SAFETY EVALUATION REPORT

SOURCE/BYPRODUCT MATERIAL LICENSE

OGLE PETROLEUM, INC.

BISON BASIN PROJECT

DOCKET NO. 40-8745

LICENSE NO. SUA-1396

MAY 1981

CONTENTS

1.0 DESCRIPTION OF PROPOSED ACTION

By letter dated August 10, 1979, Ogle Petroleum, Inc. (OPI) applied for a Source Material License to construct and operate a commercial scale in situ leach uranium mine and recovery plant at Bison Basin in Fremont County, Wyoming.

A pilot R & D in situ solution mining and aquifer restoration operation was previously licensed on August 31, 1978 at this site. The R&D facility has demonstrated the feasibility of the use of the in situ solution mining technique at this site and the applicant's capability to satisfactorily maintain the water quality of the affected aquifer.

The proposed action is to grant a five year license authorizing the operation of a commercial in situ leach uranium recovery plant and to process up to 4.5×10^5 kg (9.9×10^5 lbs) of U_3O_8 at a rate not to exceed an estimated 1.8×10^5 kg per year (4.0×10^5 lb/year).

The Final Environmental Statement (FES), NUREG-0687, issued in April 1981, and this Safety Evaluation Report (SER) provide the basis for the issuance of this Source Material License.

2.0 REVIEW SCOPE

This document details the staff's review of in-plant radiological safety and control programs and radiological effluent control systems for the OPI Bison Basin project. This review included an evaluation of the initial application dated August 10, 1979 and the "Radiological Safety Program" report with cover letter dated May 19, 1980 and supplement dated July 28, 1980.

A site visit was conducted by the then licensing review project manager, R. S. Kaufmann, and members of the Oak Ridge National Laboratories (ORNL) consulting staff on October 31, 1979. A scoping meeting was held subsequently on November 1, 1979 to determine state and local concerns regarding the proposal.

An inspection will be conducted by I & E Region IV staff to review OPI's development and implementation of administrative and operating procedures and monitoring programs prior to commencing commercial scale uranium extraction operations. Any problem areas identified by I & E at that time must be corrected prior to operations startup.

3.0 AUTHORIZED ACTIVITIES

The proposed license will authorize Ogle Petroleum, Inc. to solution-mine uranium from an ore body with an average ore grade of approximately 0.07% U_3O_8 at an extraction pumping rate up to 4550 liters per minute (1200 gpm). The uranium-containing solution will be extracted and concentrated at an on-site process facility into a final U_3O_8 slurry product.

3.1 Facility Description

The proposed Bison Basin project area is located in the southern part of Fremont County, Wyoming, approximately 80 kilometers (50 air miles) south of Riverton and 48 kilometers (30 air miles) southwest of Jeffrey City (see Figure 1). The mill area is situated in gently rolling terrain which slopes generally southeast at about 74 m/km. Area drainage is provided by several small ephemeral washes that discharge either into Grassy Lake or West Alkali Creek.

The project area comprises 308 hectares (761 acres), including all of Section 25, T27N, R97W and a portion of Section 30, T27N, R96W (see Figure 2). The uranium ore body covers 16 hectares (40 acres) and contains approximately 4.5×10^5 kg (9.9×10^5 lbs.) of proven recoverable U_3O_8 reserves.

The locations of the uranium recovery processing equipment and buildings including the processing recovery building, the storage tanks and personnel facilities are shown in Figure 3.

3.2 Process Operations

Standard hydrochemical concentration and precipitation processes are planned for use at Bison Basin. OPI proposes to use a lixiviant consisting of sodium carbonate/bicarbonate and oxygen or hydrogen peroxide in water. The recovery process will consist of three sequential circuits: the well field leaching circuit, the ion exchange elution/precipitation circuit, and the product preparation area. The recovery plant will have a flow capacity of up to 4550 liters per minute (1200 gpm). Figure 4 presents a process flow chart for the well field leaching circuit and the elution/precipitation circuit. A yellowcake slurry will be produced and shipped to other facilities for final product preparation. A license condition will require that any changes in the process circuit shall require the approval of the RSO and the Uranium Recovery Licensing Branch.

3.2.1 Well Field Leach Circuit

The well field leach circuit consists of the ore body, injection and recovery wells, ion exchange absorption columns, lixiviant solution makeup unit, and other auxiliary equipment as indicated in Figure 4.

