents the total environmental dose commitments to the regional population within 80 km of the mill and the transcontinental population from operations over the Moab Mill license renewal period. The environmental dose to the population will be evaluated again in five years. Transcontinental dose commitments, as opposed to regional impacts, result entirely from the release of radon gas. Both tables discussed above also contain a comparison of total dose commitments resulting from the Atlas operation with dose commitments resulting from natural background.

2.3.6 Evaluation of Radiological Impacts to the Public

A review of Table 4 which compares individual dose commitments with the EPA 40 CFR 190 standard of 25 mrem to the whole body or any organ, indicates that, for the most part, individual dose commitments are small fractions of the standard with one exception. The exception is Tex's Tour Center, the nearest residence. The MILDOS model estimates a dose commitment of about 32 millirem to the lung of an individual residing at this location. However, since that location is not occupied on a continual basis the staff concludes that exposures should fall below

regulatory limits. A review of Tables 5 and 6 indicates that regional and transcontinental dose commitments are only very small fractions of the dose commitments from naturally occurring background radiation. This compared well to the actual sampling results submitted by licensee.

2.3.7 Radionuclide Concentrations at Site Boundaries

The radiological assessment also included the calculation of projected radionuclide concentrations at eight site boundary locations during the fifth year of operation. A comparison of these projected concentrations with unrestricted area concentration limits specified in Appendix B to 10 CFR Part 20 is presented in Table 7. The highest projected natural uranium concentration occurs at the north site boundary and is only about 4 percent of the unrestricted area MPC. This projected maximum concentration compares favorably with the highest natural uranium concentration actually measured at the site boundary, which was 4.5 percent of the unrestricted area MPC and occurred at sampling station S-3 (station S-1 exhibited a maximum of 0.4 percent of MPC). The maximum projected Th-230 concentration also occurs at the north site boundary and is about 9 percent of the unrestricted area MPC. The maximum measured Th-230 value was 153 percent of MPC and occurred at site S-3 during the third quarter of 1983, while site S-1 registered a maximum third quarter 1983 value of 20 percent of MPC.

2.3.8 Summary

The radiological assessment performed by the staff indicates that estimated site boundary concentrations are small fractions of the unrestricted area MPC; however, the estimated and actual annual organ dose commitments to the lung of a person continuously residing at the nearest residence may be in excess of the 40 CFR 20 organ dose limits. The staff will evaluate future land use surveys to assess occupancy factors for close in locations.

The staff will require by license condition that the licensee shall conduct an annual survey of land use (grazing, residence, wells, etc.) in the area within two miles of the mill and submit a report of this survey annually to the USNRC, Uranium Recovery Field Office. This report shall indicate any differences in land use from that described in the licensee's previous annual land use report. The report shall be submitted by March 31 of each year. Significant changes in regional population, grazing or land cultivation patterns near the mill would necessitate a revised radiological assessment, and could alter the conclusions in this assessment. URFO will continue to review the licensee's future submittals to determine compliance with existing

Additionally, the licensee will be required by license condition to assess all activities not previously evaluated in this environmental assessment or licensee will be required to obtain NRC approval prior to initiating the activity.

3.0 EFFLUENT AND ENVIRONMENTAL MONITORING PROGRAMS

3.1 Effluent Monitoring (Process Stacks)

Atlas has proposed both an operational and nonoperational effluent and environmental monitoring program as described in Section 5.5.6 and Tables 5.5-8 and 5.5-9 of the renewal application. The operational stack effluent monitoring program proposed by Atlas in Table 5.5-8 requires quarterly isokinetic sampling of the yellowcake dust collector and the yellowcake scrubber stacks. Atlas has also proposed performing semiannual representative grab sampling of the four area stacks. All samples will be analyzed for U-nat, Th-230, Pa-226 and Pb-210. Additionally, during operational periods stack flow rates will be measured; no stack sampling is proposed during nonoperational periods, as shown in Table 5.5-9. Additionally in Section 3.3 the licensee proposed instrumentation for use in the effluent control systems. Table 4.1-1 of the renewal application lists the ventilation and exhaust systems in place at the Moab mill. A wet scrubber equipped with an automatic alarm system, controls the emissions from the product dryer or stack while a baghouse dust collector reduces stack emissions from the yellowcake packaging area. Data on throughput, emissions, stack height, exit diameter, flow rates and exhaust temperature for 1983 are also provided on Table 4.1-1 of the renewal application.

The staff recommends as a condition of the renewed license that the licensee be required to maintain the effluent control systems as specified in Section 3.3 of the licensee's renewal application that; operations shall be immediately suspended in the affected area of the mill whenever any of the emission control equipment for the yellowcake drying or packaging area is not operating within specifications for design performance; during all periods of yellowcake drying operations, the licensee shall assure that the scrubber is operating within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance. Air pressure differential gauges for emission control equipment, other than the wet scrubber, shall be read and the readings documented once per shift, during operations; and any changes in the effluent control systems, as described above, shall require approval by the USNRC, Uranium Recovery Field Office, in the form of a license amendment.

3.2 Airborne Particulate Monitoring

Atlas proposed both an operational and nonoperational airborne particulate monitoring program as specified in Section 5.5.6 and Tables 5.5-8 and 5.5-9 of the renewal application. Atlas has proposed monitoring five locations continuously. The locations consist of three site boundary locations (S-1, S-2 and S-3) which includes the nearest residence, Tex's Tour Center (S-1). Also included, a station at Arches National Park (S-4), and a background location (S-6). During operational periods, weekly composite samples are to be analyzed quarterly for U-nat, Ra-226, Th-230 and Pb-210, while only Th-230 is proposed to be monitored during nonoperational periods. Air samples are proposed to be collected by means of continuous environmental air samplers utilizing a glass fiber filter of 47 mm diameter with a pore size of 0.2 to 10 μ m. The staff recommends that the licensee conducts its "Airborne Particulate Monitoring" program during nonoperational periods as proposed in Table 5.5-8 for operational periods, except that analysis for Pb-210 need not be conducted during nonoperational periods.

3.3 Radon Gas and Direct Radiation Monitoring

Atlas proposed to perform operational and nonoperational continuous radon and direct radiation monitoring at the same locations indicated for air particulate monitoring or at least 1 week each month during nonoperational periods; as specified in Section 5.5.6.1 and Tables 5.5-8 and 5.5-9 of the renewal application.

The passive radon and direct radiation monitors are collected quarterly and are read by outside contractors.

3.4 Soil and Vegetation Sampling

The operational and nonoperational soil and vegetation programs are specified in Section 5.5-6 and Tables 5.5-8 and 5.5-9 of the renewal application. Atlas proposes to perform annual soil sampling at the five air monitoring sites and analyze the samples for U-nat, Ra-226 and Pb-210 during operations. Atlas also proposes to perform annual vegetation sampling during the grazing season at two grazing areas across the Colorado River, opposite the mill site, during operational periods. The vegetation samples are to be analyzed for Ra-226 and Pb-210. During nonoperational periods Atlas proposed to suspend soil and vegetation sampling and analysis. The staff recommends that the licensee conduct its "Soil and Vegetation Sampling" program during nonoperational periods as proposed in Table 5.5-8 for operational periods.

Atlas has also proposed obtaining an annual sample of three fish from the Colorado River downstream near the mill during operations. They will be analyzed for U-nat, Ra-226 and Pb-210. No fish samples will be collected during nonoperational periods.

In addition, Atlas proposes to collect three beef and vegetable samples from locally grazed beef and locally grown vegetables once a year during operational periods and to analyze them for Ra-226 and Pb-210. During nonoperations, no beef or vegetable samples are proposed.

3.5 Ground Water and Surface Water Sampling

3.5.1 Ground Water Sampling

Tables 5.5-8 and 5.5-9 of the renewal application contain Atlas' proposed operational and nonoperational ground-water monitoring programs. Atlas has proposed quarterly sampling of seven monitor wells during both operational and nonoperational periods. Six of the wells are located downgradient of the tailings impoundment, while the seventh well is located upgradient and serves as the background monitoring station. Of the downgradient wells, two wells (MW-1R and MW-2R) monitor the near surface formation, while wells MW-3, ATP-1S and ATP-2S and ATP-2B monitor deeper portions of the formation.

The quarterly samples are analyzed for gross beta, dissolved U-nat, Th-230, Ra-226, Pb-210, Po-210, As, Se, Cl, NO₃, SO₄, TDS, pH and conductivity. However, the detection monitoring program proposed in the renewal application is not consistent with Appendix A, 10 CFR 40. The implementation of a ground water detection monitoring program consistent with Appendix A, 10 CFR 40 was required by Amendment No. 22 and shall therefore, be a condition of the renewed license.

3.5.2 Surface Water Sampling

Tables 5.5-8 and 5.5-9 of the renewal application contain Atlas' proposed operational and nonoperational surface water monitoring programs. Atlas has proposed quarterly sampling of surface water at two locations on the Colorado River during both operational and nonoperational periods. The grab samples are intended to monitor water quality upstream and immediately downstream of the tailings impoundment.

The licensee will perform a similar analysis on the surface water samples as proposed for the ground water program. Should the tailings impoundment seepage have a noticeable effect on the Colorado River, such a sampling program will be sufficient to detect it.

3.6 Quality Assurance for Environmental Monitoring

Atlas' proposed operational and nonoperational environmental quality assurance monitoring program is described in Section 7.6 of the licensee's renewal application. Atlas has proposed in Table 7.11-1 of

the renewal application, Lower Limits of Detection (LLDs) for all radionuclides sampled and the respective media. The staff determined that LLD's for sample analysis were incomplete and inconsistent with the recommendations contained in Regulatory Guide 4.14 (i.e. an LLD for U-nat stack sampling was not presented, the LLD for Ra-226 stack sampling was not consistent with Section 5 of Regulatory Guide 4.14, LLD's for water, vegetation, food, fish and ore dust were not consistent with Section 5 of Regulatory Guide 4.14, etc.). The staff reviewed the Atlas quality assurance program which included programs from their subcontracting analytical laboratories. The staff concluded that the subcontracted laboratories participate in the EPA QA program available for the uranium mining industry, but that the LLD's established by the licensee were not consistent with the staff recommendations contained in Section 5 of Regulatory Guide 4.14.

3.7 Summary

The staff concludes that the effluent and environmental programs proposed by Atlas is not consistent with the staff positions presented in Regulatory Guide 4.14 and 4.15. Therefore, the staff will require by license condition that air particulate samples shall be analyzed for U-nat, Ra-226, and Th-230, quarterly, that the analysis of quality control samples shall be in accordance with Section 6.3 of Regulatory Guide 4.15, the lower limits of detection utilized for sample analysis shall be in accordance with Section 5 of Regulatory Guide 4.14, and that soil and vegetation samples shall be analyzed annually for Ra-226 and Pb-210.

The staff will also require as a condition of the renewed license that the results of the effluent and environmental monitoring programs required by the license shall be reported in accordance with the format in the attachment to SUA-917 entitled, "Sample Format For Reporting Monitoring Data." In addition that the results of sampling, analyses, surveys and monitoring; the results of calibration of equipment; reports on audits and inspections; all meetings and training courses required by this license; and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in USNRC regulations, all such documentation shall be maintained for a period of at least five (5) years.

Finally, the staff will require as a condition of the renewed license that in addition to the effluent control systems as described in Section 3.3, operations shall be immediately suspended in the affected area of the mill if any of the emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance. Also, during all periods of yellowcake drying operations, assure that the scrubber is operating

within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance. And that air pressure differential gauges for emission control equipment other than the wet scrubber shall be read and the readings documented once per shift during operations. The staff will further require that any changes in the effluent control systems, as described above, shall require approval by the USNRC, Uranium Recovery Field Office, in the form of a license amendment.

4.0 TAILINGS MANAGEMENT

4.1 During Operations

Tailings produced by Atlas' Moab, Utah mill are disposed of in an onsite constructed tailings impoundment covering approximately 130 acres. The impoundment consists of five embankments containing liquid effluents and mill tailings. The embankments have been raised to the present elevation of 4058 feet since the 1979 license renewal. An 18-foot lift has to the final elevation of 4076 feet MSL was reviewed and approved under Amendment No. 7 to SUA-917 dated June 30, 1982. The dam raise had not been initiated at the time of this review. The added capacity is not required at this time as the mill is in a long-term shutdown status. The staff will require that any additional expansion of the tailings impoundment area by raising the height of the present dam or constructing a new dam must receive NRC review and approval in the form of a license amendment.

During operations Atlas discharges the tailings slurry through spigots located 100 feet apart. Discharge of tailings is shifted among spigots to effect an evenly wetted beach so as to minimize blowing of the tailings. During periods of long-term shutdown, the beaches are coated with a compound to provide a crust that may prevent the tailings from blowing away. The staff will require that the effectiveness of these control measures be evaluated by means of daily documented inspections and a weekly summary report. The staff will also require that the licensee conduct daily documented inspections of the tailings embankments and notify USNRC, Uranium Recovery Field Office by telephone or telegraph of any failure in the tailings retention or discharge systems which results in a release of radioactive material from those systems.

The licensee proposed, in Section 4.3 of the renewal application, a contaminated waste disposal program. However, the staff finds the licensee's proposal lacks specific guidelines; therefore, the staff recommends as a condition of the renewed license that the licensee shall not dispose of materials other than uranium mill tailings, spent resins, raffinate, vanadium waste residues, liquids or residue contained in the catchment basin, or liquid sanitary waste with the approval of the Utah Bureau of Water Pollution Control.

Section 5.5.10.2 of the licensee's application proposed the burial of radioactive contaminated solid wastes in the tailings impoundment and in the sump collection pond located adjacent to the southeast section of the tailings impoundment. The staff authorized disposal in the sumps area by issuance of Amendment No. 17. The licensee has withdrawn the proposal in Sections 5.5.10.2 by letter dated January 30, 1985, to authorize in disposal in the tailings area.

During a routine unannounced radiation safety inspection conducted by this office on March 12-14, 1986, NRC Inspection Report 40-3453/86-001, areas of significant soil contamination were identified. In a letter dated January 23, 1987 Atlas discussed the results of their windblown tailings delineation survey, a determination of the background radium-226 concentration, areas proposed for cleanup, and a schedule for performing the cleanup. Cleanup activities northwest and west of the tailings impoundment, between the impoundment and State Highway No. 279, (HWY 279) were completed during the period February through March 1987; however, cleanup of tailings west of HWY 279 has not been completed.

Atlas cleaned up the area along the west side of HWY 279 but did not clean all area in excess of 5 pCi in the first 15 centimeters of soil. The areas remaining are on a steep slope west of HWY 279. In accordance with a letter from URFO dated February 25, 1987, Atlas submitted an evaluation of a section southeast of the tailings impoundment, by letter dated June 29, 1987. The detailed evaluation of the section southeast of the tailings impoundment consisted of surveys, soil sampling, and groundwater analysis to estimate the areal extent and depth of the contaminated soil, and to estimate the volume of contaminated soil to be stabilized, in that section. The results of licensee assessment of the of the contaminated soils indicate that the contamination is currently stabilized and/or relatively unaccessible. Atlas proposed to finish cleanup of these areas, west of HWY 279 and the section southeast of the tailings impoundment, during final reclamation. Therefore, the staff recommends as a condition of the renewed license that the licensee shall, prior to reclamation, develop methods and procedures to ensure that the entire area, southeast of the tailings impoundment, consisting of approximately 6.6 acres with an estimated volume of 25,000 cubic yards of contaminated soil is placed in the tailings pond prior to final reclamation and otherwise ensure that the entire area is decontaminated to level consistent with 10 CFR Part 40, Appendix A, Criterion 6 and that the entire area, west of State Highway No. 279, identified as exceeding the levels required in 10 CFR Part 40, Appendix A, Criterion 6, shall be removed and placed in the tailings pond prior to final reclamation. By our letter dated February 25, 1987, background for the area west of State Highway No. 279 is 5.5 pCi/gm. Records of all analysis of the section southeast of the tailings impoundment and west of State Highway No. 279 shall be maintained until the commission authorizes disposal.

4.2 Interim Stabilization

The licensee proposed three methods for stabilization of the tailings pond and ore piles from wind erosion. For the pond, these methods were: 1) controlled deposition of tailings slurry; 2) sprinkling of tailings solution on dry beaches; and 3) use of a chemical dust suppressant. The licensee has also sought to control blowing tailings by the addition of fresh water to keep the tailings covered. As noted earlier, continued additions of water to the pond only serve to perpetuate seepage from the impoundment. Moreover, it is not feasible to maintain a water cover over all the tailings and those tailings not covered by water, despite good faith efforts by the licensee, have been subject to blowing out of the impoundment. In a similar fashion, unstabilized ore piles near the site perimeter have been subject to blowing and contamination of unrestricted areas. Therefore, the staff recommends as a condition of the renewed license that the licensee shall minimize dispersal of dust from the ore piles by water sprinkling in other dust suppression techniques, unless a documented weekly inspection indicates that the moisture content of the ore and/or weather conditions are controlling dusting.

4.3 Reclamation

The reclamation plan titled, "Report, Conceptual Design and Cost Estimate, Tailings Pile Reclamation, Moab, Utah for Atlas Minerals" was incorporated in the existing license as License Condition No. 21. The plan has been resubmitted as part of the renewal application in Section 5.5.9 without any changes to the existing requirements. The review of the plan was made in the memo to file dated June 29, 1982 (see memorandum to Docket File No. 40-3453 dated June 29, 1982).

The plan allows two years for the tailings to dry out and then requires resloping the pile to a maximum of 10H to 3V. After stabilization of the pile and the application of ten feet of cover, regrading will be accomplished, then two feet of rock cover will be placed on the slopes and the essentially flat top surface will be seeded and revegetated.

The present plan was designed in accordance with criteria contained in the "Final Generic Environmental Impact Statement on Uranium Milling" (FGEIS), dated September, 1980. The plan was also reviewed for conformance to the criteria contained in the FGEIS. Subsequent to the initial staff review and approval, the EPA promulgated its 40 CFR 192 standard which specifies longevity and radon attenuation criteria for reclamation plans. The Commission subsequently incorporated these criteria into 10 CFR 40, Appendix A, Criterion 6 (Criterion 6). The staff has therefore reviewed the present plan for conformance to the criteria specified in Criterion 6.

Criterion 6 requires that the disposal area be designed to provide reasonable assurance that radon emanation from reclaimed tailings does not exceed an average release rate of 20 pCi/m²/sec over a period of 1,000 years to the extent reasonably achievable, and, in any case, at least 200 years. The existing plan was based on attenuation of radon from the reclaimed site to twice the background rate. The staff's evaluation of radon attenuation for the existing plan is documented in an appendix to the June 29, 1982 memorandum. The conclusion of the staff's evaluation was that the proposed plan would reduce radon emissions from the tailings to 1.27 pCi/m²/sec. Since specific longevity requirements were not in effect at the time, an analysis of the depth of cover estimated to be removed by sheet water and wind erosion was not performed. However, the existing plan will easily meet the Criterion 6 radon attenuation standard over a 1000 year period due to the much more conservative criteria used to design the cover. Staff analysis of the required cover thickness indicates that the proposed cover thickness is adequate. Details for the calculation are provided in Appendix D.

Criterion 6 also requires that the reclamation plan be effective for 1000 years, to the extent practicable, but at least for 200 years. The staff therefore performed a review of hydrologic conditions which could affect the reclaimed site. This analysis is documented in a memo to file dated March 20, 1986 (see memorandum to Docket File No. 40-3453 dated March 20, 1986). The memorandum basically concluded that the current reclamation plan is adequate to protect against flooding from the Colorado River and Moab Wash. However, several minor items will need to be evaluated by the licensee as a result of recent research sponsored by the NRC. These items are discussed below.

- (a) Design of the rock protection for the side slopes - The original design of the rock protection was based on recommendations contained in FGEIS and did not utilize engineering methodology.

The staff will therefore require that Atlas provide an engineering design for the gradation and thickness of the riprap. Further, the current design includes a revegetated pile top. Although the pile top is very flat and possibly not susceptible to gully erosion, the staff concludes that flow concentrations will occur (due to differential settlement, construction irregularities, etc.). This flow concentration will magnify the rock size requirements for the side slopes. The staff will therefore require that the riprap be designed in accordance with one of the following options: (1) if rock is not to be used for the pile top, a flow concentration factor should be used to design the side slope riprap, or (2) if the plan is modified to include rock protection for the top, the side slope riprap may be designed assuming unconcentrated sheet flow.

- (b) Rock durability - The limited rock durability testing performed showed the rock to be of marginal quality. To compensate for the marginal quality of the rock in the absence of specific quantitative procedures, Atlas proposed to double the 1-foot thickness recommended in the FGEIS. Research currently completed at Colorado State University (NUREG/CR-4620) provides procedures for oversizing marginal rock as well as selective screening of the rock to assure placement of the better quality rock in frequently-saturated areas (i.e., along the toe of the embankment). The staff will therefore require that Atlas provide the results of additional rock durability testing and propose a rock placement and/or oversizing plan which will assure protection of the reclaimed pile over a 1000-year period.
- (c) The current plan includes out slopes of 10H:3V. The staff concludes that added assurance regarding the stability of the pile can be achieved by flattening the slopes. The staff will therefore require that Atlas evaluate alternatives for flattening the slopes. Flattening the out slopes could result in a reduction in rock size requirements.

4.3.1 Surety Arrangements

With respect to financial assurances for site decommissioning and reclamation, Atlas Corporation has submitted a Letter of Credit, No. 119907 dated December 3, 1987 drawn on the Bank of America, in the amount of \$6,000,000. The staff recommends that the renewed license contain the following license condition:

The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground water restoration as warranted and the long-term surveillance fee. Within three (3) months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within three (3) months of written NRC approval. Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to the NRC at least three (3) months prior to the anniversary of the

effective date of the existing surety instrument. If the NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for one year.

Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The licensee shall also provide the NRC with all surety related correspondence submitted to the State, a copy of the State's surety review and the final approved surety arrangement, if applicable. The licensee shall also ensure that the surety, where authorized to be held by the State, expressly identifies the NRC portion of the surety and covers the decommissioning and decontamination of the mill and mill site, reclamation of the tailings and waste disposal areas, soil and water sample analyses to confirm decontamination, ground water restoration as warranted and the transfer of the long-term surveillance fee to the U.S. General Treasury. The basis for the cost estimate is the NRC approved reclamation/decommissioning plan or NRC approved revisions to the plan. Attachment entitled, "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates," outlines the minimum considerations used by the NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

Atlas' currently approved surety instrument, Irrevocable Letter of Credit No. 119907, issued by the Bank of America, in favor of the NRC, shall be continuously maintained in an amount no less than \$6,000,000 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by the NRC. For the purposes of the annual update of Atlas' cost estimate required by Criterion 9, October 31, 1987, is designated as the effective date of the existing surety arrangement.

4.3.2 Land Ownership

Table 5.5-11 of the licensee's renewal application states that the land holdings of the company encompass the mill and tailings impoundment sites. Section 5.5.10.11 of the renewal application states that the licensee will transfer ownership of the land after decommissioning and reclamation to either the United States Government or the State of Utah. The previous statement does not give the state the first option; therefore, the staff will require that prior to termination of the license, the licensee shall provide for transfer of title to byproduct

material and land, including any interests therein (other than land owned by the United States or the State of Utah), which is used for the disposal of such byproduct material or is essential to ensure the long term stability of such disposal site to the United States or the State of Utah, at the State's option.

5.0 CONCLUSION

The impacts resulting from the renewal of Source Material License No. SUA-917 authorizing continued uranium milling operations at the Atlas Minerals, Moab, Utah facility are summarized below.

1. Impacts to land use are expected to be minimal. Continuation of milling should not result in additional land disturbance beyond that projected in the FES for Atlas and the staff analysis approving the 1981 Tailings Dam Construction and Management Plans submitted by the licensee. In addition, all disturbed land will be reclaimed in accordance with current and future approved reclamation plans after operations have ceased.
2. Mill emissions from the process stacks have on occasion exceeded restricted area MPC's and concentrations of Thorium-230 have also exceeded unrestricted area MPC on occasion. However, the perimeter air monitoring stations have shown annual average airborne radionuclide concentrations to be consistently below the respective U-nat, Th-230 and Ra-226 MPCs. Radon concentrations at these sites have also been within MPC.
3. Ground water radionuclide concentrations have generally been within 10 CFR 20 values. Although seepage has occurred beneath the dam, all flow is toward the Colorado River. Sample analysis has shown that values of samples taken of the river above and below the mill are not significantly different. The licensee has also taken steps to reduce the flow of the seepage. The staff reviewed the recent 40 CFR 192 requirements and the associated orders in the form of an amendment to the license, and concludes the requirement for compliance to 40 CFR 192 shall be continued as a license condition.
4. Continued operation of the Atlas mill should not result in individual doses to the bone, lung and whole body at the nearest occupied area which are above the EPA 40 CFR 190 standard of 25 mrem/yr. Although a projected maximum annual dose estimated for the nearest resident of the Moab mill was 32 mrem to the lung the staff concludes that limited and transient occupancy should limit actual exposures at levels less than the standard.

It is the staff's conclusion that the impacts associated with renewal of Source Material License No. SUA-917 are within the realm of impacts expected in the FES (NUREG-0453) dated January, 1979, that was prepared by the staff. Recognizing these impacts, the staff has available two alternatives with respect to the requested license renewal:

1. Renew the license with such conditions as are considered necessary or appropriate to protect the public health and safety and the environment; or
2. Deny renewal of the license.

In the safety evaluation report prepared for this action, the staff has reviewed the licensee's proposed action with respect to the criteria for license issuance specified in 10 CFR 40, Section 40.32 and has no basis for denial of the license. Moreover, the environmental impacts described in this document do not warrant denial of the application. For these reasons, license denial is considered an unacceptable alternative.

Based on the environmental impact appraisal presented in this document, the staff recommends that Source Material License No. SUA-917 be renewed subject to the following license conditions:

1. The mill production per calendar year shall not exceed 850 MT (1,870,000 pounds) of barreled U_3O_8 .
2. Notwithstanding representations made in Section 4.3 of the renewal application the licensee shall not dispose of materials other than uranium mill tailings, spent resins, raffinate, vanadium waste residues, liquids or residues contained in the catchment basin described in Condition No. 27, or liquid sanitary wastes in the tailings pond, without the specific authorization of the Uranium Recovery Field Office, USNRC. If liquid sanitary wastes are discharged to the tailings pond, written authorization shall first be obtained from the Utah Bureau of Water Pollution Control. A copy of the written authorization shall be submitted to the Uranium Recovery Field Office prior to the discharge of the liquid sanitary wastes.

The licensee shall not discharge any liquids or solids to the tailings impoundment during nonoperational periods other than needed to perform routine or preventative maintenance, without prior written approval of the NRC.

3. Atlas shall implement a ground water detection monitoring program to ensure compliance to 40 CFR 192.32(a)(2) which includes the following elements:
 - A. Atlas shall monitor at the temporary point of compliance and background wells for the following indicator parameters: Arsenic, Selenium and pH. Atlas shall utilize analytical techniques capable of providing lower limits of detection of 0.005 mg/l and 0.001 mg/l for arsenic and selenium, respectively. Measurements of pH shall be reported to the nearest 1/10 standard unit.
 - B. The determination of compliance shall be based upon sampling Well MW-3.
 - C. The determination of background levels for the parameters specified in subsection (A) shall be defined by sampling Well ATP-3.
 - D. Atlas shall sample for those parameters specified in subsection (A) at those wells designated in subsections (B) and (C) on a monthly basis for a period of one (1) year and at least twice annually thereafter. All semiannual samples shall be taken at least four months apart.
 - E. Atlas shall, within 60 days of collection of the last of the twelve monthly samples, propose for USNRC review and approval background levels for indicator parameters and a statistical procedure for identifying significant changes (95% confidence level) between data from the wells specified in subsections (B) and (C).
 - F. Atlas shall report the data required by subsection (D) semiannually along with those data required by Condition No. 48 in accordance with the reporting format in the Attachment entitled, "Detection Monitoring Data Report."
 - G. Atlas shall report at least annually in accordance to reporting requirements specified in subsection (F) the rate and direction of ground-water flow under the tailings impoundment.
4. The licensee shall minimize dispersal of dust from the ore piles by water sprinkling or other dust suppression techniques, unless a documented weekly inspection indicates that the moisture content of the ore and/or weather conditions are controlling dusting.

5. The licensee shall maintain effluent control systems as specified in Section 3.3 of the licensee's renewal application with the following additions:
 - A. Operations shall be immediately suspended in the affected area of the mill if any of the emission control equipment for the yellowcake drying or packaging area is not operating within specifications for design performance.
 - B. The licensee shall, during all periods of yellowcake drying operations, assure that the scrubber is operating within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance. This shall be accomplished by either (1) performing and documenting checks of water flow and air pressure differential hourly during operation or (2) installing instrumentation which will signal an audible alarm if either water flow or air pressure differential fall below the manufacturer's recommended levels. If an audible alarm is used, its operation shall be checked and documented daily.
 - C. Air pressure differential gauges for emission control equipment other than the wet scrubber shall be read and the readings documented once per shift during operations.
 - D. Any changes in the effluent control systems, as described above, shall require approval by the USNRC, Uranium Recovery Field Office, in the form of a license amendment.
6. Reclamation phase modifications to Moab Wash shall be as specified in the "Pilot Channel" option of the licensee's submittal dated October 13, 1983 with the following modifications:
 - A. The pilot channel bottom shall be sloped at a 1% grade away from the tailings pile (i.e., to the north).
 - B. Excavation material shall be used to backfill the entire length of the existing Moab Wash channel, with the fill sloped away from the tailings pile. Any remaining excavation material shall be used to construct a berm on the south side of the pilot channel to increase channel capacity.

In addition, operational phase modifications to Moab Wash shall be maintained in accordance with the licensee's submittal dated October 26, 1982.

7. Mill tailings other than samples for research shall not be transferred from the site without specific prior approval of the USNRC, Uranium Recovery Field Office. The licensee shall maintain a permanent record of all transfers made under the provisions of this condition.
8. A. Construction of the tailings embankment to elevation 4076 feet shall be in accordance with Appendix B of the submittal "Report of Stability Analyses, 18-Foot Raise of Tailings Embankment to Elevation 4076 Feet, Moab, Utah, for Atlas Minerals" dated June 4, 1981, with the following exceptions:
 - 1) Quality control tests shall be performed at the frequencies specified below (ASTM Standard Methods):
 - a) Compaction Test, D-698 - At least five full tests prior to construction using a range of representative borrow soils followed by one-point tests at a frequency of at least one per 5,000 cubic yards of fill placed. The family of curves developed from the full compaction tests shall be used in evaluating one-point test data.
 - b) Gradation test, D-422 - At least one test per 5,000 cubic yards of fill placed.
 - c) Nuclear moisture and density tests D-3017 and D-2922, respectively - At least one test per 2,500 cubic yards of fill placed.
 - d) Conventional moisture and density tests D-2216 and D-1556, respectively - Calibration of the nuclear tests specified in (c) above shall be performed using the tests specified in this section prior to beginning construction and at least once per 50,000 cubic yards of fill placed thereafter.
 - e) Additional gradation testing shall be performed if the gradation of material appears to differ significantly from materials previously tested. If the gradation has changed significantly, a full compaction test shall be performed.

- 2) Embankment piezometers shall be read at a weekly frequency during construction and until readings have stabilized. Thereafter, piezometers shall be read on a monthly frequency.
 - 3) A report describing construction activities and containing the results of all quality control testing specified in (1) above shall be submitted to the USNRC, Uranium Recovery Field Office, within six months of completion of construction.
- B. The licensee shall maintain a minimum of six feet of freeboard and 150 feet of beach between the embankment crest and the ponded liquid.
- C. Drainage berms shall be installed over seepage areas on the embankment prior to construction of the lift. These berms shall be graded to protect against piping of the embankment material.
9. The licensee is authorized to dispose of by-product contaminated solid wastes generated at the Moab Mill in the sump collection pond as described in the licensee's submittal dated February 29, 1984.
 10. The licensee shall conduct and document at least one inspection of the tailings embankment per day and shall immediately notify the USNRC, Uranium Recovery Field Office, by telephone and telegraph, of any failure to the tailings dam or tailings discharge and solution return system which results in a release of radioactive material and/or of any unusual conditions which if not corrected could lead to such a failure. This requirement is in addition to the reporting requirements of 10 CFR 20.
 11. Except as authorized by Condition 40 below, the licensee shall not make any changes in the tailings retention system without specific prior approval of the USNRC, Uranium Recovery Field Office, in the form of an amendment to this license.
 12. The licensee shall reclaim the tailings disposal area in accordance with the May 29, 1981 submittal "Report, Conceptual Design and Cost Estimate, Tailings Pile Reclamation, Moab, Utah, for Atlas Minerals." In addition, the licensee shall by July 1, 1988, provide for USNRC, Uranium Recovery Field Office, review and approval in the form of a license amendment, the following information:

- A. An engineering design for the rock layer to be placed on pile out slopes. The rock layer shall be designed assuming unconcentrated sheet flow from a Probable Maximum Flood (PMF) event if the reclamation plan is modified to include placement of rock on the pile top or a concentration of sheet flow from a PMF if the pile top remains unrocked.
 - B. A design for riprap placement based on rock durability. The information shall include the results of additional laboratory testing (specific gravity, absorption, and sodium sulfate soundness tests) and a proposal for selective screening and placement of rock and/or oversizing of the rock for more frequently saturated areas to assure protection of the reclaimed pile for a 1000-year period, to the extent practicable.
 - C. An analysis of alternatives for modifying the existing plan to include slopes of 5H:1V or flatter for all out slopes which receive runoff from the pile top. The information submitted shall include an evaluation of costs for various pile configurations.
- 13. Atlas shall, in accordance with submittals dated February 25 and June 29, 1987, develop methods and procedures prior to reclamation, to ensure that:
 - A. The entire area of contaminated soil southeast of the tailings impoundment, consisting of approximately 6.6 acres with an estimated volume of 25,000 cubic yards, is placed in the tailings pond and otherwise ensure that the entire area is decontaminated consistent with 10 CFR Part 40, Appendix A, Criterion 6.
 - B. The entire area west of State Highway No. 279 identified as exceeding Ra-226 levels provided in 10 CFR Part 40, Appendix A, Criterion 6, shall be removed and placed in the tailings pond prior to final reclamation. By our letter dated February 25, 1987, background for the area west of State Highway No. 279 is 5.5 pCi/gm Ra-226.
 - C. Records of all surveys and soil analyses of the section southeast of the tailings impoundment and west of State Highway No. 279 shall be maintained until the USNRC authorizes their disposal.

14. The licensee shall maintain an NRC-approved financial surety arrangement, consistent with 10 CFR 40, Appendix A, Criteria 9 and 10, adequate to cover the estimated costs, if accomplished by a third party, for decommissioning and decontamination of the mill and mill site, for reclamation of any tailings or waste disposal areas, ground water restoration as warranted and the long-term surveillance fee. Within three (3) months of NRC approval of a revised reclamation/decommissioning plan, the licensee shall submit, for NRC review and approval, a proposed revision to the financial surety arrangement if estimated costs in the newly approved plan exceed the amount covered in the existing financial surety. The revised surety shall then be in effect within three (3) months of written NRC approval. Annual updates to the surety amount, required by 10 CFR 40, Appendix A, Criteria 9 and 10, shall be submitted to the NRC at least three (3) months prior to the anniversary of the effective date of the existing surety instrument. If the NRC has not approved a proposed revision to the surety coverage 30 days prior to the expiration date of the existing surety arrangement, the licensee shall extend the existing surety arrangement for one year.

Along with each proposed revision or annual update, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation, maintenance of a minimum 15 percent contingency fee, changes in engineering plans, activities performed and any other conditions affecting estimated costs for site closure. The licensee shall also provide the NRC with all surety related correspondence submitted to the State, a copy of the State's surety review and the final approved surety arrangement, if applicable. The licensee shall also ensure that the surety, where authorized to be held by the State, expressly identifies the NRC portion of the surety and covers the decommissioning and decontamination of the mill and mill site, reclamation of the tailings and waste disposal areas, soil and water sample analyses to confirm decontamination, ground water restoration as warranted and the transfer of the long-term surveillance fee to the U.S. General Treasury. The basis for the cost estimate is the NRC approved reclamation/decommissioning plan or NRC approved revisions to the plan. Attachment entitled, "Recommended Outline for Site Specific Reclamation and Stabilization Cost Estimates," outlines the minimum considerations used by the NRC in the review of site closure estimates. Reclamation/decommissioning plans and annual updates should follow this outline.

Atlas' currently approved surety instrument, Irrevocable Letter of Credit No. 119907, issued by the Bank of America, in favor of the NRC, shall be continuously maintained in an amount no less than \$6,000,000 for the purpose of complying with 10 CFR 40, Appendix A, Criteria 9 and 10, until a replacement is authorized by the NRC. For the purposes of the annual update of Atlas' cost estimate required by Criterion 9, October 31, 1987, is designated as the effective date of the existing surety arrangement.

15. Prior to termination of this license, the licensee shall provide for transfer of title to byproduct material and land, including any interests therein (other than land owned by the United States or the State of Utah), which is used for the disposal of such byproduct material or is essential to ensure the long term stability of such disposal site to the United States or the State of Utah, at the State's option.
16. The licensee shall implement an interim tailings stabilization program as specified in the March 16, 1987 submittal. In addition, this program shall include written procedures which are of sufficient detail to describe inspection methodologies, management notifications and implementation of corrective actions to assure compliance to Criterion 8 of 10 CFR 40, Appendix A. As a minimum the licensee shall perform at least weekly a documented inspection to assure the effectiveness of the control methods used. Corrective actions taken shall be documented in response to inspection findings. Corrective actions shall be completed within 30 days unless a longer period is approved in writing by the USNRC.
17. Before engaging in any activity not previously assessed by the NRC, the licensee shall prepare and record an environmental evaluation of such activity. When the evaluation indicates that such activity may result in a significant adverse environmental impact that was not assessed, or that is greater than that assessed in the Final Environmental Statement (NUREG-0453), the licensee shall provide a written evaluation of such activities and obtain prior approval of the USNRC, Uranium Recovery Field Office, for the activity.
18. Prior to disturbing any presently undisturbed soils for mill related activities (including borrow areas for tailings reclamation cover) in the future, the licensee shall have an archeological survey conducted of the site(s) to be disturbed. The Utah State Department of Development Services and the U.S.

Department of the Interior shall be contacted by the licensee prior to the survey to provide assistance or comment in planning such a survey. The completed survey shall be submitted to the USNRC, Uranium Recovery Field Office, for review and approval to proceed prior to any disturbance of presently undisturbed areas.

19. The results of sampling, analyses, surveys and monitoring; the results of calibration of equipment; reports on audits and inspections; all meetings and training courses required by this license; and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in USNRC regulations, all such documentation shall be maintained for a period of at least five (5) years.
20. The licensee shall conduct an annual survey of land use (grazing, residence, wells, etc.) in the area within two miles of the mill and submit a report of this survey annually to the USNRC, Uranium Recovery Field Office. This report shall indicate any differences in land use from that described in the licensee's previous annual land use report. The report shall be submitted by March 31 of each year.
21. The results of the effluent and environmental monitoring programs required by this license shall be reported in accordance with 10 CFR 40, Section 40.65 with copies of the report sent directly to the USNRC, Uranium Recovery Field Office. Data from the effluent and environmental monitoring program shall be reported in accordance with the format in the attachment to SUA-917 entitled, "Sample Format For Reporting Monitoring Data."
22. The licensee shall conduct an environmental and effluent monitoring program as specified in the renewal application in accordance with Table 5.5-8 during normal operations and Table 5.5-9 during periods of extended shutdown with the following modifications:
 - A. Air particulate samples shall be analyzed for U-nat, Ra-226, and Th-230, quarterly.
 - B. The analysis of quality control samples shall be in accordance with Section 6.3 of Regulatory Guide 4.15.
 - C. Lower limits of detection utilized for sample analysis shall be in accordance with Section 5 of Regulatory Guide 4.14.

- D. Soil and vegetation sampling shall be analyzed annually for Ra-226 and Pb-210.

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APPENDIX A

Tables and Figures

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Tables and Figures

Table 1 - Principal parameter values used in the radiological assessment of the Atlas Minerals Mill

Parameter	Value*
<u>General Data</u>	
Maximum ore grade, % U_3O_8	0.25
Average secular equilibrium ore activity of U-238 and daughters, pCi/gm	700
Ore processing rate, MT/yr	424,222
Annual operating time, days/year	354
Recovery rate of ore processing, %	94
Dust/bulk ore activity concentration ratio, Ore Storage and Handling	2.5
Loss of ore dust by truck dumping, lb/ton	0.04 ⁺
Loss of ore dust by ore pad handling machinery, lb/ton	0.02 ⁺
Ore dusting rate from ore stockpiles, MT/yr	22.3 ⁺
Loss of ore dust by ore load to grizzly and hopper, lb/ton	0.05 ⁺
Specific radon flux factor from ore storage, pCi/m ² -sec per pCi/gm Ra-226	1.0
Area of ore pad, km ²	0.04
Reduction factor due to spraying and wetting, %	30
<u>Crushing, Grinding, Screening</u>	
Uncontrolled particulate release from crushing, grinding and screening, MT/yr	0.08
Uncontrolled particulate release from wet crusher dust collector, MT/yr	0.14

See footnotes, last page of table

Table 1 (continued)

Parameter	Value*
Uncontrolled particulate release from north crusher dust collector, MT/yr	0.66
Sample tower dust collector, MT/yr	0.24
Uncontrolled particulate release from fine ore bins, MT/yr	0.37
Fraction of radon content in bulk ore released from crushing, grinding and screening, %	20
Fraction of radon content in bulk ore released from fine ore bin and other operations, %	20
<u>Yellowcake Drying and Packaging</u>	
Annual yellowcake production rate, MT/yr	835
Product purity, % U_3O_8	97
Annual U_3O_8 production rate, MT/yr	752
U_3O_8 production lost to atmosphere, MT/yr	0.518
Ratio of Ra-226 or Pb-210 to U-238 concentration in yellowcake stack effluent	0.005
Ratio of Th-230 to U-238 concentration in yellowcake stack effluent	0.001
Radon release rate from yellowcake stack	negligible
<u>Tailings Management Operations</u>	
Total tailings area, km^2	0.22
Dusting rate from exposed beach, gm/m^2	262.6
Specific radon flux from exposed beach, pCi/m^2 -sec per pCi/gm Ra-226	1.0

See footnotes, last page of table.

Table 1 (continued)

Parameter	Value*
Dust/tails activity concentration ratios	2.5
Activity in homogeneous solid tailings for:	
U-238 (pCi/gm)	42.0
Th-230	697.0
Ra-226	699.0
Pb-210	699.0
Dusting reduction factor due to water cover and wetting of exposed sands, %	50.0

Staging of tailings impoundment and individual stage areas are described in Figure 1. Further details on the tailings source terms are in Appendix B.

*These values were selected by the NRC staff for use in its radiological assessment of the Atlas facility. They represent conservative selections from ranges of potential values in instances where available data have been insufficient and/or not specific.

+Values based on recommendations in Colorado Department of Health Fugitive Emission Factors Worksheet (draft) of Air Pollution Control Division.

#The rationale for this figure is presented on page G-6 of the "Final Generic Environmental Impact Statement on Uranium Milling" (NUREG-0706).

Table 2 - Estimated annual airborne releases of radioactive materials from the Atlas Uranium Mill in the fifth year of operation*

Source Description	Estimated Releases (Curies/Year) ⁺				
	U-238	Th-230	Ra-226	Pb-210	Rn-222
Yellowcake stack	1.00E-1	3.00E-3	1.00E-3	1.00E-3	0.0
Ore Pad 1	4.90E-3	4.90E-3	4.90E-3	4.90E-3	3.78E+1
Ore Pad 2	1.08E-3	1.80E-3	1.80E-3	1.80E-3	1.38E+1
Ore Pad 3	4.40E-4	4.40E-4	4.40E-4	4.40E-4	3.50E+1
Grizzly	7.00E-5	7.00E-5	7.00E-5	7.00E-5	7.00E+1
Crusher W	1.23E-4	1.23E-4	1.23E-4	1.23E-4	7.00E+1
Crusher N	3.30E-4	3.30E-4	3.30E-4	3.30E-4	7.00E+1
Tower	2.13E-4	2.13E-4	2.13E-4	2.13E-4	7.00E+1
Fine Ore Bin	5.80E-4	5.80E-4	5.80E-4	5.80E-4	7.00E+1
Tailings Impoundment	2.00E-4	4.00E-3	4.00E-3	4.00E-3	5.00E+3

*Releases of all other radionuclides in the U-238 decay series are also included in the radiological impact analysis. These releases are assumed to be identical to those presented here for parent nuclides. For instance, the release rate of U-234 is taken to be identical to that for U-238. Release rates of Pb-210 and Po-210 are assumed equal to that given for Ra-226.