Incoming pregnant leach solution from the well field will be pumped into ion exchange columns, either directly from the well field or by way of the surge tanks located outside the plant building. In the ion exchange columns, uranium (uranyl tricarbonate) will be absorbed onto resins and thereby removed from the solution. The barren fluid will then be transferred to an injection surge tank.

Before re-injection, the barren leach solution will be treated in a makeup unit to refortify the chemical activity of the solution. This will be accomplished by (1) adding sodium carbonate and/or sodium bicarbonate, (2) adding sodium hydroxide and sparging in carbon dioxide, or (3) a combination of these two methods. As the reconstituted leach solution is pumped back to the well

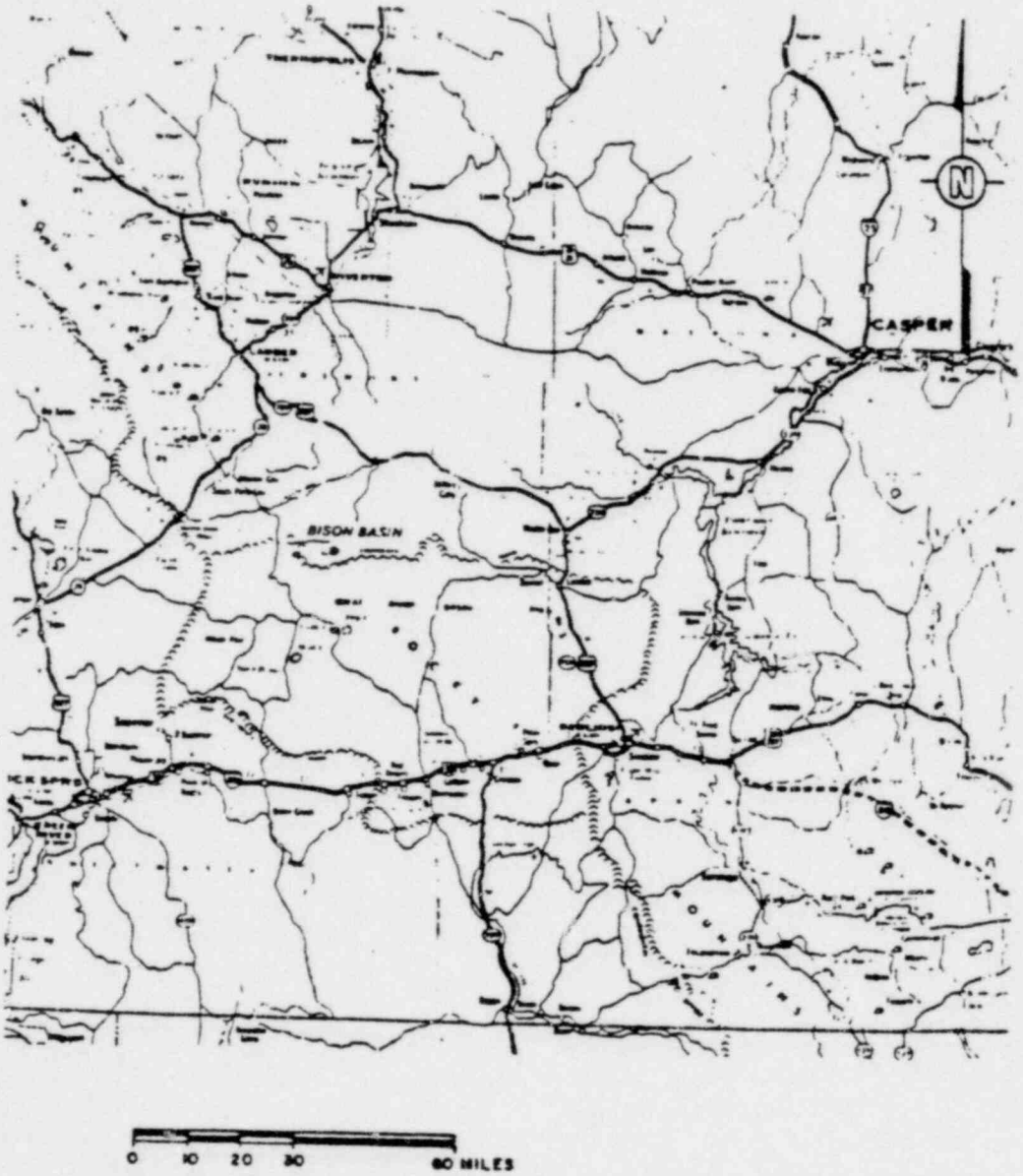


Figure 1. Map of the region surrounding the Bison Basin Project. Source: Western Nuclear, Inc., *Report 3, Environmental Effects of Present and Proposed Tailings Disposal Practices, Split Rock Mill, Jeffrey City, Wyoming*, vol. 1, prepared by D'appolonia Consulting Engineers, Inc., October 1977, adapted from Fig. 2-1.