⁺Releases are estimated on the basis of parameters as displayed in Table 1.

#Releases from the tailings impoundment reflect the configuration as proposed for the fifth year of operations.

Table 3 - Annual dose commitments to individuals in the vicinity of the Atlas Uranium Mill

Location	Exposure Pathway	Annual Dose Commitment,* mrem/year			
		Whole Body	Bone	Lung	Bronchial Epithelium
1. Tex's Tour Center 0.8 km E	Inhalation ⁺	3.78E-01	8.10E+00	3.18E+01	1.01E+02
	External ground	3.29E-01	3.29E-01	3.29E-01	3.29E-01
	External Cloud	3.47E-01	3.47E-01	3.47E-01	3.47E-01
	Total	1.054	8.766	3.25E+01	1.02E+02
2. Arches Park 2.4 km NW	Inhalation ⁺	4.67E-2	7.89E-1	3.99E+0	7.08E-1
	External ground	3.92E-2	3.92E-2	3.92E-2	3.92E-2
	External cloud	4.21E-1	4.21E-1	4.21E-1	4.21E-1
	Total	0.507	1.45	4.45	71.26
3. Moab 2.7 km SE	Inhalation ⁺	1.86E-2	4.04E-1	1.52E+0	2.32E+1
	External ground	1.87E-2	1.87E-2	1.87E-2	1.87E-2
	External cloud	2.19E-1	2.19E-1	2.19E-1	2.19E-1
	Meat ingestion [§]	2.39E-3	3.12E-2	2.39E-3	2.39E-3
	Total	0.259	0.673	1.76	23.4
4. Academy 9.59 km ESE	Inhalation ⁺	2.79E-3	6.36E-2	2.05E-1	4.27E+0
	External ground	2.38E-3	2.38E-3	2.38E-3	
	External cloud	6.46E-2	6.46E-2	6.46E-2	
	Milk Ingestion [§]	4.45E-4	5.45E-2	4.45E-4	
	Total	0.070	0.136	0.272	4.27E+0

*Dose commitments are integrated over a 50-year period from one year of exposure. Occupancy is assumed to be 24 hours/day.

⁺Doses to the whole body, lungs, and bone are those resulting from the inhalation of particulates of U-238, U-234, Th-230, Ra-226, Pb-210 and Po-210. Doses to the bronchial epithelium are those resulting from the inhalation of radon daughters.

[§]Ingestion impacts result from the assumed consumption of meat from cattle grazed within within 5 km of the mill center.

Table 4 - Comparison of annual dose commitments to individuals with EPA radiation protection standards (40 CFR 190)*

Location	Exposure Pathway	Annual Dose Commitment, mrem/year		
		Body	Bone	Lung
EPA limits (40 CFR 190)		25.0	25.0	25.0
1. Tex's Tour Center 0.8 km E	Inhalation	3.78E-01	8.09E+00	3.18E+01
	External	4.24E-02	4.24E-02	4.24E-02
	Total	4.20E-01	8.13E+00	3.18E+01
	Fraction of limit	0.017	0.32	1.27 ⁺⁺
2. Arches Park 2.4 km NW	Inhalation	0.0464	0.979	3.99
	External	0.00486	0.00486	0.00486
	Total	0.051	0.984	4.00
	Fraction of limit	0.002	0.04	0.16
3. Moab 2.7 km SE	Inhalation	0.0183	0.394	1.52
	External	0.00194	0.00194	0.00194
	Meat ingestion ⁺	0.00233	0.00298	0.00233
	Total	0.226	0.426	1.52
	Fraction of limit	0.0009	0.017	0.061
4. Academy 9.59 km ESE	Inhalation	0.00238	0.0507	0.202
	External	0.000249	0.000249	0.000249
	Milk ingestion	0.000422	0.000488	0.000422
	Total	0.00305	0.0514	0.203
	Fraction of limit	0.00012	0.0021	0.008

*40 CFR Part 190 specifically excludes any dose commitments arising from the release of radon and its daughters.

⁺Meat ingestion impacts result from the assumed consumption of meat from cattle grazed within 5 km of the mill center.

⁺⁺Assumes 100% occupancy.

Table 5 - Annual 100-year environmental dose commitments to regional population within 80-km radius of the Atlas Uranium Mill

Exposure Pathway	Annual Environmental Dose Commitments (EDC), $\frac{\text{person-rem}^*}{\text{Year}}$			
	Whole Body	Bone	Lung	Bronchial Epithelium ⁺
Inhalation	2.762E-2	6.248E-1	2.061E+0	3.144E+1
External ground	1.534E-1	1.534E-1	1.534E-1	-
External cloud	4.415E-1	4.415E-1	4.415E-1	-
Vegetable ingestion	7.126E-2	1.309E+0	7.126E-2	-
Meat ingestion	3.575E-3	6.971E-2	3.575E-3	-
Milk ingestion	4.281E-3	5.875E-2	4.281E-3	-
TOTAL	7.017E-1	2.657E+0	2.735E+0	3.144E+1
Estimated population dose from natural background§	1683.7	2107.5	1695.2	6414
Ratio of total EDC to background population dose	0.0004	0.0013	0.0016	0.0049

*Doses to the whole body, lung, and bone are those resulting from the releases of particulates of U-238, U-234, Th-230, Ra-226, and Pb-210.

⁺Inhalation doses to the bronchial epithelium are those resulting from the inhalation of radon daughters.

§Background doses are based on the regional population size of 11,454 and natural background organ doses as follows:

Whole body - 147 mrem/yr
Bone - 184 mrem/yr

Lung - 148 mrem/yr
Bronchial epithelium - 560 mrem/yr

Source: G. L. Montet et al., "Description of United States Uranium Resource Areas, a Supplement to the Generic Environmental Impact Statement on Uranium Milling," Report NUREG/CR-0597, ANL/ES-75, prepared by Argonne National Laboratory for the U.S. Nuclear Regulatory Commission, June 1979. The staff assumes the population dose due to background is equivalent to the general background dose for the Wyoming Basin.

Table 6 - Total environmental dose commitments (EDC) over the renewal period for the Atlas Uranium Mill

	EDC to each organ, person-rem			
	Whole Body	Bone	Lung	Bronchial Epithelium
EDCs received by population within 80 km of mill	7.017E-1	2.657E+0	2.735E+0	3.144E+1
EDCs received by population beyond 80 km of mill	4.863E+1	6.531E+2	1.065E+1	2.980E+2
Total EDCs received by continental population*	1.889E+2	2.521E+3	5.536E+1	1.094E+3
Fraction of background#	2.00E-6	2.7E-5	5.5E-7	2.71E-6

*Total EDCs shown are the result of 5 years of operation.

#Background values estimated on the basis of year 1990.5, a continental population of 244 million persons, each person receiving 100 millirem/year to the whole body, bone, and lung and 500 millirem/year to the bronchial epithelium.

APPENDIX B

DETAILED RADIOLOGICAL ASSESSMENT

Appendix B

DETAILED RADIOLOGICAL ASSESSMENT

This assessment describes the models, data, and assumptions used by the staff to perform its radiological impact assessment of the Atlas Uranium Mill project. The primary calculational tool employed is MILDOS,¹ an NRC-modified version of the UDAD (Uranium Dispersion and Dosimetry) computer code originated at Argonne National Laboratory.²

B.1 ANNUAL RADIOACTIVE MATERIAL RELEASES

Table 3 lists estimated annual activity releases for the Atlas Uranium Mill. All data except for the annual average dusting rate for exposed tailings sands are based on the data and assumptions given in Table 2. This dusting rate is calculated in accordance with the following equation:

$$M = \frac{3.156 \times 10^7}{0.5} \sum_s R_s F_s, \quad (B-1)$$

where

F_s = annual average frequency of occurrence of wind speed group s , dimensionless;

R_s = dusting rate for tailings sands at the average wind speed for wind speed group s for particles ≤ 20 μ m diameter, $\text{g/m}^2 \cdot \text{s}$;

M = annual dust loss per unit area, $\text{g/m}^2 \cdot \text{year}$;

3.156×10^7 = number of seconds per year;

0.5 = fraction of total dust loss constituted by particles ≤ 20 μ m diameter, dimensionless.¹

The values of R_s and F_s used by the staff are as given in Table B.1.

The calculated value of the annual dusting rate, M , is $262.6 \text{ g/m}^2 \cdot \text{year}$. Annual curie releases from the tailings pile are then given by the following relationship:

$$S = MA(1 - f_c)f_t(C) (2.5 \times 10^{-12}), \quad (B-2)$$

where

A = assumed beach area of the pile, m^2 ;

f_c = fraction of dusting rate controlled by mitigating actions, dimensionless;

TABLE R.2

```

REGION=ATLAS
METSET=HANKSVILLE METDA
DATE= 85/01/16.
, PAGE NO. 2
CODE=MILDOS,REVO (7/79)
JOINT FREQUENCY IN PERCENT, DIRECTION INDICATES WH ERE WIND IS FROM
MPH * N NNE NE ENE E ESE SE SSE S SSW SW W WSW WNW NW NNW
TOTALS
.11916
.02100
.09631
.15758
.30542
.26824
.15758
.09631
.02100
.11916
TOTALS

```

[illegible]

Table B.3 - Physical Characteristics assumed for particulate material releases

Activity source	Diameter (um)	Density (g/cm ³)	Deposition Velocity (cm/s)	AMAD* (um)
Crusher dusts	1.0	2.4	1.0	1.55
Yellowcake dusts	1.0	8.9	1.0	2.98
Tailings, ore pile				
dusts 30%	5.0	2.4	1.0	7.75
70%	35.0	2.4	8.8	54.2
Ingrown radon daughters	0	1.0	0.3	0.3

*Aerodynamic equivalent diameter, used in calculating inhalation doses.

B.3 CONCENTRATION IN ENVIRONMENTAL MEDIA

Information provided below describes the methods and data used by the staff to determine the concentrations of radioactive materials in the environmental media of concern in the vicinity of the site. These include concentrations in the air (for inhalation and direct external exposure), on the ground (for direct external exposure), and in meat and vegetables (for ingestion exposure). Concentration values are computed explicitly by the MILDOS code of U-238, Th-230, Ra-226, Rn-222 (air only), and Pb-210. Concentrations of Th-234, Pa-234, and U-234 are assumed to equal that of U-238. Concentrations of Bi-210 and Po-210 are assumed to equal that of Pb-210.

B.3.1 Air concentrations

Ordinary, direct air concentrations are computed by the MILDOS code for each receptor location from each activity source by particle size (for particulates). Direct air concentrations computed by MILDOS include depletion by deposition (particulates) or the effects of ingrowth and decay in transit (radon and daughters). To compute inhalation doses, the total air concentration of each isotope at each location as a function of particle size, is computed as the sum of the direct air concentration and the resuspended air concentration

$$C_{aip}(t) = C_{aipd} + C_{aipr}(t), \quad (B-3)$$

where

$C_{aip}(t)$ = total air concentration of isotope i, particle size p, at time t, pCi/m³;

C_{aipd} = direct air concentration of isotope i, particle size p, for the time constant, pCi/m³;

— $C_{aipr}(t)$ = resuspended air concentration of isotope i , particle size p , at time t , pCi/m³.

The resuspended air concentration is computed using a time-dependent resuspension factor, $R_p(t)$, defined by

$$\begin{aligned} R_p(t) &= (1/V_p) 10^{-5} e^{-\lambda R t} && \text{for } t \leq 1.82 \text{ years} \\ &= (1/V_p) 10^{-9} && \text{for } t > 1.83 \text{ year,} \end{aligned} \quad (8-4)$$

where

$R_p(t)$ = ratio of the resuspended air concentration to the ground concentration, for a ground concentration of age t years, of particle size p , m⁻¹;

V_p = deposition velocity of particle size p , cm/s;

R = assumed decay constant of the resuspension factor (equivalent to a 50-d half-life), 5.06 years;

10^{-5} = initial value of the resuspension factor (for particles with a deposition velocity of 1 cm/s), m⁻¹;

10^{-9} = terminal value of the resuspension factor (for particles with a deposition velocity of 1 cm/s), m⁻¹;

1.82 = time required to reach the terminal resuspension factor, years.

The basic formulation of the above expression for the resuspension factor, the initial and final values, and the assigned decay constant derive from experimental observations.⁴ The inverse relationship to deposition velocity eliminates mass balance problems involving resuspension of more than 100% of the initial ground deposition for the 35- μ m particle size (see Table B.3.). Based on this formulation, the resuspended air concentration is given by

$$\begin{aligned} C_{aipr}(t) &= 0.01 C_{aipd} \times 10^{-5} \frac{1 - \exp[-(\lambda_i^* + \lambda_R)(t - a)]}{(\lambda_i^* + \lambda_R)} \\ &+ 10^{-9} \delta(t) \frac{\exp[-\lambda_i^*(t - a)] - \exp(-\lambda_i^* t)}{\lambda_i^*} (3.156 \times 10^7), \end{aligned} \quad (8-5)$$

where

$a = (t - 1.82)$ if $t \leq 1.82$, years;

$\delta(t) = 0$ if $t \leq 1.82$ and is unity otherwise, dimensionless;

λ_i^* = effective decay constant for isotope i on soil, year⁻¹;

0.01 = deposition velocity for the particle size for which the initial resuspension factor value is 10^{-5} per meter, m/s;

$$3.156 \times 10^7 = \text{s/year.}$$

Total air concentrations are computed using Eqs. B-3 and B-5 for all particulate effluents. Radon daughters that grow in from released radon are not depleted because of deposition losses and are therefore not assumed to resuspend.

B.3.2 Ground concentrations

Radionuclide ground concentrations are computed from the calculated airborne particulate concentrations arising directly from onsite sources (not including air concentrations resulting from resuspension). Resuspended particulate concentrations are not considered for evaluating ground concentrations. The direct deposition rate of radionuclide i is calculated using the following relationship:

$$D_{di} = \sum_p C_{adip} V_p, \quad (\text{B-6})$$

where

C_{adip} = direct air concentration of radionuclide i , particle size p , pCi/m³;

D_{di} = resulting direct deposition rate of radionuclide i , pCi/m².s;

V_p = deposition velocity of particle size p , m/s (see ref. 4).

The concentration of radionuclide i on a ground surface resulting from constant deposition at the rate D_{di} over time interval t is obtained from

$$C_{gi}(t) = D_{di} \frac{1 - \exp(-\lambda_i + \lambda_e)t}{\lambda_i + \lambda_e}, \quad (\text{B-7})$$

where

$C_{gi}(t)$ = ground surface concentration of radionuclide i at time t , pCi/m²;

t = time interval over which deposition has occurred, s;

λ_e = assumed rate constant for environmental loss, s⁻¹;

λ_i = radioactive decay constant⁵ for radionuclide i , s⁻¹.

The environmental loss constant λ_e corresponds to an assumed half-time for loss of environmental availability of 50 years.⁴ This parameter accounts for downward migration in soil and loss of availability caused by chemical binding. It is assumed to apply to all radionuclides deposited on the ground.

Ground concentrations are explicitly computed only for U-238, Th-230, Ra-226, and Pb-210. For all other radionuclides, the ground

concentration is assumed equal to that of the first parent radionuclide for which the ground concentration is explicitly calculated. For lead-210, ingrowth from deposited radium-226 can be significant. The concentration of lead-210 on the ground caused by radium-226 deposition is calculated by the staff using the standard Bateman formulation and assuming that radium-226 decays directly to lead-210. If $i = 6$ for radium-226 and $i = 12$ for lead-210 (ref. 1), the following equation is obtained:

$$C_{g12}(Pb \leftarrow Ra) = \frac{\lambda_{12}^0 D_6}{\lambda_6^*} \frac{1 - \exp(-\lambda_{12}^* t)}{\lambda_{12}^*} + \frac{\exp(-\lambda_6^* t) - \exp(-\lambda_{12}^* t)}{\lambda_6^* - \lambda_{12}^*}, \quad (B-8)$$

where

$C_{g12}(Pb \leftarrow Ra)$ = incremental lead-210 ground concentration resulting from radium-226 deposition, pCi/m²;

λ_n^* = effective rate constant for loss by radioactive decay and migration of a ground-deposited radionuclide and
 $= \lambda_n + \lambda_e$, s⁻¹.

B.3.3 Vegetation concentrations

Vegetation concentrations are derived from ground concentrations and total deposition rates. Total deposition rates are given by the following summation:

$$D_i = \sum_p C_{aip} V_p, \quad (B-9)$$

where D_i is the total deposition rate, including deposition of resuspended activity, of radionuclide i , pCi/m²·s.

Concentrations of released particulate materials can be environmentally transferred to the edible portions of vegetables or to hay or pasture grass consumed by animals by two mechanisms: direct foliar retention and root uptake. Five categories of vegetation are treated by the staff: edible above ground vegetables, potatoes, other edible below ground vegetables, pasture grass, and hay. Vegetation concentrations are computed using the following equation:

$$C_{vi} = D_i E_r E_v \frac{1 - \exp(-\lambda_w t_v)}{\gamma_v \lambda_w} + C_{gi}(B_{vi}/P), \quad (B-10)$$

where

B_{vi} = soil-to-plant transfer factor for isotope i , vegetation type v , dimensionless;

C_{vi} = resulting concentration of isotope i , in vegetation v , pCi/kg;

E_v = fraction of foliar deposition reaching edible portions of vegetation v , dimensionless;

E_r = fraction of total deposition retained on plant surfaces, 0.2, dimensionless;

P = assumed areal soil density for surface mixing, 240 kg/m²;

t_v = assumed duration of exposure while growing for vegetation v , s;

Y_v = assumed yield density of vegetation v , kg/m²;

λ_w = decay constant accounting for weathering losses (equivalent to a 14-d half-life), 5.73×10^{-7} per second.

The value of E_v is assumed to be 1.0 for all above ground vegetation and 0.1 for all below ground vegetables.⁶ The value of t_v is taken to be 60 d, except for pasture grass, where a value of 30 d is assumed. The yield density, Y_v , is taken to be 2.0 kg/m², except for pasture grass, where a value of 0.75 kg/m² is applied. Values of the soil to plant transfer coefficients, B_{vi} , are provided in Table B-4.

B.3.4 Meat and milk concentrations

Radioactive materials can be deposited on grasses, hay, or silage, which are eaten by meat animals, which are, in turn, eaten by man. It has been assumed that meat animals obtain 50% of their feed requirements by open grazing and by eating non-locally grown stored feed for the remaining portion of their feed requirement. The equation used to estimate meat concentrations is

$$C_{bi} = QF_{bi}(0.50C_{pgi} + 0.50C_{hi}), \quad (B-11)$$

where

C_{pgi} = concentration of isotope i in pasture grass, pCi/kg;

C_{hi} = concentration of isotope i in hay (or other stored feed), pCi/kg;

C_{bi} = resulting concentration of isotope i in meat, pCi/kg;

F_{bi} = feed-to-meat transfer for isotope i , pCi/kg per pCi/d (see Table A.4);

Q = assumed feed ingestion rate, 50 kg/d;

0.50 = fraction of total annual feed requirement assumed to be satisfied by pasture grass;

0.50 = fraction of total annual feed requirement assumed to be satisfied by locally grown stored feed (hay).

Inhalation doses have been computed using air concentrations obtained by Eq. A-3 (resuspended air concentrations are included) for particulate materials and the dose conversion factors presented in Table B.5.

Dose to the bronchial epithelium from radon-222 and short-lived daughters were computed based on the assumption of indoor exposure at 100% occupancy. The dose conversion factor for bronchial epithelium exposure from radon-222 derives as follows:

1. $1 \text{ pCi/m}^3 \text{ radon-222} = 5 \times 10^{-6} \text{ working levels (WL).}^*$
2. Continuous exposure to 1 WL = 25 cumulative working level months (WLM) per year.
3. $1 \text{ WLM} = 5,000 \text{ mrem.}$

Therefore,

$$(1 \text{ pCi/m}^3 \text{ radon-222}) \times 5 \times 10^{-6} \frac{\text{WL}}{\text{pCi/m}^3} \times 25 \frac{\text{WLM}}{\text{WL}} \times 5000 \frac{\text{mrem}}{\text{WLM}} =$$
$$0.625 \text{ mrem,}$$

and the radon-222 bronchial epithelium dose conversion factor is taken to be 0.625 millirem per year per pCi/m^3 .

*One WL concentration is defined as any combination of short-lived radioactive decay products of radon-222 in 1 L of air that will release $1.3 \times 10^5 \text{ MeV}$ of alpha particle energy during radioactive decay to lead-210.

Table B.5 - Inhalation dose conversion factors. Values are given in millirem per year per pCi/m³

Organ	U-238	U-234	U-230	Ra-226	Pb-210	Po-210
<u>Particle size = 0.3 μm</u>						
Whole body					7.46E+0*	1.29E+0
Bone					2.32E+2	5.24E+0
Kidney					1.93E+2	3.87E+1
Liver					5.91E+1	1.15E+1
Mass average lung					6.27E+1	2.66E+2
<u>Particle size = 1.0 μm, density = 8.9 g/cm³</u>						
Whole body	9.82E+0	1.12E+1	1.37E+2	3.58E+1	4.66E+0	5.95E+1
Bone	1.66E+2	1.81E+2	4.90E+3	3.58E+2	1.45E+2	2.43E+0
Kidney	3/78E+1	4.30E+1	1.37E+3	1.26E+0	1.21E+2	1.78E+1
Liver	0.	0.	3.83E+2	4.47E-2	3.69E-1	5.34E+0
Mass average lung	1.07E-3	1.21E+3	2.37E+3	4.88E+3	5.69E+2	3.13E+2
<u>Particle size = 1.0 μm, density = 2.4 g/cm³</u>						
Whole body	4.32E+0	4.92E+0	1.66E+2	3.09E+1	4.36E+0	4.71E-1
Bone	7.92E+1	7.95E+1	5.95E+3	3.09E+2	1.35E+2	1.92E+0
Kidney	1.66E+1	1.89E+1	1.67E+3	1.09E+0	1.13E+2	1.42E+1
Liver	0.	0.	3.43E+2	3.87E-2	3.45E+1	4.22E+0
Mass average lung	1.58E+2	1.80E+2	3.22E+3	6.61E+3	7.72E+3	4.20E+2
<u>Particle size = 5.0 μm</u>						
Whole body	1.16E+0	1.32E+0	1.01E+2	4.00E+1	4.84E+0	7.10E-1
Bone	1.96E+1	2.14E+1	3/60E+3	4.00E+2	1.50E+2	2.89E+0
Kidney	4.47E+0	5.10E+0	1.00E+3	1.41E+0	1.25E+2	2.13E+1
Liver	0.	0.	2.07E+2	4.97E-2	3.83E-1	6.36E+0
Mass average lung	1.24E+3	1.42E+3	1.38E+3	2.84E+3	3.30E+2	1.88E+2
<u>Particle size = 35.0 μm</u>						
Whole body	7.92E-1	9.02E-1	5.77E+1	3.90E+1	4.43E+0	7.28E-1
Bone	1.34E+1	1.46E+1	2.07E+3	3.90E+2	1.38E+2	2.96E+0
Kidney	3.05E+0	3.47E+0	5.73E+2	1.38E+0	1.15E+2	2.19E+1
Liver	0.	0.	1.19E+2	4.85E-2	3.51E+1	6.52E+0
Mass average lung	3.33E+2	3.80E+2	3.71E+2	7.64E+2	8.79E+1	5.75E+1

*Read as 7.46×10^0 , or 7.46.

Sources: M. Momeni et al., "Uranium Dispersion and Dosimetry (UDAD) Code," Report ANL/ES-72, NUREG/CR-0553, Argonne National Laboratory, Chicago, May 1979 and D. R. Kalkwarf, "Solubility Classification of Airborne Products from Uranium Ores and Tailings Piles," Report PNL-2830, NUREG/CR-0530, Pacific Northwest Laboratory, Richland, Wash., January 1979.

B.4.2 External doses

External doses from air and ground concentrations are computed using the dose conversion factors provided in Table B.6.¹ Doses are computed based on 100% occupancy at the particular location. Indoor exposure is assumed to occur 14 h/d at a dose rate of 70% of the outdoor dose rate.

B.4.3 Ingestion doses

Ingestion doses are computed for vegetables and meat (beef and lamb) on the basis of concentrations obtained using Eqs. B-9 through B-12, ingestion rates given in Table B.7, and dose conversion factors given in Table B.8.^{1,4} Vegetable ingestion doses were computed assuming an average 50% activity reduction caused by food preparation.⁴ Ingestion doses to children and teenagers were computed but were found to be equal to or less than doses to adults.

Table B.6 - Dose conversion factors for external exposure

Isotope	Skin	Whole body
<u>For air concentration doses,</u> millirem per year per pCi/m ³		
U-238	1.05E-5*	1.57E-6
Th-234	6.63E-5	5.24E-5
Pa(m)-234	8.57E-5	6.64E-5
U-234	1.36E-5	2.49E-6
Th-230	1.29E-9	3.59E-6
Ra-226	6.00E-5	4.90E-5
Rn-222	3.46E-0	2.83E-6
Po-218	8.18E-7	6.34E-7
Pb-214	2.06E-3	1.67E-3
Bi-214	1.36E-2	1.16E-2
Po-214	9.8E-7	7.66E-7
Pb-210	4.17E-5	1.43E-3
<u>For ground concentration doses,</u> millirem per year per pCi/m ²		
U-238	2.13E-6	3.17E-7
Th-234	2.10E-6	1.66E-6
Pa(m)-234	1.60E-6	1.24E-6
U-234	2.60E-6	4.78E-7
Th-230	2.20E-6	6.12E-7
Ra-226	1.16E-6	9.47E-7
Rn-222	6.15E-8	5.03E-8
Po-218	1.42E-8	1.10E-8
Pb-214	3.89E-5	3.16E-5
Bi-214	2.18E-4	1.85E-4
Po-214	1.72E-8	1.33E-8
Pb-210	6.65E-6	2.27E-6

*Read as 1.05×10^{-5} , or .0000105.

Source: U.S. Nuclear Regulatory Commission, "Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations," Report Task RH 802-4, Washington, D.C., May 1979.

Table B.8 - Ingestion dose conversion factors, values are in millirem/pCi ingested

Age Group Organ		Isotope							
		U-238	U-234	Th-234	Th-230	Ra-226	Pb-210	Bi-210	Po-210
Infant	Whole body	3.33E-4*	3.80E-4	2.00E-8	1.06E-4	1.07E-2	2.38E-3	3.58E-7	7.41E-4
	Bone	4.47E-3	4.88E-3	6.92E-7	3.80E-3	9.44E-2	5.28E-2	4.16E-6	3.10E-3
	Liver	0.	0.	3.77E-8	1.90E-4	4.76E-5	1.42E-2	2.68E-5	5.93E-3
	Kidney	9.28E-4	1.06E-3	1.39E-7	9.12E-4	8.72E-4	4.33E-2	2.08E-4	1.26E-2
Child	Whole body	1.94E-4	2.21E-4	9.88E-9	9.91E-5	9.87E-3	2.09E-3	1.69E-7	3.67E-4
	Bone	3.27E-3	3.57E-3	3.42E-7	3.55E-3	8.76E-2	4.75E-2	1.97E-6	1.52E-3
	Liver	0.	0.	1.51E-8	1.78E-4	1.84E-5	1.22E-2	1.02E-5	2.43E-3
	Kidney	5.24E-4	5.98E-4	8.01E-8	8.67E-8	4.88E-4	3.67E-2	1.15E-4	7.56E-3
Teenager	Whole body	6.49E-5	7.39E-5	3.31E-9	6.00E-5	5.00E-3	7.01E-4	5.66E-8	1.23E-4
	Bone	1.09E-3	1.19E-3	1.14E-7	2.16E-3	4.09E-2	1.81E-2	6.59E-7	5.09E-4
	Liver	0.	0.	6.69E-9	1.23E-4	8.13E-6	5.44E-3	4.51E-6	1.07E-3
	Kidney	2.50E-4	2.85E-4	3.81E-8	5.99E-4	2.32E-4	1.72E-2	5.48E-5	3.70E-3
Adult	Whole body	4.54E-5	5.17E-5	2.13E-9	5.70E-5	4.60E-3	5.44E-4	3.96E-8	8.59E-5
	Bone	7.67E-4	8.36E-4	8.01E-8	2.06E-3	4.60E-2	1.53E-2	4.61E-7	3.56E-4
	Liver	0.	0.	4.71E-9	1.17E-4	5.74E-6	4.37E-3	3.18E-6	7.56E-4
	Kidney	1.75E-4	1.99E-4	2.67E-8	5.65E-4	1.63E-4	1.23E-2	3.83E-5	2.52E-3

*Read as 3.33×10^{-4} or .000333.

Sources: U.S. Nuclear Regulatory Commission, "Calculational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations," Report Task RH 802-4, Washington, D.C., May 1979, and G. R. Hoenes and J. K. Soldat, "Age-Specific Radiation Dose Conversion Factors for a One-Year Chronic Intake," Report NUREG-0172, Battelle Pacific Northwest Laboratories, Richland, Washington, November 1977.

REFERENCES FOR APPENDIX B

1. U.S. Nuclear Regulatory Commission, "Computational Models for Estimating Radiation Doses to Man from Airborne Radioactive Materials Resulting from Uranium Milling Operations," Report Task RH 802-4, Washington, D.C., May 1979.
2. M. Momeni et al., "Uranium Dispersion and Dosimetry (UDAD) Code," Report ANL/ES-72, NUREG/CR-0553, Argonne National Laboratory, Chicago, May 1979.*
3. Atlas Minerals, License Renewal Application, May 31, 1984.
4. U.S. Nuclear Regulatory Commission, "Final Generic Environmental Impact Statement on Uranium Milling," Report NUREG-0706, Washington, D.C., September 1980.*
5. D. C. Kocher, "Nuclear Decay Data for Radionuclides Occurring in Routine Releases from Nuclear Fuel Cycle Facilities," Report ORNL/NUREG/TM-102, Oak Ridge National Laboratory, Oak Ridge, TN, August 1977.
6. J. F. Fletcher and W. L. Dotson, "HERMES - A Digital Computer Code for Estimating Regional Radiological Effects from the Nuclear Power Industry," Report HEDL-TME-71-168, Hanford Engineering Development Laboratory, Hanford, Wash., December 1971.
7. D. R. Kalkwarf, "Solubility Classification of Airborne Products from Uranium Ores and Tailings Piles," Report NUREG/CR-0530; PNL-2830, Pacific Northwest Laboratory, January 1979.*
8. National Academy of Sciences - National Research Council, "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation, Report on the Advisory Committee on Biological Effects of Ionizing Radiation," U.S. Government Printing Office, Washington, D.C., 1972.
9. G. R. Hoenes and J. K. Soldat, "Age-Specific Radiation Dose Conversion Factors for a One-Year Chronic Intake," Battelle Pacific Northwest Laboratories, U.S. Nuclear Regulatory Commission Report NUREG-0172, November 1977.**

*Available for purchase from the NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and the National Technical Information Service, Springfield, Virginia 22161.

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APPENDIX C

CALCULATION OF GAMMA RADIATION ATTENUATION FOR
RECLAIMED TAILINGS IMPOUNDMENT

APPENDIX C

CALCULATION OF GAMMA RADIATION ATTENUATION FOR RECLAIMED TAILINGS IMPOUNDMENT

Assuming soil to be composed mainly of SiO_2 , the mass attenuation coefficient for a 1 to 2 MeV gamma ray is $0.0518 \text{ cm}^2/\text{g}$.¹ (Most of the dose rate from a typical natural emitter is in this range.²) Assuming that the tailings Ra-226 activity is 699 pCi/g , as indicated in Table 1, and the conversion factor³ of $2.5 \text{ uR/hr per pCi/g Ra-226}$; then the estimated gamma radiation should not exceed 15.3 R/year . If the bulk density of the soil is assumed to be 1.6 g/cm^3 , then the effect of the proposed 3.05 m (10 ft) of soil material would reduce the gamma radiation to about $1.61 \times 10^{-10} \text{ R/year}$. The calculation is as follows:

$$I/I_0 = \exp[-(\mu_{\text{en}}/\rho)\rho x] = \exp[-(0.0518 \text{ cm}^2/\text{g})(1.6 \text{ g/cm}^3)(305 \text{ cm})] = 1.05 \times 10^{-11},$$

$$I = (1.05 \times 10^{-11})(15.3 \text{ R/year}) = 1.61 \times 10^{-10} \text{ R/year} = 1.61 \times 10^{-7} \text{ mR/year}$$

The area's background radiation dose from all sources of radioactivity, including the contribution from fallout, is about 147 mR/year .⁴ Thus, the gamma radiation from the deposited tailings after reclamation would be insignificant compared to the natural background radiation.

REFERENCES FOR APPENDIX C

1. U.S. Department of Health, Education, and Welfare, "Radiological Health Handbook," U.S. Government Printing Office, Washington, D.C., January 1970, p. 139.
2. H. May and L. D. Marinelli, "Cosmic Ray Contribution to the Background of Low Level Scintillation Spectrometry, The Natural Radiation Environment," J. A. S. Adams and W. M. Lowder, Eds., University of Chicago Press, Chicago, 1964.
3. Schiager, K. J., "Analysis of Radiation Exposures On or Near Uranium Mill Tailings Piles." Rad. Data and Reports 15:411-425. (1974)
4. G. L. Montet et al, "Descriptions of United States Uranium Resource Areas, a Supplement to the Generic Environmental Impact Statement on Uranium Milling," Report NUREG/CR-0597, Report ANL/ES-75, prepared by Argonne National Laboratory for the U.S. Nuclear Regulatory Commission, June 1979, pp. 16-1 and 16-2. Available for purchase from the NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and the National Information Service, Springfield, VA 22161.

APPENDIX D

CALCULATION OF THICKNESS OF REQUIRED COVER MATERIAL

Appendix D

CALCULATION OF THICKNESS OF REQUIRED COVER MATERIAL

D.1 INTRODUCTION

The thickness of cover material required for uranium mill tailings reclamation is usually determined by a radon flux or concentration criterion which must be satisfied. The general approach used in estimating the required thickness of a cover can be divided into two phases. First, the characteristic parameters of the tailings and cover must be measured or estimated. These include the radon diffusion coefficients, porosities and moistures of the tailings and cover, and the radium content and emanating power of the tailings. Second, the thickness of cover needed to achieve a prescribed radon flux is determined by iteratively calculating radon fluxes for various cover thicknesses until the thickness giving the prescribed flux is found. Alternatively, an approximate expression can be used to calculate the cover thickness directly.

In the following equations, the diffusion coefficient for radon in the total pore space of the soil is designated by the symbol D , consistent with recent reports on radon movement. A second parameter, the effective bulk diffusion coefficient of the soil, is often designated D_e , and has sometimes been confused with D due to varying symbols and nomenclature used in the literature. The two are related by $D = D_e/p$, where p is the total soil porosity.

2.1 RADON DIFFUSION EQUATION

The one-dimensional steady-state radon diffusion equation is:

$$D \frac{d^2C}{dx^2} - \lambda C + R\rho\lambda E/p = 0 \quad (1)$$

where

C = radon concentration in the total pore space (pCi cm^{-3})

D = diffusion coefficient for radon in the total pore space
(cm^2s^{-1})

λ = decay constant of radon ($2.1 \times 10^{-6} \text{ s}^{-1}$)

R = specific activity of radium in the soil (pCi g^{-1})

ρ = dry bulk density of the soil (g cm^{-3})

E = radon emanation coefficient (dimensionless)

p = total porosity of the soil (dimensionless)

The radon flux from the bulk soil material is related to the radon concentration in its pore space by Fick's Law:

$$J = -10^4 D_p \frac{dC}{dx} \quad (2)$$

where

J = bulk radon flux ($\text{pCi m}^{-2} \text{ s}^{-1}$)

10^4 = factor to convert units from $\text{pCi cm}^{-2} \text{ s}^{-1}$ to $\text{pCi m}^{-2} \text{ s}^{-1}$

Verification of Atlas' proposed tailings cover will be performed using the RAECOM computer program since the necessary iterative calculations are best performed by a computer.

— —

The licensee proposed to reclaim the Atlas Mineral's tailings impoundment using 10.0 feet of a local silty sand soil. Estimated input parameters are conservative although typical for the area since the licensee did not supply them directly.

The attached table lists the input parameters utilized for the RAECOM computer program. Results of the RAECOM computer run indicate that approximately 6.3 feet (192 cm) of cover will attenuate radon to 20 pCi/m²-sec. Therefore, the cover proposed by Atlas for the existing tailings impoundments should attenuate radon to less than 20 pCi/m²-sec in accordance with the 40 CFR 192 standard. Should the impoundment's size or constituents change from that described in the licensee's renewal application dated May 30, 1984, a new cover evaluation should be performed.

Table D.1

Parameters Used in URFO RAECOM Run
For Atlas Minerals Uranium Mill

	¹ Tailings	Silty Soil
Thickness (cm)	500 ²	305
Porosity ³ (fraction)	0.41	0.39
Diffusion Coefficient (cm ² /s)	0.029	0.012
Radon Source ⁴ Term (pCi/cm ³ /s)	0.000745	
Moisture ⁴ (%)	6.5	9.0

¹ Since the licensee will scatter sands and slimes, the tailings are considered to be a homogeneous mixture of sands and slimes.

² A maximum depth of tailings is assumed.

³ Conservative estimates.

⁴ From $Q = R p E \lambda / P$ where R = specific activity, p = bulk density, E = emanation fraction, $\lambda = 2.1E-6/s$ decay constant and P = porosity.

ATLAS MINERALS

***** INPUT PARAMETERS *****

NUMBER OF LAYERS : 2
 RADON FLUX INTO LAYER 1 : .000 pCi/m2/SEC
 SURFACE RADON CONCENTRATION : .000 pCi/LITER
 LAYER 2 ADJUSTED TO MEET JCRIT : 20.0 +/- .100E-02 pCi/m2/sec
 BARE SOURCE FLUX (JO) FROM LAYER 1 : 358.8 pCi/m2/sec

LAYER	THICKNESS (cm)	DIFF COEFF (cm2/sec)	POROSITY	SOURCE (pCi/cm3/sec)	MOISTURE (DRY WT. PERCENT)
1	500.	2.9000D-02	.4100	7.4500D-04	6.50
2	305.	1.2000D-02	.3900	.0000D+00	9.00

Pause.

Please press <return> to continue.

RESULTS OF RADON DIFFUSION CALCULATION

LAYER	THICKNESS (cm)	EXIT FLUX (pCi/m2/sec)	EXIT CONC. (pCi/liter)	MIC
1	500.	1.2701D+02	2.2919D+05	.3131
2	192.	1.9993D+01	.0000D+00	.7187

Stop - Program terminated.

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- 1 -

FEB 22 1989

URFO:VRS
 Docket No. 40-3453
 License No. SUA-917
 04003453431E

MEMORANDUM FOR: Docket File No. 40-3453

FROM: Van R. Scovill, Project Manager
 Licensing Branch 2
 Uranium Recovery Field Office, Region IV

SUBJECT: SAFETY EVALUATION REPORT FOR ATLAS MINERALS MOAB
 MESA URANIUM MILL

Attached is the Safety Evaluation Report prepared in support of the
 renewal of Source Material License SUA-917 for Atlas Minerals Moab
 Uranium Mill located in Grand County, Utah.

151
 Van R. Scovill, Project Manager
 Licensing Branch 2
 Uranium Recovery Field Office
 Region IV

Approved by:

151
 Harry J. Pettengill, Chief
 Licensing Branch 2
 Uranium Recovery Field Office
 Region IV

Attachment: Atlas Safety Evaluation Report bcc: John Darke
 Moab Public Library

Case Closed: 04003453431E

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8203240004 1P

SAFETY EVALUATION REPORT

FOR

ATLAS MINERALS

MOAB URANIUM MILL

LICENSE SUA-917

DOCKET NO. 40-3453

Dated: FEB 22 1988

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION.....	1
1.1 Description of the Proposed Action.....	1
1.2 Background Information.....	1
1.3 Review Scope.....	1
2.0 AUTHORIZED ACTIVITIES.....	2
2.1 Facility Description.....	2
2.2 Operations.....	6
3.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES....	6
3.1 Corporate and Facility Organization.....	6
3.2 Radiation Safety Staff and Responsibilities.....	6
3.3 Minimum Technical Qualifications for Radiation Safety Staff.....	11
3.4 Administrative and Operating Procedures.....	12
3.5 Inspections and Audits.....	13
3.5.1 Inspections and Monthly Audit.....	13
3.5.2 ALARA Policy and Audit.....	14
3.6 Radiation Safety Training.....	15
4.0 RADIATION SAFETY CONTROLS AND MONITORING.....	16
4.1 Ventilation and Effluent Controls.....	16
4.2 In-Plant Monitoring Data.....	17
4.3 External Radiation Control Program.....	18
4.3.1 Occupational Exposure.....	18
4.3.2 External Radiation Surveys.....	18
4.4 Internal Radiation Control Program... ..	18
4.4.1 Airborne Radioactivity Surveys.....	18
4.4.2 Internal Exposure to Radioactivity.....	19
4.4.3 Respiratory Protection Program.....	19
4.5 Bioassay.....	19

TABLE OF CONTENTS (Cont.)

	<u>Page</u>
4.6 Contamination Control.....	20
4.6.1 Personnel Contamination.....	20
4.6.2 Surface Contamination.....	21
4.6.3 Disposal of Contaminated Equipment.....	21
4.7 Quality Assurance and Calibration.....	22
5.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL.....	22
6.0 EMERGENCY PROCEDURES AND PREVENTIVE MEASURES.....	23
7.0 TAILINGS DAM EVALUATION.....	24
8.0 MILL SITE DECOMMISSIONING.....	26
9.0 COMPLIANCE INSPECTION HISTORY.....	27
10.0 CONCLUSION.....	39

1.0 INTRODUCTION

1.1 Description of the Proposed Action

By application dated May 31, 1984, Atlas Minerals (Atlas), a division of Atlas Corporation, requested renewal of Source Material License No. SUA-917 for their Moab Mill located near Moab, Utah. The request would authorize the processing of uranium ore to produce up to 850 metric tons (MT) of uranium concentrate (yellowcake) per calendar year. The proposed action is to grant a renewal of the subject license.

1.2 Background Information

Atlas has operated the Moab Mill since 1956. The mill has produced uranium oxide (U_3O_8), vanadium oxide and copper during the operating period. Today the mill is capable of producing 850 MT of U_3O_8 per year. Daily processing of ore containing 0.1 to 0.6 percent U_3O_8 can be up to 1200 MT. Copper is no longer produced and the copper circuit has been bypassed. Vanadium processing is a continuing part of the mill process. The mill has been in a long-term standby mode since April 1984. A proposed below ground tailings storage system had been submitted with the application for renewal (Section 5.5.10) but has since been withdrawn.

1.3 Review Scope

The safety review of Atlas' renewal application included evaluations of (1) the renewal application dated May 31, 1984, (2) supplements to the renewal application dated December 17, 1984, January 18 and June 5, 1985, December 4, 1986, and January 26, 1988 which also describes Atlas' corporate organizational structure, (3) compliance history for the Moab Mill, and (4) the following inplant monitoring data supplied by Atlas:

<u>Type</u>	<u>Years</u>
Airborne Uranium Concentrations	1981-1984
Radon Daughter Concentrations	1981-1984
TLD Penetrating Radiation Levels	1981-1984

Atlas' proposed programs were evaluated against NRC regulations as specified in 10 CFR Part 20 and NRC staff policy as documented in the following publications:

- (1) Regulatory Guide 3.11 - "Design, Construction and Inspection of Embankment Retention Systems for Uranium Mills."

- (2) Regulatory Guide 3.11.1 - "Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings."
- (3) Regulatory Guide 4.15 - "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."
- (4) Regulatory Guide 8.15 - "Acceptable Programs for Respiratory Protection."
- (5) Regulatory Guide 8.22 - "Bioassay at Uranium Mills."
- (6) Regulatory Guide 8.30 - "Health Physics Surveys in Uranium Mills."
- (7) Regulatory Guide 8.31 - "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills Will Be As Low As Is Reasonably Achievable."
- (8) Staff Technical Position WM-8201 - "Hydrologic Design Criteria for Tailings Retention Systems."

2.0 AUTHORIZED ACTIVITIES

The renewed license will authorize Atlas to continue to process uranium ore for the production of not more than 850 MT (1,874,250 pounds) per calendar year of yellowcake (U_3O_8).

2.1 Facility Description

Atlas' Moab uranium mill is located in Grand County approximately 2.5 highway miles northwest of Moab, Utah (Figures 1 and 2).

Major mill features include a 0.2 acre ore stockpile area, nine mill buildings and a small sample plant. The ore is initially processed in the crushing plant which contains 12- and 24-inch grizzly screens and a jaw crusher. Ore is crushed to minus 3/4-inch size and passes through the sample tower, ten fine ore storage bins, acid and alkaline leach circuits, solvent extraction circuits for uranium and vanadium, precipitation circuit, high temperature hearth dryer and packaging circuits. A reproduction of the plant layout submitted by the licensee is shown in Figure 3. There have not been any major changes to the mill circuit since the April 23, 1979 license renewal. The current tailings disposal system consists of approximately 130 acres of above ground impoundment. A final lift to the current tailings embankment to an elevation of 4076 feet has been approved by the USNRC, Uranium Recovery Field Office, as License Condition No. 18 of the current license. The license condition is to be included in the renewed license.

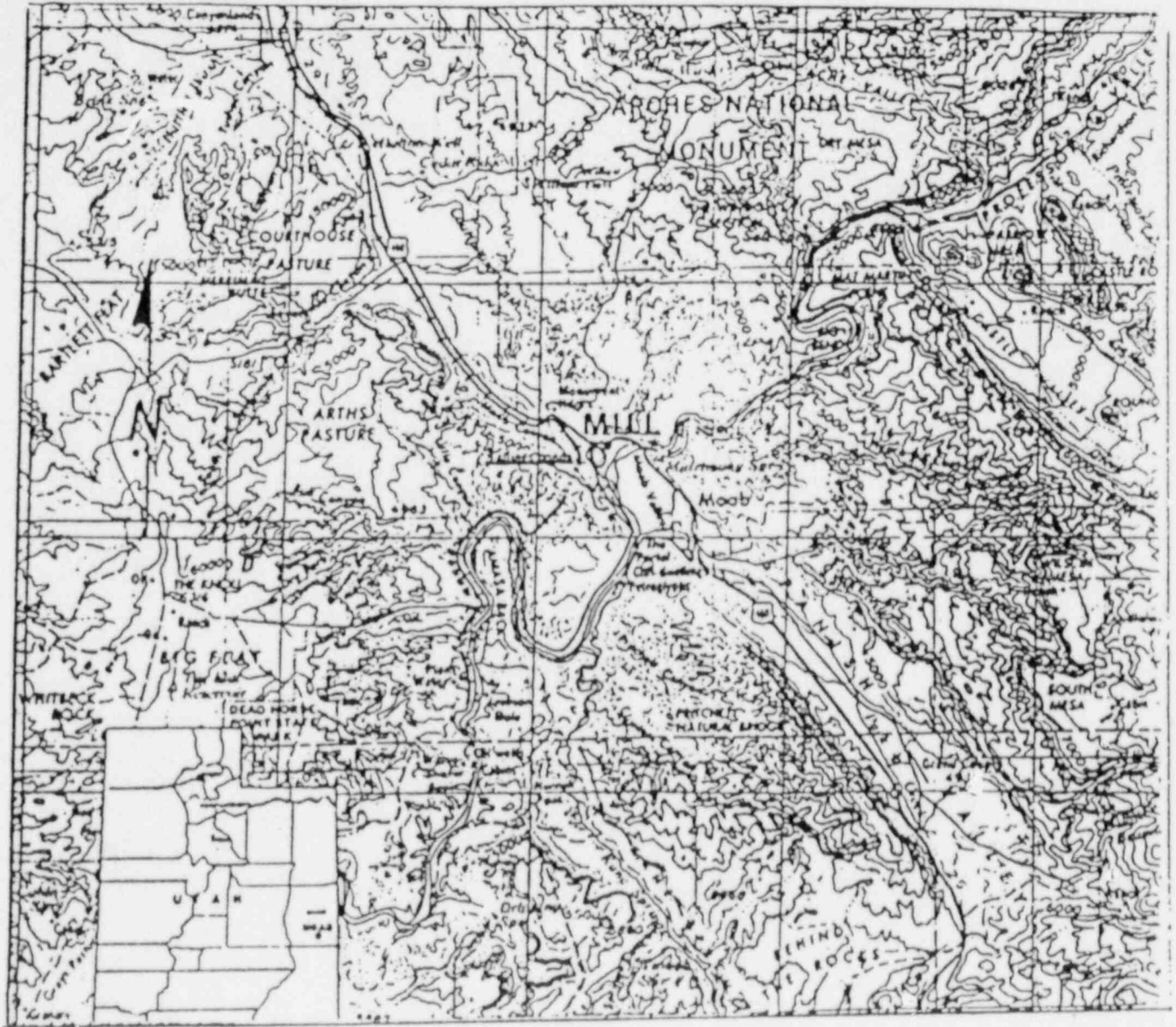


FIGURE 1
REGIONAL SITE LOCATION MAP

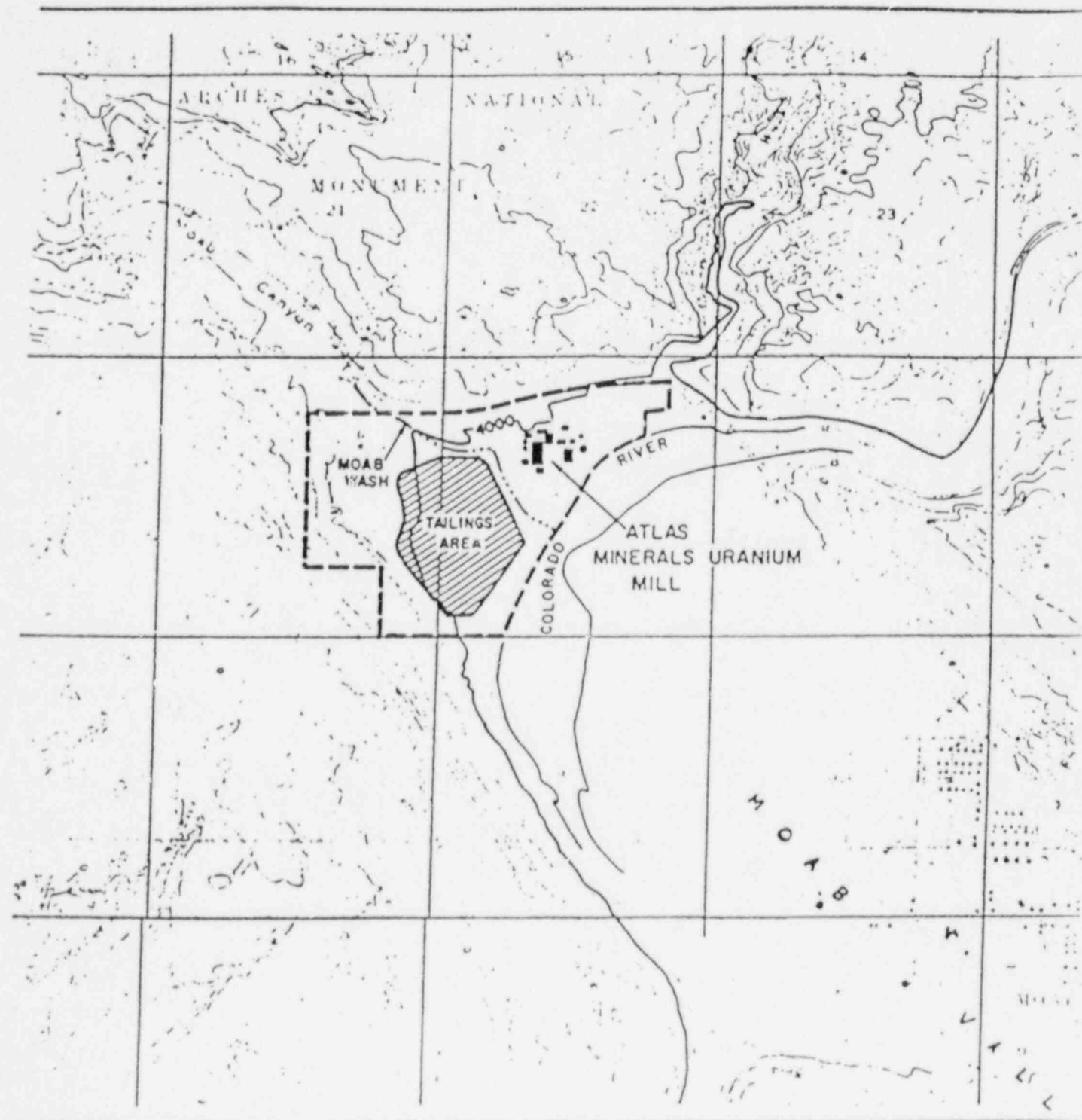


FIGURE 2
DETAILED SITE LOCATION MAP

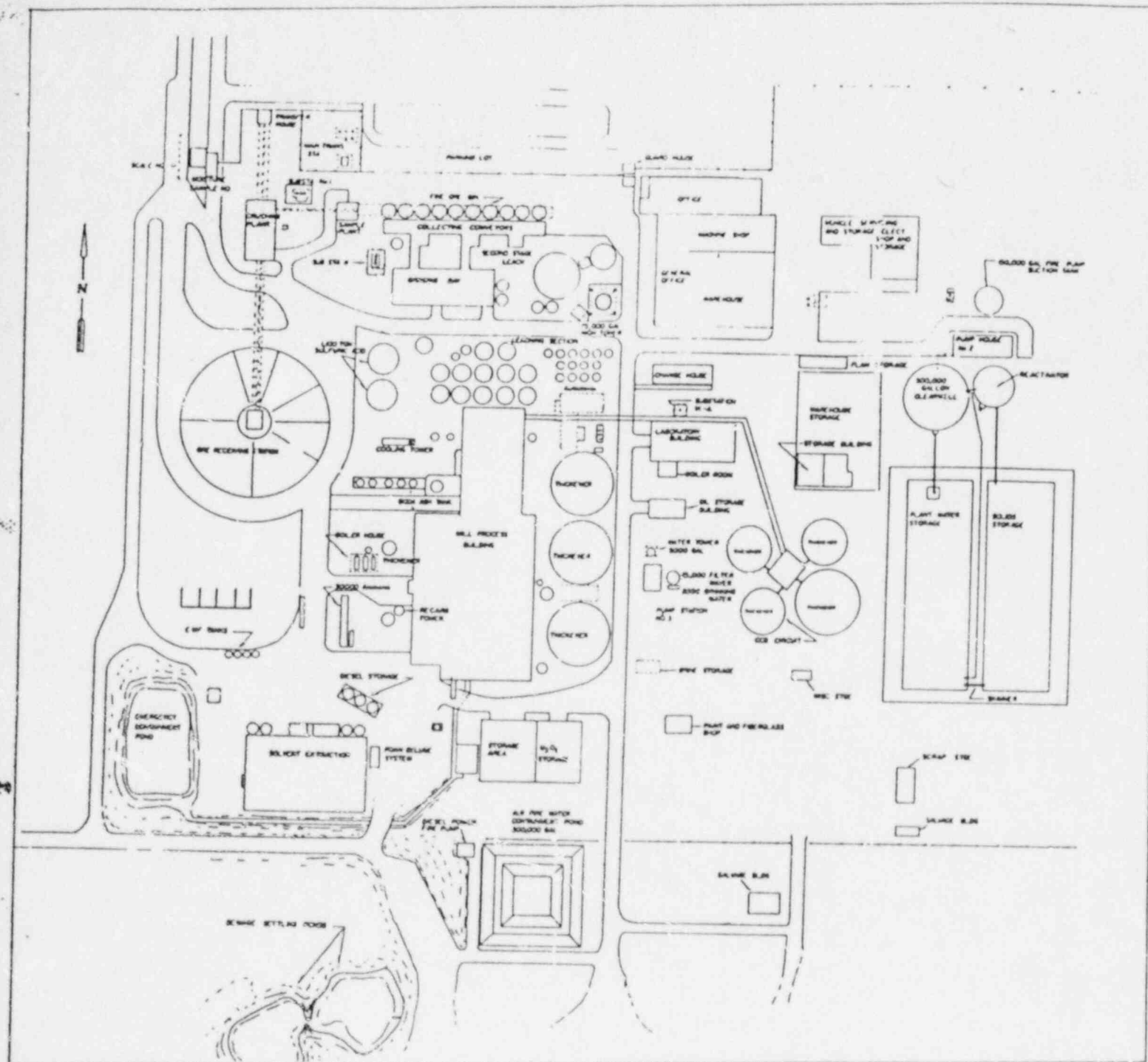


FIGURE 3
PLANT LAYOUT

2.2 Operations

The Atlas milling process is divided into six major steps: crushing, leaching (alkaline and/or acid), liquid solid separation, thickening, solvent extraction and precipitation, and drying and packaging. Figures 4, 5 and 6, taken from Atlas' renewal document, are flowcharts of the mill processes. These figures depict the crushing circuit, alkaline and acid circuit processes. The processes used at the mill are an acid and/or alkaline leach process that have a recovery rate of 96 percent of U_3O_8 . The licensee also operates an ion exchange facility at the Velvet Mine in accordance with the submittal dated November 1, 1983. The operation of the ion exchange unit was authorized by Amendment No. 13 of the previous license. This condition will be incorporated as a condition of the renewed license.

3.0 FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

3.1 Corporate and Facility Organization

Atlas Minerals is a Division of Atlas Corporation. Atlas' corporate headquarters are located at Princeton, New Jersey. Uranium operations are managed from offices located in Grand Junction, Colorado. Atlas' onsite official is the Moab Operations Manager, who reports directly to the Vice President of Finance, located in Grand Junction, Colorado. During standby/inactive periods, the organization remains essentially the same (Figure 7).

Atlas described the responsibility and authority of each management level. Brief descriptions of each member of the radiation safety staff are provided below.

3.2 Radiation Safety Staff and Responsibilities

The Regulatory Affairs Manager (RAM) is responsible for the development, review, approval, implementation, adherence and maintenance of the radiation protection, environmental protection, safety, licensing and "ALARA" programs. The RAM reports directly to the President, Minerals Division (Figure 7).

The Radiation Control Coordinator (RCC) reports to the RAM. Neither the RCC or the RAM have any production responsibilities. The RCC is directly responsible for supervising the radiation control technicians, and for conducting the day-to-day operations of the radiation control program, including the maintenance of required records. Both the RAM and RCC have the requirement and authority to suspend, postpone or modify any work activity that is unsafe or potentially a violation of USNRC regulations, — — license conditions or the ALARA program.

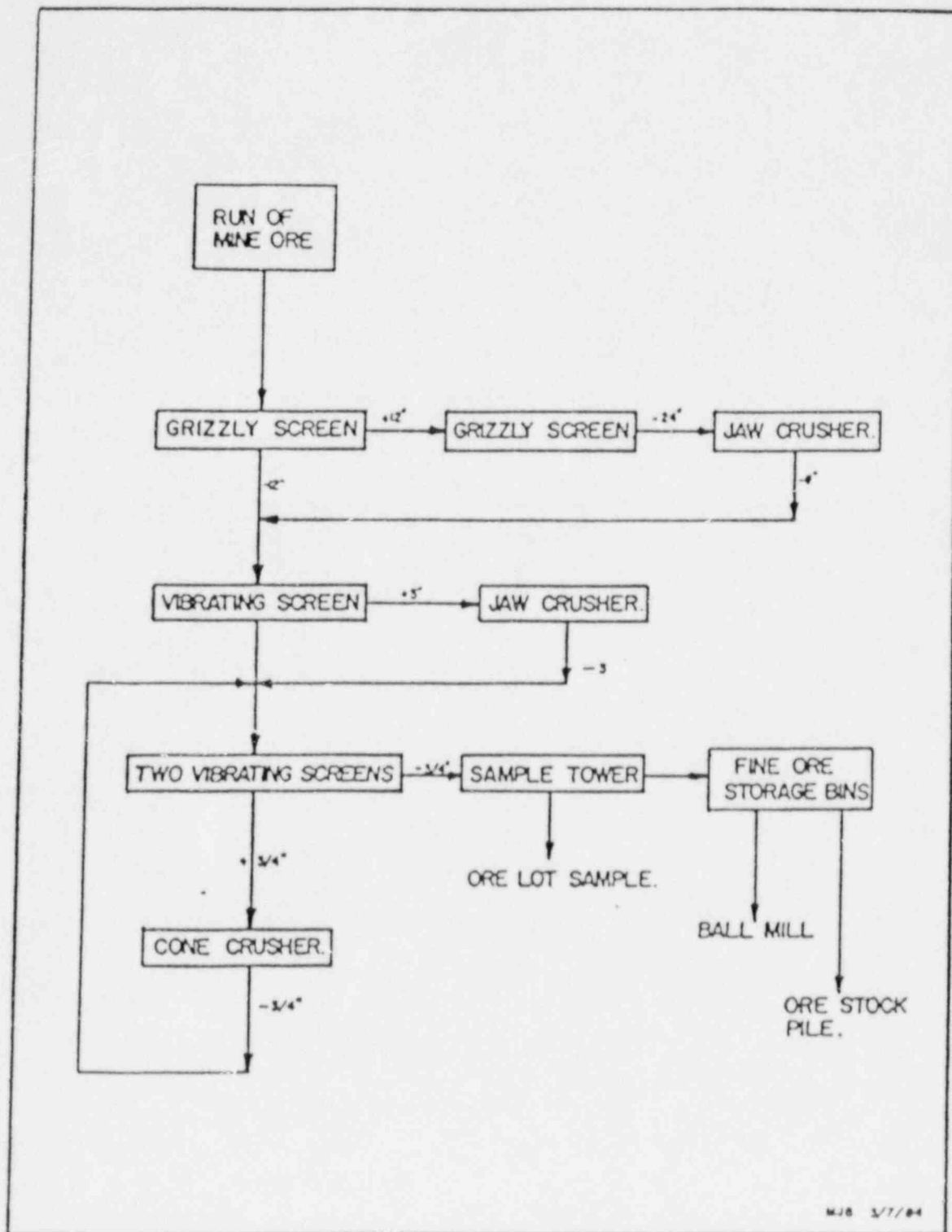
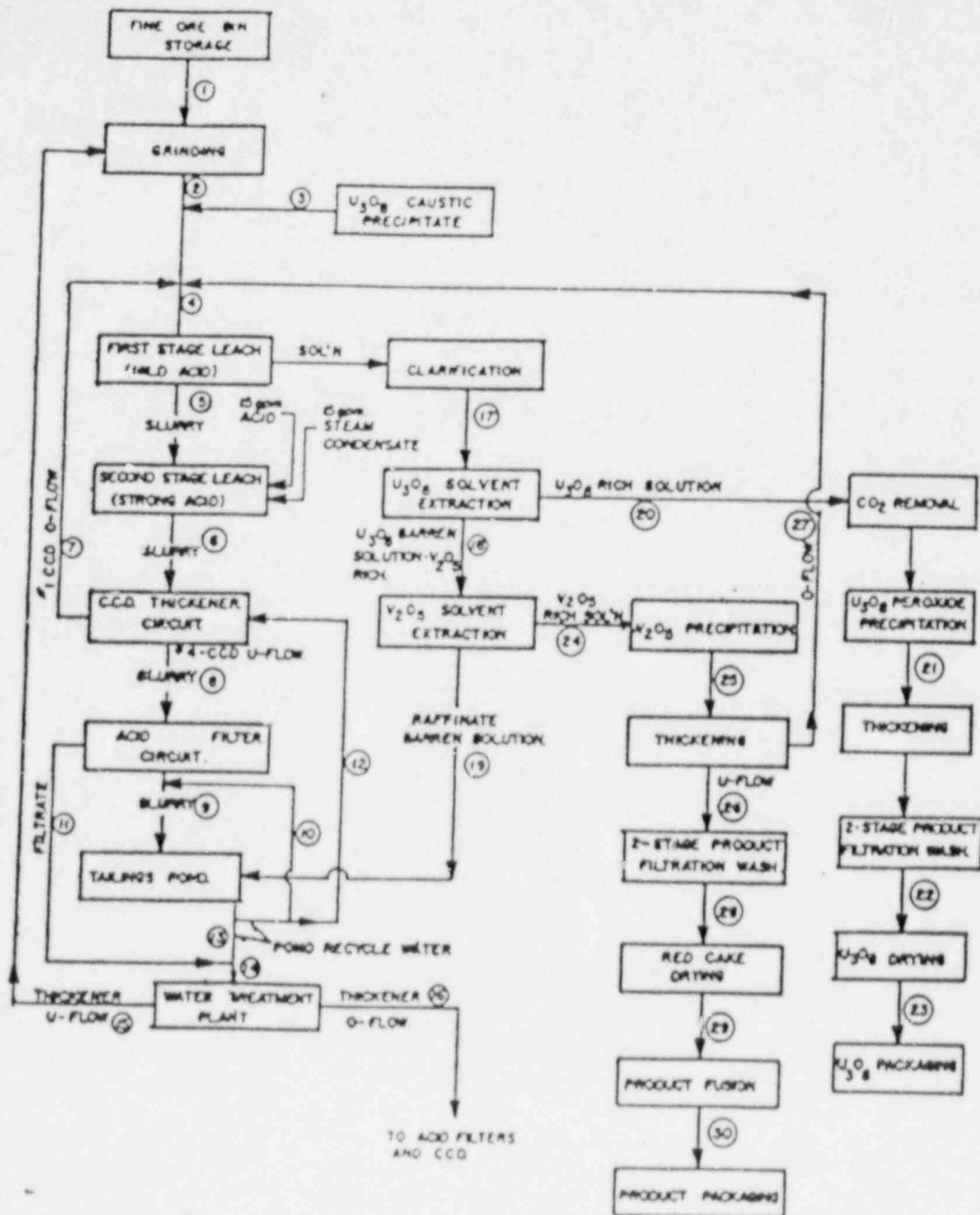


FIGURE 4
CRUSHING CIRCUIT FLOW SHEET





MJB.

3/7/84

FIGURE 6
ACID CIRCUIT PROCESS BLOCK DIAGRAM

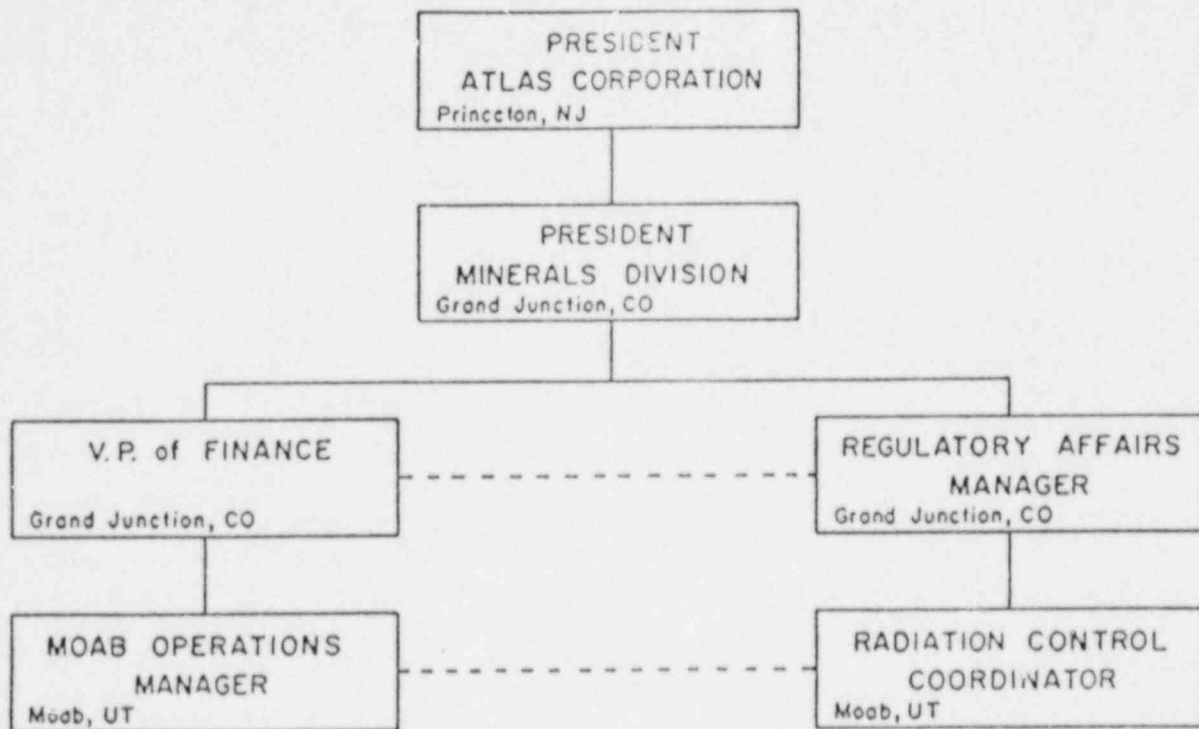


FIGURE 7
ATLAS ORGANIZATIONAL CHART

During active mill operations, the radiation safety staff consists of the RAM, RCC, and Radiation Technicians. When the mill is in a shutdown/standby condition, the onsite staff consists of the RCC and Radiation Technicians, and the RAM is located in the Grand Junction, Colorado office.

The staff finds the radiation safety organization is consistent with regulatory policy as specified in Regulatory Guide 8.31.

3.3 Minimum Technical Qualifications for the Radiation Safety Staff

The minimum qualifications for the radiation protection staff associated with uranium processing activities at the Moab Mill are as follows:

Regulatory Affairs Manager

The Regulatory Affairs Manager (RAM) position does not have a Minimum Technical Qualification Description listed in the license application. They do have a resume of the incumbent and a description of the duties. The staff will require by license condition that the RAM meet the minimum qualifications for an RSO recommended in Regulatory Guide 8.31.

Radiation Control Coordinator

The position does not have a Minimum Technical Qualification Description. Atlas requires that the Radiation Control Coordinator (RCC) possess the experience necessary to perform satisfactorily the duties of the position. The staff will require by license condition that the RCC meet the minimum qualifications recommended for an RSO in Regulatory Guide 8.31.

Radiation Technician

Atlas requires the incumbent to have a working knowledge of health physics instrumentation, survey procedures, sample collection and analysis. Radiation Technicians may have a high school diploma, three months of specialized radiological health training and two years of relevant applied radiation protection, a knowledge of health physics instrumentation, surveying and sampling operations.

The staff finds the above qualifications for radiation safety personnel, as modified by the staff, are consistent with the regulatory position specified in Regulatory Guide 8.31.

3.4 Administrative and Operating Procedures

The licensee has established and committed to conduct all onsite activities in accordance with standard written operating procedures for production and safety activities involved with processing of radioactive materials. Health physics, environmental monitoring, sampling, sample analysis and instrument calibration procedures have been established and documented. Written procedures are available to mill personnel for each specific function being performed.

Written procedures for production and nonproduction activities are reviewed and approved by the Regulatory Affairs Manager and the Radiation Control Coordinator prior to implementation. Existing operating and radiation safety procedures are reviewed every two years for the addition of new radiation safety requirements and to delete obsolete procedures. The staff concluded that the licensee's proposal to review radiation safety procedures every two years, does not meet the requirement for annual reviews, which is specified in Regulatory Guide 8.31.

Atlas has committed, in Section 5 of the renewal application, to utilize Radiation Work Permits, referred to by the licensee as a work order authorization form, for nonroutine activities which may produce airborne radioactive material. Appendix 5.3 discusses the procedure for issuance of a work order authorization form. All non-routine activities which might involve radioactive material must require a work order authorization form, the form is reviewed and signed by a superintendent or the radiation safety supervisor. The staff finds that the review of the work order authorization form conducted by the supervisor or the radiation safety supervisor lacks specificity in that it fails to adequately characterize the nature of the activity. A work order authorization form should describe the following:

1. The details of the job to be performed.
2. Any precautions necessary to reduce exposure to uranium and its daughters.
3. The radiological monitoring necessary before, during and after completing the job.

Also, the superintendent, and radiation safety supervisor must be given documented radiation safety training equivalent to meet the minimum qualifications recommended for an RSO in Regulatory Guide 8.31, in order to be eligible to review and sign work order authorization forms, when a potential for exposure to radioactive material exists. The staff recommends that as a condition of the renewed license, the licensee be required to conduct a documented review of all operating procedures at least annually to ensure that existing procedures do not violate any

newly established radiation protection practice; include on the work order authorization form the items discussed above; and to provide and document the radiation safety training discussed above to any individual authorized to review and sign order authorization forms.

3.5 Inspections and Audits

3.5.1 Inspections and Monthly Audits

The following radiation safety inspection program is proposed by Atlas. The Radiation Control Coordinator (RCC) or his designated Radiation Technician (RT) will visually survey all mill areas on a daily basis and document his observations on forms sent to the Moab Operations Manager (MOM). The radiation protection staff performs a documented weekly inspection of all work and storage areas. The RCC also performs a monthly audit of personnel exposure data, bioassay data and the radiation and environmental survey records and prepares a report to the RAM and MOM. The program is performed during periods of mill operations. The radiation safety staff conducts a formal survey semiannually to ensure that signs, labels and required notices to employees and copies of the licenses are properly posted. Fencelines and other radiation safety items are examined to assure that they have been properly maintained in accordance with license conditions and Title 10, Code of Federal Regulations.

The inspections and audits are consistent with the staff policy specified in Regulatory Guide 8.31.

During periods of extended shutdown lasting 30 days or more, the licensee is committed to operating under the "Non-Operational Mill Radiological Program" and the "Non-Operational - Environmental Monitoring Program". The differences between the two programs are that during non-operational periods there is a reduction in sampling and surveying within the mill complex. Examples include a reduction in the frequency for sampling for mill airborne particulates from weekly and monthly to only those periods of time when dust generating work is performed; and mill radon daughters monitoring, which is conducted weekly, monthly and quarterly, to be extended to quarterly in five areas of greatest activity. The operational and non-operational plans are consistent with staff policy as specified in Regulatory Guide 8.30 with one exception.

The staff recommends that as a condition of the license, the licensee be required to document the results of sampling, analyses, surveys and monitoring; the results of calibration of equipment; reports on audits and inspections; all meetings and training courses required by this license; and any subsequent reviews, investigations, and corrective actions. Unless otherwise specified in USNRC regulations, all such

documentation shall be maintained for a period of at least five (5) years.

3.5.2 ALARA Policy and Audit

Section 5.1.4 of the licensee's application states Atlas' ALARA policy and philosophy and commits to its implementation. Atlas further committed to specific responsibilities for ALARA implementation for mill management, the Regulatory Affairs Manager (RAM), Radiation Control Coordinator (RCC) and all mill workers in accordance with Regulatory Guide 8.31.

Atlas also committed to have the RCC and/or a health physics consultant perform a formal annual audit of the ALARA program and submit a written report of the audit results to the President of Atlas Minerals. The major findings of these inspections and audits are presented to the plant ALARA Committee, which is composed of the RAM (Chairman), MOM and RCC. The primary purpose of the audit is to evaluate the overall effectiveness of the mill ALARA program. The audit is to include a review of the following program areas:

1. Employee exposure and bioassay records and trend (if applicable).
2. Reports on overexposure of workers.
3. Mill surveys and summary reports.
4. Training program.
5. Radiological survey and sampling.
6. Radioactive effluent and environmental monitoring trends (if applicable).
7. New operating procedures.
8. Whether equipment for exposure control and effluent control is being properly used, maintained and inspected.
9. Recommendations on ways to further reduce personnel exposures and effluent releases of uranium and its daughters.
10. Reviews of Radiation Work Permits.

The ALARA Committee was formed for the purpose of minimizing worker exposure to ionizing radiation and heavy metal contamination. The

committee members exchange ideas and information regarding potential radiation hazards that may develop during the processing of uranium ores. The meetings also provide a forum for review of NRC license requirements. Meetings are scheduled as frequently as deemed necessary by the RAM, typically two to four times per year.

The staff concludes that the licensee's ALARA statement is consistent with the formal annual ALARA audit, and ALARA committee meetings are consistent with staff policy outlined in Regulatory Guide 8.31 and constitute an adequate ALARA audit program with one exception. The staff recommends that as a condition of the renewed license, a copy of the annual ALARA report be submitted to the Uranium Recovery Field Office within 30 days of completion of the audit report.

3.6 Radiation Safety Training

Atlas states that the purpose of in-house radiation safety training is to comply with 10 CFR 19.12 and Regulatory Guide 8.31. Radiation safety training is given to all new workers and retraining is conducted annually. The initial and supplementary training provide the employee a basic understanding of the radiation protection procedures. Training given to new employees covers mill and personnel safety as well as basic radiation concepts. Each employee is required to demonstrate his understanding of these concepts by means of a documented written examination. Similarly, the results of annual refresher training are also documented with a written examination. Supervisors, radiation safety staff and other worker categories are provided with additional training as necessary in support of their respective duties.

In addition, the licensee assured that radiation safety topics would be included during routine monthly safety meetings. Also, one monthly safety meeting each year would be dedicated to radiation safety. Complete details of all in-house training were submitted as Appendix 5.3 to the renewal application.

The licensee did not discuss training for visitors and contractors. Visitors and contractors to the site should be instructed in accordance with Regulatory Guide 8.31 prior to entering the restricted area or performing any onsite work.

The staff has determined that the radiation safety training program proposed by the applicant is consistent with the staff policy specified in Regulatory Guide 8.31 with one exception. The staff recommends that as a condition of the renewed license, the licensee shall provide instruction and training for all visitors and contractor personnel, in accordance with 10 CFR 19.12, prior to entering a restricted area of the — — mill.

4.0 RADIATION SAFETY CONTROLS AND MONITORING

4.1 Ventilation and Effluent Control

Adequate ventilation and exhaust systems are essential to maintaining exposures to airborne uranium and radon progeny ALARA. Table 4.1-1 of the renewal application lists the ventilation and exhaust systems in place at the Moab mill. A wet scrubber equipped with an automatic alarm system, controls the emissions from the product dryer or stack while a baghouse dust collector reduces stack emissions from the yellowcake packaging area. Data on throughput, emissions, stack height, exit diameter, flow rates and exhaust temperature for 1983 are also provided on Table 4.1-1 of the renewal application.

The staff recommends as a condition of the renewed license that the licensee be required to maintain the effluent control systems as specified in Section 3.3 of the licensee's renewal application with the following additions:

- A. Operations shall be immediately suspended in the affected area of the mill whenever any of the emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.
- B. The licensee shall, during all periods of yellowcake drying operations, assure that the scrubber is operating within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve design performance. This shall be accomplished by either (1) performing and documenting checks of water flow and air pressure differential gauges every hour during operation or (2) installing instrumentation which will signal an audible alarm if either water flow or air pressure differential fall below the manufacturer's recommended levels. If an audible alarm is used, its operation shall be checked and documented daily.
- C. Air pressure differential gauges for emission control equipment, other than the wet scrubber, shall be read and the readings documented once per shift, during operations.
- D. Any changes in the effluent control systems, as described above, shall require approval by the USNRC, Uranium Recovery Field Office, in the form of a license amendment.

The ball mill is equipped with two 48-inch powered ventilation fans on the East wall in the upper and lower sections, two 48-inch powered ventilation fans on the West wall in the middle and near the top, one

48-inch powered ventilation fan in the middle of the North wall, one 48-inch powered ventilation fan in the middle of the South wall and two 24-inch powered ventilation fans in the roof. The mill building is equipped with 48-inch powered ventilation fans situated in the following locations: three on the West side of the building, two on the East side, two near the acid filters close to the top on the North side, and two near the top on the South side, two in the precipitation area and two in the compressor room. The fans are in operation continuously to assure that there is a good flow of air with a sufficient replacement to maintain exposure levels ALARA.

The staff concludes that the ventilation and effluent control systems requirements as modified by the staff are adequate and consistent with staff policy contained in Regulatory Guide 8.31.

4.2 In-Plant Monitoring Data

The staff examined the in-plant monitoring results for 1981, 1982 and 1983, for the Moab mill since the mill shut down in early 1984.

A. Airborne Uranium

Routine collection and analysis of air particulate samples was performed at 19 locations during 1981, 1982 and 1983. The highest annual measured value was 256 percent of MPC, occurring in the grizzly pit in 1981, which is a designated airborne respirator area. The highest and average annual values for 1982 were 73 and 15 percent, respectively, of MPC, while the highest and average values for 1983 were 36 and 13 percent of MPC, respectively.

B. Radon Daughters

The same 19 locations were sampled for radon daughters in 1982 and 1983. In 1981, no radon daughter samples were collected. The highest annual exposures were 45 and 54 percent of MPC for 1982 and 1983, respectively. However, the annual average did not exceed 6 percent of the MPC during the monitoring period.

C. Exposure Data

During 1981-1983, personnel TLDs registered exposures from 0 to 1560 mrem/yr with the highest being 31 percent of MPE which occurred in 1981. Average exposures were all less than 5 percent of MPE.

Average annual mill gamma measurements performed in 34 areas with portable survey instruments were all less than 50 percent of MPE.

4.3 External Radiation Control Program

4.3.1 Occupational Exposure

In Section 5.5 of the renewal application, Atlas stated that all employees permanently assigned to work in restricted areas wear a TLD badge to provide primary monitoring of employee external radiation exposure. The TLD's are exchanged quarterly during the periods of operation and non-operation. The quarterly exchange is the preferred frequency in uranium mills and data on the exposures to personnel is statistically more reliable than monthly exchanges. The badges are maintained in a badge rack located in the Guard House when not in use. The control badge is also kept at the badge rack. The vendor of the badges reports all results in a timely manner. The staff concludes that the licensee's proposed external radiation monitoring program is consistent with staff policy contained in Regulatory Guide 8.30.

4.3.2 External Radiation Surveys

Atlas stated that surveys will be conducted with a survey instrument calibrated at six month intervals. Function checks of the instruments will be performed before each use and documented. Review of the licensee's external radiation survey program reveals that the choice of locations and measurements, as well as the survey evaluations, are in accordance with Regulatory Guide 8.30. The staff concludes that the external radiation survey program described in Atlas Minerals' application is consistent with staff recommendations outlined in Regulatory Guide 8.30.

4.4 Internal Radiation Control Program

4.4.1 Airborne Radioactivity Surveys

In Section 5.5.2 of the renewal application, Atlas proposed taking 7 weekly, 6 monthly and 6 quarterly air particulate samples at 19 locations during normal plant operations. Yellowcake areas are designated as a weekly sampling frequency. Passive radon monitoring devices are placed at the same locations. Sample frequency is based on the working level histories of each location. The lower limits of detection for uranium are 1×10^{-11} uCi/ml for general air and 5×10^{-12} uCi/ml for ore dust, while radon daughters in air is 0.03 working levels as stated in Regulatory Guide 8.30. Atlas uses the level of radon daughters, measured at 19 locations, to determine representative worker exposures to radon. Areas where average radionuclide levels

exceed 25 percent of the respective MPC values contained in Appendix B, Table 1, Column 1, 10 CFR Part 20, are classified as "Airborne Radioactivity Areas."

4.4.2 Internal Exposure to Radiation

Under Atlas' internal radiation dosimetry methodology, the hours worked by each mill worker in each area of the mill are recorded. This data is used with the most recent air sampling results to compile weekly exposures for each employee. The exposures determined from monitoring non-routine work activities are factored into the employee's exposure. The exposures calculated in this manner are then compared to the maximum permissible exposures as specified in 10 CFR 20.103. The staff finds that the internal radiation dosimetry methodology does not contain adequate detail with regard to the timeliness of sample analysis and exposure calculations.

The staff will therefore require that the licensee perform and document exposure determinations within one week of the regulatory compliance period as specified in 10 CFR 20.103(a)(2) and (b)(2). The staff will also require that the licensee analyze routine airborne samples in a timely manner and that non-routine samples be analyzed and the results reviewed by the RCC within two working days after sample collection.

The staff concludes that the proposed program for determining internal radiation exposure, as modified by the staff, is acceptable.

4.4.3 Respiratory Protection Program

The licensee has in place an approved respiratory protection program. Protection factors are taken into account when determining exposures. The renewal application provides procedures for the program such as training, fit testing, respirator use, respirator check-in after each use, cleaning, test for removable and non-removable contamination, inspection, storage and surveillance during use. The licensee has an atmosphere testing room for assuring proper fit. Medical exams are conducted annually with the physician stating whether an individual is capable of safely wearing a respirator. The tests for fit of a respirator are performed by the radiation safety staff.

On the basis of the above evaluation, the staff concludes that the respiratory protection program is in accordance with Regulatory Guide 8.15 and 10 CFR 20.103.

4.5 Bioassay

Section 5.5.4 of Atlas' renewal application describes the licensee's proposed bioassay program. The licensee has committed to follow the

program outlined in Regulatory Guide 8.22. Urine samples are collected every two weeks from personnel who work in the yellowcake area, except during non-operational periods when the frequency is to be extended to every 2 weeks when workers perform jobs involving soluble uranium. Samples are submitted within 48-96 hours after the most recent exposure. Each group of specimens are processed with two or more controls and spiked samples. Control samples are standards of 15 and 30 ug/l uranium concentrations. Aliquots from 5 percent of the specimens obtained are contaminated (spiked) with a known uranium concentration. Should the control or spiked sample results exceed ± 30 percent error, repeat analysis and further collection of samples are conducted. Urinalysis frequency is not reduced due to the use of respiratory protection devices. Action levels of 15 ug/l of uranium for bioassays have been established for investigation by the Radiation Control Coordinator and possible work limitations. Levels of 30 ug/l of uranium for bioassays require an immediate documented investigation to determine the cause and establish work restrictions to be implemented for the affected employees. Operations will continue only after verification that no other worker will exceed 30 ug/l. Kidney function tests are performed when four consecutive bioassays from an individual exceed 30 ug/l or a single exposure exceeds 130 ug/l.

The staff concludes that the proposed bioassay program is acceptable and in accordance with the regulatory position specified in Regulatory Guide 8.22. The staff will however, incorporate requirements regarding reporting excessive concentrations to the NRC and an action level for decontamination of laboratory surfaces. The staff recommends that the licensee ensure that laboratory surfaces used for in-house bioassay analyses are decontaminated to less than 25 dpm alpha-(removable)/100 cm² prior to analysis of samples; that corrective actions taken for those individuals with urinalysis results equal to or in excess of 15 ug/l, be documented and submitted to the NRC as part of the semiannual report required by 10 CFR 40.65; and anytime an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen is reached or exceeded, the licensee shall document the corrective action and submit a copy to the NRC within 30 days of exceeding the action level.

4.6 Contamination Control

4.6.1 Personnel Contamination

Atlas requires, in Section 5.5.5.2 of the renewal application, that all employees shower and/or monitor potentially contaminated surfaces, such as: hands, face, neck, clothing and shoes prior to passing through the guard house, which is the main point of exit, when departing from the mill. The personnel are to monitor themselves using an alpha survey meter. If the maximum allowable levels of surface contamination are exceeded, the radiation safety staff investigates the incident and the

affected employee returns to the mill decontamination area and decontaminates the portion of his body or article of clothing to meet decontamination levels in Section 5.5.5.2 of the application. Individual monitoring results will not be recorded. Atlas proposes the security guards routinely observe the monitoring procedure. Quarterly spot checks are performed and documented by the Radiation Safety Staff. The staff concludes that the personnel contamination program is consistent with the regulatory position specified in Regulatory Guide 8.30, with one exception.

The staff recommends as a condition of the license, that the licensee be required to maintain documentation of the personnel contamination survey conducted in accordance with Section 5.5.5.2 of the application. In addition, the licensee (RCC or qualified alternate) shall perform spot personnel surveys for alpha contamination at least quarterly on employees leaving the restricted area.

4.6.2 Surface Contamination

In Section 5.5.5.5 of the renewal application, Atlas has proposed that lunch rooms, change rooms, control rooms, and offices will be surveyed for surface contamination every two weeks when they are in use. If the level detected is above 500 dpm/100 cm² removable alpha, the areas will be surveyed weekly. If the level exceeds 1000 dpm/100 cm² removable alpha, the area will be cleaned. Administrative offices will be surveyed quarterly for removable alpha contamination.

The staff recommends as a condition of the license, that the frequency of surface contamination surveys be increased to weekly. The recommendation is consistent with the regulatory position specified in Regulatory Guide 8.30. The staff concludes that Atlas' surface contamination control program, as modified by the staff, is consistent with staff policy as presented in Regulatory Guide 8.30.

4.6.3 Disposal of Contaminated Equipment

Atlas stated in Section 5.5.5.3 and 5.5.5.4 of the renewal application that all equipment will be surveyed for contamination prior to release for unrestricted use. Any equipment that is monitored and determined to be in excess of 1000 dpm/100 cm² alpha shall be smear tested to determine the level of removable contamination. If the level of removable alpha contamination is found to be greater than 1000 dpm/100 cm², the equipment shall not be released until cleaned, resurveyed and found to be below the values in Table 1 of Regulatory Guide 8.30.

The staff recommends that a license condition be added which states that — — the release of equipment or packages from the facility shall be in

accordance with "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" dated September 1984.

The licensee was authorized, by License Condition No. 48, to dispose of byproduct contaminated solid wastes in the sump collection pond, as approved in the licensee's submittal dated February 29, 1984. The licensee has proposed, in the renewal application, the burial of solid wastes in the tailings pond. The licensee later withdrew the request for authorization to dispose of wastes in the pond. The staff recommends, as a condition of the license, that burial of contaminated solid wastes in the sump collection pond is authorized; however, burial of any contaminated wastes in the tailings pond must be submitted to NRC for review and approval prior to initiating disposal.

The staff has concluded that the licensee's procedures for the disposal of contaminated equipment, as modified by the above conditions, is consistent with the regulatory position specified in Regulatory Guide 8.30.

4.7 Quality Assurance and Calibration

The quality assurance program, described in Section 7 of the renewal application, proposes procedures and policies for the effluent and radiological monitoring programs. Appendix 5.5.5 of the application proposes procedures for calibration of radiological monitoring equipment. The staff shall require that radiation monitoring and sampling equipment be calibrated at least quarterly or at the manufacturer's suggested interval, and after repairs, whichever is sooner. The quality assurance program is based on Regulatory Guide 4.15. During extended periods of time when the mill is in shutdown or standby status, samples are sent to commercial laboratories for analysis. The vendor for sample analysis is a participant of the EPA QA Program Intercomparison Study. The licensee also participates with other laboratories in a program which compares results. The vendor that provides the thermoluminescent dosimeter (TLD) service for Atlas follows procedures acceptable to the NRC. The staff finds the licensee's proposal for quality assurance and equipment calibration to be in accordance with the regulatory position described in Regulatory Guide 8.30.

5.0 RESTRICTED AREA MARKINGS AND ACCESS CONTROL

Section 5.4 of Atlas' renewal application describes security at the Moab, Utah facility. The mill and tailings impoundment are contained within a fenced, restricted area. The restricted area is posted at proper intervals with "Caution Radioactive Materials" and "No Trespassing" signs. Each permanent entrance through the perimeter fence is

conspicuously posted with the words "Any Area Within This Mill May Contain Radioactive Materials" in accordance with 10 CFR 20.203(e)(2). The staff recommends as a condition of the license that the licensee be exempted from the requirements of 10 CFR 20.203(e)(2) for areas within the mill as long as the entrances to the mill remain posted as noted above.

Visitors are required to register on entry and are issued a visitor's badge. The badges are collected when the visitors sign out. The licensee is committed to maintain security 24 hours a day and perform perimeter surveys once per shift. All yellowcake storage areas are locked and secured with inspections by a security patrol each shift.

The staff concludes that the above measures constitute adequate warnings and access control.

6.0 EMERGENCY PROCEDURES AND PREVENTIVE MEASURES

Atlas submitted information concerning emergency procedures in Section 6 and Appendix 6 of the renewal application. The procedures describe a general action plan in the event of emergencies such as fires, explosions, tailings spills, material spills, equipment failures and tailings dam failure. The accidents involving radioactivity are divided into the following four categories:

1. Trivial incidents.
2. Small releases to the environment.
3. Large releases to the environment.
4. Transportation accidents.

As stated in the application, trivial incidents include the following: spills, ruptures in process tanks or plant piping containing solution or slurries, failure of the filter wash circuit used for yellowcake dewatering or a tailings pond retention system pipe rupture where tailings flow into the tailings pond. Small releases are defined by Atlas as failure of the air cleaning system serving the concentrate drying and packaging area, or in the yellowcake dryer. A large release is defined as resulting from a major tornado strike or tailings release to the Colorado River due to failure of the tailings pond retention system. The emergency plan for radiation accidents in Appendix 6 of the renewal application describes the sequence of response for the listed situations. It also includes the phone numbers of NRC Region IV, EPA and the Utah Water Pollution Control Board. In addition to this requirement, the staff recommends that the licensee be required by license condition to notify the Uranium Recovery Field Office by telephone or telegraph of any accidents involving or having the potential for release of radioactive materials.

Transportation accidents are discussed in Section 6.4 of the renewal application. Any vehicle accidents that may occur are regulated and investigated by the Department of Transportation under Title 49, Code of Federal Regulations.

Fire protection is covered in detail in Appendix 6 of the renewal application. It discusses the automatic fire suppression system and methods for combating SX fires, facility fires, and the response by the personnel on duty and the local fire department. The SX area is outdoors since it has the greatest potential for fire. Specifically, the SX area is comprised of eight different sections and each is controlled by a single delay valve. Should a fire break out in one section, the associated sprinkling system is activated as well as System No. 4 sprinklers. The System No. 4 sprinklers act as a water curtain to protect the rest of the SX area. The mill has an 8-inch main pressure line and is connected to a fire control storage pond which holds 300,000 gallons. Included in Appendix 6 are evacuation plans for all personnel as well as job duties associated with fire control. The fire control system is tested during routine fire drills which are conducted on an approximate semiannual schedule.

The licensee has stated in the renewal application that the storage tanks for reagents or process material have containment around them sufficient to retain any spills or ruptures of the tanks. The staff shall require the maintenance of the catchment basin west of the SX area.

The staff has concluded that emergency procedures and preventive measures, as modified by the staff, are adequate.

7.0 TAILINGS DAM EVALUATION

Since the construction of the original tailings pond impoundment at the Moab Mill, the staff has evaluated several proposals for raises to the impoundment. The latest raise was authorized by License Condition No. 18, in accordance with submittal dated June 4, 1981, and permitted the construction of a raise from 4058 feet to 4076 feet. This approved dam raise of approximately 18 feet has not been constructed.

During 1982 Atlas Minerals' placed approximately 110 drums of vanadium sludge in the northwest corner of the tailings impoundment. During July and August 1984 Dames and Moore, a consultant for Atlas Minerals, evaluated the tailings impoundment to determine the vanadium sludge disposals potential impact on the tailing impoundment. The report indicates that the drums were placed about 160 to 200 feet from the impoundment crest at an elevation of about 4050 feet, which is approximately at the natural ground surface in that area of the impoundment. The conclusion of the report indicates that the embankment

stability within the extreme northwest portion of the pond area will not be effected by the vanadium sludge disposal and that the construction of the proposed 18-foot lift may be allowed without affecting the embankment stability. Further, subsidence caused by the drums will take place before the placement of cover material.

Each of the reviews required extensive staff evaluation of the existing impoundment and the proposed modifications. Analyses for stability were performed in accordance with Regulatory Guide 3.11. Construction specifications and procedures had been submitted for review and were approved. The licensee's embankment surveillance program consists of an inspection every 4 hours during operations.

Section 5.5.7 of the licensee's renewal application stated that interim stabilization measures have been completed at the site. A flood protection dike was constructed along the east and southeast portions of the mill in 1979. The dike was subsequently raised in 1983 and 1984, to provide a greater level of safety from flooding by the Colorado River. The other potential for flooding was from the Moab Wash, which is adjacent to the eastern side of the tailings embankment. The area had been filled and graded and the eastern wash embankment was graded to 3 feet in elevation less than the western embankment. The upper end of Moab Wash near the ore pads was graded to provide smooth flows in the wash. Additionally, riprap had also been placed along the northern embankment. This effort provides interim protection to the impoundment.

During periods of operation as well as extended non-operation, the radiation safety staff is committed to a daily visual inspection of the pond and its embankments with the completion of a daily pond inspection sheet. A detailed monthly inspection of the embankment is required to be performed. It includes checking for tension cracking, slumping, erosion, seepage and to record any unusual observations or occurrences.

In addition, Atlas has proposed, in Section 4.0 of the renewal application, an annual technical evaluation of the embankment to be performed by a professional engineer who is familiar with the design, construction and operation of the embankments. Staff review indicates that the license should be modified to include an assessment of the hydraulic and hydrologic capacities, water quality and structural stability.

The staff concludes that the tailings dam evaluation program is consistent with staff policy contained in Regulatory Guide 3.11, with two exceptions. The staff will require that Atlas install an alarm on the tailings lines to indicate a plugged line or a rupture. The alarm shall be in an occupied area. Instrumentation shall be tested daily. The alarm shall be installed prior to the licensee resuming operation. In

addition, the staff will require that the technical evaluation include an assessment of the hydraulic and hydrologic capacities, water quality and structural stability.

The staff recommends that, in addition to the tailings embankment surveillance program presented in the renewal application, the licensee be required to comply with the following:

- A. The professional responsible for the annual technical evaluation shall ensure that personnel who performed the routine inspections are trained to recognize and assess signs of possible distress or abnormality.
- B. All inspection reports shall be dated, signed by the inspector and maintained on file at the mill site.
- C. The results of groundwater sampling and piezometers and pond level measurements shall be maintained in graphical form and on file at the mill site for use in developing the annual report.
- D. The annual technical evaluation shall include an assessment of the hydraulic and hydrological capacities, water quality and structural stability of the tailings impoundment.
- E. A copy of each annual technical evaluation report shall be submitted to URFO within one month of completion of the report.

Based on the staff evaluation noted in the previous paragraph, and the licensee's construction, surveillance and quality assurance procedures, the staff concludes that the design and inspection of Atlas' tailings impoundment are acceptable.

The licensee has proposed an additional below grade tailings disposal system for increased capacity. The staff finds that the information submitted was not sufficient to perform an evaluation. A letter dated December 5, 1984, was sent to the licensee for clarification of information in the proposal. The licensee withdrew the proposal for a below grade tailings disposal from the renewal application by letter of January 30, 1985.

8.0 MILL SITE DECOMMISSIONING

Section 5.5.9 of the licensee's renewal application discusses the mill site decommissioning and reclamation plan dated May 29, 1981, from Dames and Moore entitled, "Report Conceptual Design and Cost Estimate, Tailings Pile Reclamation, Moab, Utah for Atlas Minerals." The general plan for decommissioning the mill site is to dismantle all structures, salvage and

decontaminate all useable equipment, and place all contaminated materials on top of the dessicated slimes in the tailings impoundment. The staff will require the licensee to prepare a final detailed mill decommissioning plan and submit the plan to the Uranium Recovery Field Office for review and approval, by February 28, 1988.

Decommissioning of the mill site will be in accordance with the Commission's Attachment to SUA-917 entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product or Source Materials," dated September, 1984.

The staff's review of the licensee's proposals for reclamation of the tailings impoundment are discussed in the environmental assessment accompanying this license renewal.

9.0 COMPLIANCE INSPECTION HISTORY

The compliance history of the Moab Mill is given below, in chronological order, since the license renewal dated April 23, 1979.

July 17-19, 1979 Inspection

Four items of noncompliance were identified one of which was a repeat of an infraction noted in the August 2-3, 1978 inspection. The noncompliance items with the licensee's response and proposed corrective actions are as follows:

Violation 1 (Infraction)

Contrary to 10 CFR 20.103(e) and Section C.2 of Regulatory Guide 8.15 respiratory protective equipment is to be selected to provide a protection factor (PF) greater than the ratio of the "peak concentration" to the applicable 10 CFR 20 Appendix B concentration value. The licensee permitted an employee on September 7, 1978, to use respiratory equipment with a PF of 50 to be worn in the yellowcake area where the concentration was 300 times the Appendix B limit.

Corrective Action

The licensee stated in a September 4, 1979 response that personnel working in the area will wear a constant airflow respirator (PF 2000) and that air samples would be collected to determine peak concentrations. This was a repeat of the previous inspection finding.

Violation 2 (Infraction)

Contrary to License Condition 14, effectiveness of measures to minimize blowing tailings had not been evaluated or documented during the period August 3, 1978 and July 19, 1979.

Corrective Action

Atlas developed a tailings inspection form for the operator to record whether the tailings were blowing or not. To hold blowing tailings to a minimum a spray truck was used to coat the tailings with a binding agent.

Violation 3 (Infraction)

Contrary to License Condition 25a, biweekly surface contamination surveys were not conducted in the change rooms between August 3, 1978 and July 19, 1979.

Corrective Action

The surveys at the change rooms were put on the inspection schedule and have been conducted.

Violation 4 (Infraction)

Contrary to License Condition 26, documented weekly moisture content inspection of the ore and/or weather conditions were not conducted between August 3, 1978 and July 19, 1979.

Corrective Action

A new form was put into use by the licensee requiring operators to inspect and record the condition of the ore and/or weather conditions.

June 23-24, 1980 Inspection

One item of noncompliance was identified in 1980 inspection. Corrective action on previous inspection findings had been verified.

Violation (Infraction)

Contrary to License Condition 37, monthly background sampling for Rn-222 remote from the site and vegetation samples collected at offsite seasonal grazing locations were not analyzed for Ra-226 since July 19, 1969.

Corrective Action

A background sampler was installed and operating during September 1980. Background samples have been collected during 1981.

May 11-15, 1981 Mill Appraisal (Violation and Significant Appraisal Findings)

Violation 1 (Severity Level IV)

Contrary to License Condition 25(c), contamination levels in excess of the values specified in License Annex C, dated November 1976, were present in the acid filter doghouse, a lunchroom and office area, during March, June and July, 1980, and corrective measures were not taken to prevent a buildup. The licensee had not performed a study to determine the cause of the buildup.

Corrective Action

In the August 5, 1981 response the licensee denied that a study was not performed, however, they admitted that it was poorly documented. The licensee proposed a redesign and construction of the acid doghouse and a restructuring to the employees of cleaning and housekeeping in the area. Employees have ceased using the grizzly shack and sample tower doghouse as eating areas. Violation vacated by NRC at the September 14, 1981 meeting with the licensee in Moab, Utah.

Violation No. 2 (Severity Level IV)

Contrary to License Condition 39, isokinetic sampling of the yellowcake drying and packaging stacks had not been performed since January 1980.

Corrective Action

Platforms and ladders for the isokinetic sampling have been constructed and installed with sampling initiated in August 1981.

Violation No. 3 (Severity Level IV)

Contrary to License Condition 46, remote instrumentation, installed by Atlas on the scrubber of the yellowcake exhaust, signals an audible alarm as a result of temperature changes rather than a result of changes in water flow and air pressure differential. Daily checks of the alarm system have been neither performed nor documented since the license condition was issued.

Corrective Action

The licensee has instituted daily checks and documentation of the yellowcake exhaust scrubber system. They had also installed a new alarm system.

Violation No. 4 (Severity Level IV)

Contrary to 10 CFR 20.103(b)(1), the licensee had not undertaken efforts to reduce dust accumulations in airborne radioactivity areas located within the ore crushing and storage areas.

The licensee has instituted a daily documented inspection of the ore crushing and storage areas as well as increase cleaning activities to keep the airborne levels and dust accumulations to a minimum.

Violation No. 5(a) (Severity Level IV)

Contrary to 10 CFR 10.201(b), adequate surveys had not been performed to assess worker exposure to airborne uranium in accordance with 10 CFR 20.103(a). Specifically, sampling had not been performed in a manner which would yield results representative of airborne uranium concentrations inhaled by mill workers.

Corrective Action

Personnel, equipment, and procedure changes have been made to correct this violation. Workers are required to wear lapel samplers and self monitor them. The licensee had obtained and was using equipment to obtain a more representative airborne personnel exposure concentration.

Violation 5(b)

Contrary to 10 CFR 20.201(b), surveys had not been performed in accordance with 10 CFR 20.106(a), to evaluate radioactivity in airborne effluents released to unrestricted areas north of the mill complex.

Corrective Action

The licensee claims that this violation had been issued in error and did not plan any further action. The violation was vacated by NRC at the September 18, 1981 meeting with the licensee at Moab, Utah.

Violation No. 5 (Severity Level V)

Contrary to License Condition 34, on May 11-15, 1981, sprinkler heads in the solvent extraction area were encrusted with mineral deposits which would have prevented their operation.

Corrective Action

The licensee has established a documented weekly inspection that includes cleaning or replacement of sprinkler heads that are corroded or inoperative.

Violation No. 7 (Severity Level VI)

Contrary to 10 CFR 20.203(d)(2), the ore crusher area known to be an airborne radioactivity area was not so posted on May 11-15, 1981.

Corrective Action

The sign was posted and all signs are checked periodically by the RSO.

Significant Appraisal Findings

1. Organization, Management and Training

Appraisal Finding

The radiation protection function is not fully effective in implementing the mill radiation safety program due to the combination of the function with metallurgy and deficiencies in the training and qualifications of its staff members. The radiation protection component lacks full authority to implement radiation safety programs and to suspend operations as necessary. Programs for maintaining exposures ALARA, for auditing the effectiveness of the radiation protection function, and for formally and fully proceduralizing radiation protection programs have not been established. Also, responsibility and authority for worker radiation safety training and mill fire protection have not each been established under single qualified individuals. The training program has not been developed to adequately train workers in radiation safety.

Corrective Action

Atlas provided a revised organizational chart in their December 11, 1981 letter which provides the requested separation of production and radiation safety functions. As Atlas requested via telecon that a specific organizational chart not be incorporated into their license to — —

allow flexibility, Atlas' license SUA-917 was amended on September 30, 1982 to require that the line of authority between the RSO and the individual onsite with the final responsibility for site operations not include any positions having production responsibilities. This amendment, Amendment No. 10, also specified minimum qualifications and training requirements for the mill RSO and stated that the RSO would be responsible for all radiation safety programs. Atlas' December 11, 1981, letter stated that the Regulatory Affairs Manager and his designated representatives have the authority to suspend operations as necessary.

Amendment No. 10 also required that Atlas perform a comprehensive annual audit which addresses all items listed in draft Regulatory Guide OH 941-4, and that a copy of the report documenting the audit be submitted to NRC for review. By letter dated December 4, 1981, Atlas provided for NRC review a report containing detailed written procedures for all aspects of the mill radiation safety program. The staff review of quality assurance aspects of the Atlas submittal resulted in the issuance of Amendment No. 10.

Atlas stated that the RCC had responsibility for all mill radiation safety training, and that the General Mill Manager, or designated shift foremen in the event of his absence, would have overall responsibility for the mill fire protection program. In addition, Atlas has provided specific details concerning their employee radiation safety training program. The training program includes the subjects specified in draft Regulatory Guide OH 941-4 and a written examination to test and evaluate the effectiveness of the training.

2. Internal Exposure and Contamination Control

Appraisal Finding

Licensee programs for airborne radioactivity sampling, worker exposure determination, respiratory protection, contamination control and bioassay were found to be weak as a result of insufficient management commitment to program development, implementation, and enforcement which has resulted in inadequate sampling procedures and analysis techniques, incompleteness of assessment of worker exposure, and failure to institute process controls in order to maintain exposures ALARA.

Corrective Action

Major commitments made by Atlas with regard to this area are discussed below. Atlas had indicated that documentation procedures will be improved to provide a record of radiation safety practices. This was

identified as major weakness in this area. Included in the improved procedures will be records of the following: mill operational status during sampling, flow rates on lapel air samplers, investigative and corrective actions taken in response to monitoring data showing elevated radioactivity levels, and attendance at respirator user training sessions.

Atlas also committed to establish a program for routine inter-laboratory comparisons as a quality assurance check for sample analysis. A requirement that Atlas participate in the EPA cross-check program or an equivalent program is included in Amendment No. 10, as is a requirement that at least 5% of samples analyzed in the Atlas laboratory be quality control samples. This should significantly improve quality assurance for the radiation safety program.

Atlas also indicated that respirators will not be issued to individuals who have not been medically qualified to use a respirator. Atlas further agreed to an appraisal recommendation that new mill employees submit urine samples prior to initial work in the mill in order to establish baseline values.

3. Facilities and Equipment

Appraisal Finding

The appraisers found that certain mill facilities and equipment were not designed or used in a manner that would reduce effluents to the environment or maintain exposure to workers ALARA. Methods of detecting failure of stack scrubber and dust collectors had not been established, and mill ventilation and ore pile dust reduction methods had not been fully optimized.

Corrective Action

Major specific recommendations in this area are discussed below. Atlas management stated that ore piles are sprayed with water on an "as necessary" basis, and indicated this was generally done daily. Atlas further indicated that RSO inspections include examination of the ore piles for blowing ore dust. Inspection findings were documented in inspection reports.

Atlas agreed to install pressure differential gauges on bag filter dust collectors used in the crushing and grinding areas, and to read and record the values daily to provide early detection of filter failure. Findings concerning instrumentation for the yellowcake area scrubbers are

discussed under the "Violations" section of this document. Atlas Mill also agreed to phase in use of a 5/8 inch retaining bolt on yellowcake shipping containers. This shall provide better security for the barreled yellowcake product, in the event of an accident, than the smaller bolts now in service.

The final major recommendation was that Atlas institute a formal tailings embankment inspection program and perform an annual technical evaluation of embankment performance. A formal inspection program in accordance with Regulatory Guide 3.11.1, including an annual technical evaluation, was incorporated into SUA-917 by Amendment No. 7 dated June 30, 1982.

4. Environmental Monitoring

Appraisal Findings

The appraisers found that the rationale for the environmental monitoring program had not been fully developed. Ambient airborne concentrations were not assessed at a point on the site boundary closest to and predominantly downwind from the mill stacks, and equipment was not utilized in order to obtain representative samples at other locations. Stack sampling had not been performed isokinetically. Thermoluminescent dosimeters (TLD) for direct radiation measurements were improperly utilized and specified surface ponds were not sampled. A program for data trend analyses and laboratory quality assurance, including laboratory intercomparisons, had not been established.

Corrective Action

The items concerning sampling at the site boundary closest to and downwind from mill stacks and isokinetic sampling of the stacks were discussed under the "Violations" section of this document. The continuous air particulate samplers used by Atlas included a metal enclosure over the sampling assembly. The appraisers felt the samples collected using this system would not be representative. Atlas stated that their air samplers have been modified to assure representative sampling.

Atlas has replaced the TLD's previously used for external radiation monitoring, which are the same type used for personnel monitoring, with TLD's specifically designed for environmental monitoring. Atlas also agreed to read the TLD's quarterly rather than monthly, which will reduce the relative amount of statistical error associated with the measurement.

Atlas stated that the several onsite ponds noted during the appraisal are normally dry and only contain water infrequently, as a result of rainfall and river water overflow. The water is allowed to evaporate and is not subject to direct human use. Sampling of water in the ponds is therefore not necessary.

Atlas has submitted a quality assurance program which contains all the elements of an acceptable program as specified in Regulatory Guide 4.15. Aspects of the quality assurance program regarding percentage of quality control samples analyzed in the mill laboratory and participation of the mill laboratory in an inter-laboratory comparison program have been incorporated into the Atlas license via Amendment No. 10. Amendment No. 10 also specifies that the required annual ALARA audit include a trend analysis of environmental monitoring data.

May 25-27, 1982 Inspection

Four violations were identified during the inspection. Corrective actions were verified by the inspectors of violations and significant findings identified during the 1981 Mill Appraisal.

The four violations identified and corrective actions are as follows:

Violation No. 1 (Severity Level IV)

Contrary to License Condition No. 28, environmental air samplers were not calibrated during the fourth quarter of 1981.

Corrective Action

Atlas indicated that the samplers were not calibrated during the fourth quarter of 1981 because the calibration instrument used for calibration had been sent to the manufacturer for recalibration and had not been returned for several months. Atlas indicated the manufacturer has been contacted concerning the unacceptably long turn-around time, and had agreed to be more responsive in the future. In addition, Atlas has made arrangements to enable them to borrow a calibrator as a substitute, if necessary.

Violation No. 2 (Severity Level IV)

Contrary to 10 CFR 20.103(b)(2), actions were not taken sufficient to prevent ten occasions of recurrence of exposure to airborne concentrations of ore dust in excess of the 40-hour control measure during subsequent weeks of May and June, 1981.

Corrective Action

Atlas stated that the crushing and samples areas were cleaned in May, and plans were begun for a complete water wash down of the crushing area. The wash down was completed by the end of June. Atlas indicated that weekly air samples are now collected in the crushing and sampling areas to allow adequate time for the planning and rescheduling needed for extensive cleaning and wash down with water.

Violation No. 3 (Severity Level IV)

Contrary to 10 CFR 20.103(c), full-face particulate respirators with a protection factor of 50 were used during work in airborne concentrations ranging from 70 to 83 times the 10 CFR 20, Appendix B limit for natural uranium on three occasions during August through October of 1981.

Corrective Action

Atlas responded that they have rectified the situation by requiring that employees use either the Racal Airstream Respirator or air-line respirators for nonroutine work in the crusher area. Both type of respirators have protection factors of 1000.

Violation No. 4 (Severity Level V)

Contrary to 10 CFR 40.64(b), annual statements of source material inventory were not submitted to the NRC during 1980 and 1981.

Corrective Action

Atlas stated that the 1980 and 1981 inventory reports are in the process of being filed and that the 1982 report will be filed in accordance with 10 CFR 40.64(b). Atlas further indicated that administrative procedures have been established to ensure that future reports are prepared and submitted in a timely manner.

July 26-28, 1983 Inspection

Three violations were identified by the inspectors during the inspection. They also verified the corrective action on the 4 violations identified in the previous inspection. The violations and proposed corrective actions are as follows:

Violation 1 (Severity Level IV)

Contrary to License Condition 25d, since the date of the previous inspection, the alpha survey meter available at the exit of the guard house had been calibrated by using incorrect probe area dimensions.

Because of this, alpha contamination results when surveyed in dpm/100cm² were approximately 65 percent of the actual level. Records thus indicate that 23 individuals departed the mill during the last three quarterly spot surveys with alpha contamination levels on their clothing which may have exceeded the 1000 dpm/100 cm² level.

Corrective Action

The alpha survey meter was properly calibrated using the correct probe area dimensions. The Atlas radiation safety staff will perform more frequent spot surveys on personnel departing the mill and have emphasize the importance of self-monitoring to the mill personnel.

Violation 2 (Severity Level V)

Contrary to 10 CFR 20.401(a) and (c)(2), the licensee failed to maintain records of the results of surveys to determine compliance with 10 CFR 20.103(a) for the combined routine and nonroutine exposures received by three workers on June 11, 1982, and August 27, 1982.

Corrective Action

The Radiation Control Coordinator, who is responsible for maintaining these records had implemented a check on all nonroutine jobs when he compiled the monthly report. He assured that all routine and nonroutine jobs are included in calculations of personnel exposure.

Violation 3 (Severity Level V)

Contrary to License Condition 52, since the condition was added to the license on June 30, 1982, the licensee has failed to complete or submit to NRC the reference tailings embankment performance evaluation, nor has embankment piezometer readings been maintained in graphical form.

Corrective Action

An independent consultant performed an evaluation of all the tailings pond embankments. Piezometer readings were graphed and are now maintained on a monthly basis.

November 13-14, 1984 Inspection

No violations were identified by the inspectors during the inspection. They also verified the corrective action on the 3 violations identified in the previous inspection.

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March 12-14, 1986 Inspection

Two violations were identified by the inspectors during the inspection. The violations and proposed corrective actions are as follows:

Violation 1 (Severity Level IV)

Contrary to License Condition No. 4, since the date of the previous inspection, the licensee has not minimized the dispersal of blowing tailings from the tailings impoundment.

Corrective Action

Atlas states that they have maintained water cover over the tailings to the maximum extent allowed under the license. Further, upgraded dust suppressant solutions and equipment have been employed, and a survey protocol for detecting and delineating windblown tailings has been implemented.

Violation 2 (Severity Level IV)

Contrary to License Condition No. 25, since the date of the previous inspection, the license has not minimized the blowing of ore dust from the alkaline ore pile located near the north perimeter fence.

Corrective Action

Atlas stated this violation was withdrawn.

February 23-24, 1987 Special Inspection

No violations were identified by the inspectors during the inspection. The inspectors verified, through independent surveys, areas cleared windblown tailings.

March 18, 1987 Special Inspection

No violations were identified by the inspectors during the inspection. The inspectors verified, through independent surveys, areas cleared windblown tailings.

August 13, 1987 Inspection

Two violations were identified by the inspectors during the inspection. The violations and proposed corrective actions are as follows:

- -

Violation 1 (Severity Level IV)

Contrary to Title 10, Code of Federal Regulations, Part 40, Appendix A, Criterion 8, the licensee has not developed a comprehensive written procedure to assure the mitigation of blowing tailings in a timely manner.

Corrective Action

Atlas has submitted for review a written procedure for mitigation of blowing tailings; however, the staff has found that the stated corrective action did not meet the requirement noted above. The staff will continue its review of this item upon receipt of additional information requested from Atlas.

Violation 2 (Severity Level IV)

Contrary to item IVB of USNRC Order dated July 31, 1987, the licensee discharged liquids to the tailings impoundment from July 31, to August 3, 1987 and August 7 to August 10, 1987, without the prior approval of the NRC.

Corrective Action

Atlas stated that on August 14, 1987 a flange was taken apart in the line used to pump solution to the tailings pond, thus preventing any solution from being pumped or gravity fed. The pumping which occurred during the period August 7 to August 10, 1987 was considered, by the staff, to be emergency preventative maintenance.

Summary

The licensee has sustained numerous violations; however, the violations have generally been corrected in a timely manner. The Audits and Inspections program described in Section 3.5 of this document will assure that effective management attention is accorded to the conduct of operations in compliance with the conditions of Source Material License SUA-917, as renewed.

10.0 CONCLUSION

The staff having completed the safety review of Atlas' renewal application and compliance history has concluded that issuance of a renewed license to Atlas, subject to additional conditions developed by the staff, will not constitute an undue risk to the health and safety of the public. The staff has determined that the application and supplements fulfill the requirements of 10 CFR 40, Subsection 40.32:

1. The licensee's application for continued milling of uranium ore at the Atlas Minerals, Moab, Utah mill is for a purpose authorized by the act.
2. As noted in Sections 3.2, 3.3, 3.6 and 4.0 of this safety evaluation report, the licensee is qualified by reason of training and expertise to utilize source material for the requested purpose in such a manner to protect health and minimize danger to life or property.
3. As noted in Sections 2.0, 3.4, 5.0 and 6.0 of this safety evaluation report, the applicant's proposed equipment procedures, as modified by the staff, are adequate to protect health and minimize danger to life or property.
4. The renewal of the license will not be inimical to the common defense and security or to the health and safety of the public.

Therefore, the staff has concluded that issuance of a renewal license to Atlas Minerals, Division of Atlas Corporation, subject to the additional conditions developed by the staff, will not constitute an undue risk to the health and safety of the public and has determined that the application and addendum fulfill the requirements of 10 CFR 40.

The staff therefore recommends that the renewed license for the Atlas Minerals Moab Uranium Mill include the following safety related conditions:

1. Authorized place of use: The licensee's uranium milling facility located at Moab, Utah.
2. The licensee is hereby authorized to possess byproduct material in the form of uranium waste tailings and other uranium byproduct waste generated by the licensee's milling operations authorized by this license.
3. For use in accordance with statements, representations and conditions contained in Sections 4.2.4, 5 and 7 (except 5.5.10 and 5.5.11) and Appendices 5.3, 5.5.6 and 6.0 of the licensee's renewal application dated May 31, 1984 and submittals dated December 17, 1984, January 18 and June 5, 1985, December 4, 1986, and January 26, 1988.

Whenever the word "will" is used in the above referenced sections it shall denote a requirement.

4. The mill production per calendar year shall not exceed 850 MT (1,870,000 pounds) of barreled U_3O_8 .

For use in accordance with statements, representations and conditions contained in Sections 4.2.4, 5 and 7 (except 5.5.10 and 5.5.11) and Appendices 5.3, 5.5.6 and 6.0 of the licensee's renewal application dated May 31, 1984 and supplements in letters dated December 17, 1984, January 18 and June 5, 1985, December 4, 1986, and January 26, 1988.

Whenever the word "will" is used in the above referenced sections it shall denote a requirement.

5. Any changes in the mill circuit as described in Figures 3.1-2 and 3.1-3 of the licensee's renewal application, shall require approval of the USNRC, Uranium Recovery Field Office, in the form of a license amendment.
6. The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the mill, provided that all entrances to the mill are conspicuously posted in accordance with Section 20.203(e)(2) and with the words, "Any area within this mill may contain radioactive material."
7. The results of sampling, analyses, surveys and monitoring; the results of calibration of equipment; reports on audits and inspections; all meetings and training courses required by this license; and any subsequent reviews, investigations, and corrective actions, shall be documented. Unless otherwise specified in USNRC regulations, all such documentation shall be maintained for a period of at least five (5) years.
8. The licensee shall maintain effluent control systems as specified in Section 3.3 of the licensee's renewal application with the following additions:
 - A. Operations shall be immediately suspended in the affected area of the mill if any of the emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.
 - B. The licensee shall, during all periods of yellowcake drying operations, assure that the scrubber is operating within the manufacturer's recommended ranges for water flow and air pressure differential necessary to achieve — —

design performance. This shall be accomplished by either (1) performing and documenting checks of water flow and air pressure differential gauges every hour during operation or (2) installing instrumentation which will signal an audible alarm if either water flow or air pressure differential fall below the manufacturer's recommended levels. If an audible alarm is used, its operation shall be checked and documented daily.

- C. Air pressure differential gauges for emission control equipment other than the wet scrubber shall be read and the readings documented once per shift during operations.
 - D. Any changes in the effluent control systems, as described above, shall require approval by the USNRC, Uranium Recovery Field Office, in the form of a license amendment.
- 9. Release of equipment or packages from the restricted area shall be in accordance with the attachment to SUA-917 entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" dated September, 1984.
 - 10. The licensee shall have in operation, within ninety (90) days prior to resumption of operations, instrumentation to detect ruptures of the tailings discharge and solution return lines when these lines are being utilized. Indications of a possible rupture of these lines shall result in activation of an alarm in an occupied area of the mill. The instrumentation shall be tested daily, and testing documented, to ensure proper operation.
 - 11. The licensee shall conduct and document at least one inspection of the tailings embankment per day and shall immediately notify the USNRC, Uranium Recovery Field Office, by telephone or telegraph, of any failure to the tailings dam or tailings discharge and solution return system which results in a release of radioactive material and/or of any unusual conditions which if not corrected could lead to such a failure. This requirement is in addition to the requirements of 10 CFR 20.
 - 12. The licensee shall submit a detailed decommissioning plan and cost estimate for the Moab Mill Site by February 28, 1988.

13. Occupational exposure calculations shall be performed and documented within one (1) week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Routine samples taken in airborne ore dust and yellowcake areas shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. Non-routine samples taken in ore dust and yellowcake areas shall be analyzed and the results reviewed by the Radiation Control Coordinator (RCC) within two (2) working days after sample collection.
14. Standard written procedures shall be established and maintained for all operational (processing) activities involving radioactive materials that are handled, processed or stored. Standard operating procedures for operational activities shall enumerate pertinent radiation safety practices to be followed. Additionally, written procedures shall be established for nonoperational (non processing) activities to include in-plant and environmental monitoring, bioassay analyses, and instrument calibrations. Special written procedures shall be established for use when the plant is in an extended standby or shutdown condition. Up-to-date copies of all written procedures shall be kept in the applicable mill areas.

All written procedures, including special shutdown procedures, shall be reviewed and approved in writing by the RCC before implementation and whenever a change in procedure is proposed to ensure that proper radiation protection principles are being applied. The RCC shall perform a documented review of all existing procedures at least annually. At least 15 days prior to implementation of special shutdown procedures Atlas shall notify the USNRC, Uranium Recovery Field Office.

15. The personnel contamination surveys conducted, in accordance with Section 5.5.5.2 of the application, shall be documented and maintained. In addition, the licensee (RCC or qualified alternate) shall perform spot personnel surveys for alpha contamination at least quarterly on employees leaving the restricted area.
16. The licensee shall use a Radiation Work Permit (RWP) for all nonroutine work not covered by an existing procedure where the potential for significant exposure to radioactive materials exist. The RWP shall be approved by the RCC or an alternate, qualified by way of specialized radiation protection training, and shall at least describe the following:

- A. The scope of work to be performed and the potential radiological hazards.
 - B. Any precautions necessary to minimize worker exposure to radioactive materials.
 - C. The radiological monitoring and sampling necessary prior to, during, and following completion of the work in order to assess any potential exposures.
17. Notwithstanding the representations in Appendix 5.3 to the renewal application, the licensee shall develop and implement procedures to ensure that visitors and contractors receive instruction and training in accordance with Section 19.12 of 10 CFR 19, prior to entering any restricted area.
18. The existing on-site catchment basin west of the S-X units shall be maintained in a condition and with enough remaining available capacity to assure the collection of any spillage of chemicals from hazardous chemical storage tanks within the graded area. Any storage tanks containing hazardous chemicals which are not located within the graded area shall be surrounded by individual containment dikes capable of containing all leakage.
19. Notwithstanding the representations in Section 5.5.5 of the licensee's application, the licensee shall conduct weekly alpha contamination surveys of lunch rooms, change rooms, shower rooms and offices when they are in use.
20. A copy of the report documenting the annual ALARA audit in accordance to Section 5.1.4 of the renewal application dated May 31, 1984, shall be submitted to the USNRC, Uranium Recovery Field Office, for review within 30 days of completion of the audit report.
21. In addition to the tailings embankment surveillance and inspection program specified in Section 4.2.4 of the licensee's renewal application dated May 31, 1984, the licensee shall comply with the following:
- A. Notwithstanding any statements to the contrary, the professional responsible for the annual technical evaluation report shall ensure that all field inspectors are trained to recognize and assess signs of possible distress or abnormality.

- B. All routine inspection reports shall be dated and maintained on file at the mill site for use in developing the annual report.
 - C. The results of ground-water sampling and piezometer and pond level measurements shall be maintained in graphical form and on file at the mill site for use in developing the annual report.
 - D. The annual technical evaluation report shall include an assessment of the hydraulic and hydrologic capacities, water quality and structural stability of the tailings impoundment.
 - E. A copy of each annual technical evaluation report shall be submitted to the USNRC, Uranium Recovery Field Office, within one (1) month of its' completion.
22. In addition to the requirements in Section 5.2 of the renewal application, the Regulatory Affairs Manager (RAM) and Radiation Control Coordinator (RCC) shall have the minimum education, training, and experience as detailed in Section 2.4.1 of Regulatory Guide 8.31 dated May 1983.
23. Radiation survey instruments shall be calibrated at least semiannually or at the manufacturer's suggested interval, and after each repair, whichever is sooner. All radiation survey instruments shall be checked for proper operation using a radiation check source prior to each day's use. Portable air sampling equipment shall be calibrated after repair and at least quarterly or at the manufacturer's suggested interval, whichever is sooner. Flow rates on portable samplers shall be checked and documented prior to each day's use. Fixed continuous air samplers shall be calibrated after repair and at least quarterly or at the manufacturer's suggested interval, whichever is sooner. Flow rates on fixed continuous air samplers shall be checked each time the sampling head is changed.
24. Notwithstanding representations made in Section 4.3 of the renewal application the licensee shall not dispose of materials other than uranium mill tailings, spent resins, raffinate, vanadium waste residues, liquids or residues contained in the catchment basin described in Condition No. 27, or liquid sanitary wastes in the tailings pond, without the specific authorization of the Uranium Recovery Field Office, USNRC. If — —

liquid sanitary wastes are discharged to the tailings pond, written authorization shall first be obtained from the Utah Bureau of Water Pollution Control. A copy of the written authorization shall be submitted to the Uranium Recovery Field Office prior to the discharge of the liquid sanitary wastes.

The licensee shall not discharge any liquids or solids to the tailings impoundment during nonoperational periods other than needed to perform routine or preventative maintenance, without prior written approval of the NRC.

25. The licensee shall conduct a bioassay program in accordance with Section 5.5.4 of the renewal application with the following additions:
 - A. Laboratory surfaces used for in-house bioassay analyses shall be decontaminated to less than 25 dpm alpha-(removable)/100 cm² prior to analysis of samples.
 - B. Anytime an action level of 15 ug/l uranium for urinalysis is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22, dated January 1987. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR 40.65 and Condition No. 48 to this license.
 - C. Anytime an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, within thirty (30) days of exceeding the action level.

26. The installation of the ion exchange column at the Velvet Mine shall be in accordance with pages 17 and 18 of the licensee's submittal dated November 1, 1983, with the exception that sampling for airborne uranium shall be performed at least monthly.

Noah M. Shopenn, Project Manager
Licensing Branch 2
Uranium Recovery Field Office, RIV

Van R. Scovill

Van R. Scovill, Project Manager
Licensing Branch 2
Uranium Recovery Field Office, RIV

Approved by:

Harry J. Pettengill

Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office, RIV

40-3453/VRS/88/01/27/4

- 1 -

FEB 25 1988

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URFO:VRS
Docket No. 40-3453

MEMORANDUM FOR: David Meyer, Branch Chief
Rules and Procedures Branch
Office of Administration and Resources Management

FROM: Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office, Region IV

SUBJECT: PUBLICATION OF A FINAL FINDING OF NO SIGNIFICANT
IMPACT

In accordance with 10 CFR 51.35, attached is a Final Finding of No Significant Impact regarding issuance of a renewal of Source Material License SUA-917 (Docket No. 40-3453) for publication in the Federal Register as soon as possible.

Please contact Van Scovill of my staff on FTS 776-2817 when the date of publication is known and if there are any questions concerning this request.

151

Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office
Region IV

Attachment: Final Finding of No Significant Impact

OFC	UREQ <i>W</i>	URFO <i>X</i>	UREQ <i>W</i>				
NAME	VScovill/db	PJGarcia	HJPettengill				
DATE	88/02/19		88/02/19				

- 2 - FEB 25 1988

The following statements support the final Finding of No Significant Impact and summarize the conclusions resulting from the environmental assessment.

- (a) The ground water monitoring program in effect at the Moab Mill is sufficient to detect releases and thereby minimize any impact on ground water.
- (b) Radiological effluents from the proposed operation of the mill will be minimal and well within the regulatory limits and will be continuously monitored.
- (c) Environmental monitoring is comprehensive enough to detect any significant impacts due to radiological releases from the milling operation.
- (d) Radioactive wastes will be minimal and will be disposed of in the tailings impoundment which will be reclaimed in accordance with applicable federal and state regulations.

In accordance with 10 CFR Part 51.33(a), the Director, Uranium Recovery Field Office, made the determination to issue a draft Finding of No Significant Impact. A draft Finding of No Significant Impact was published (FR 49802) on December 4, 1985, and no comments were received.

In accordance with 10 CFR Part 51.33(e), the Director, Uranium Recovery Field Office, made the determination to issue a final Finding of No Significant Impact. This finding, together with the Environmental Assessment setting forth the basis for the finding, and other related environmental documents are available for public inspection and copying at the Commission's Uranium Recovery Field Office at 730 Simms Street, Golden, Colorado, and at the Commission's Public Document Room at 1717 H Street, N.W., Washington, D.C.

OFC	:	:	:	:	:	:	:
NAME	:	:	:	:	:	:	:
DATE	:	:	:	:	:	:	:

40-3453/VRS/88/01/27/4

- 3 - FEB 26 1988

Dated at Denver, Colorado, this 19th day of February, 1988.

FOR THE NUCLEAR REGULATORY COMMISSION

/s/

Harry J. Pettengill, Chief
Licensing Branch 2
Uranium Recovery Field Office
Region IV

OFC	URFO	URFO	URFO			
NAME	VRScovill/db	PJGarcia	HJPettengill			
DATE	88/02/19		88/02/19			