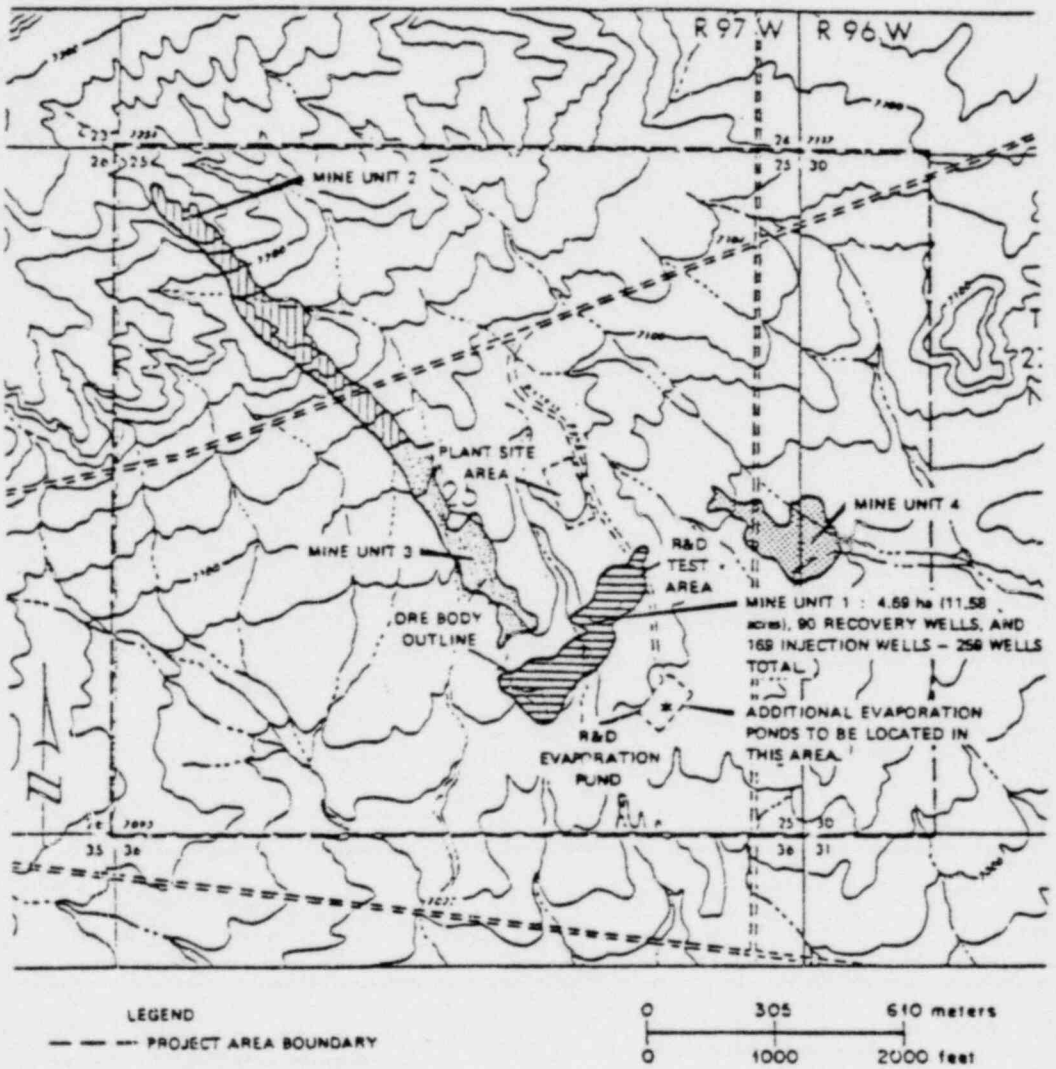


Figure 2. Bison Basin Project mining plan.
Source: ER, Fig. 3.2-1.

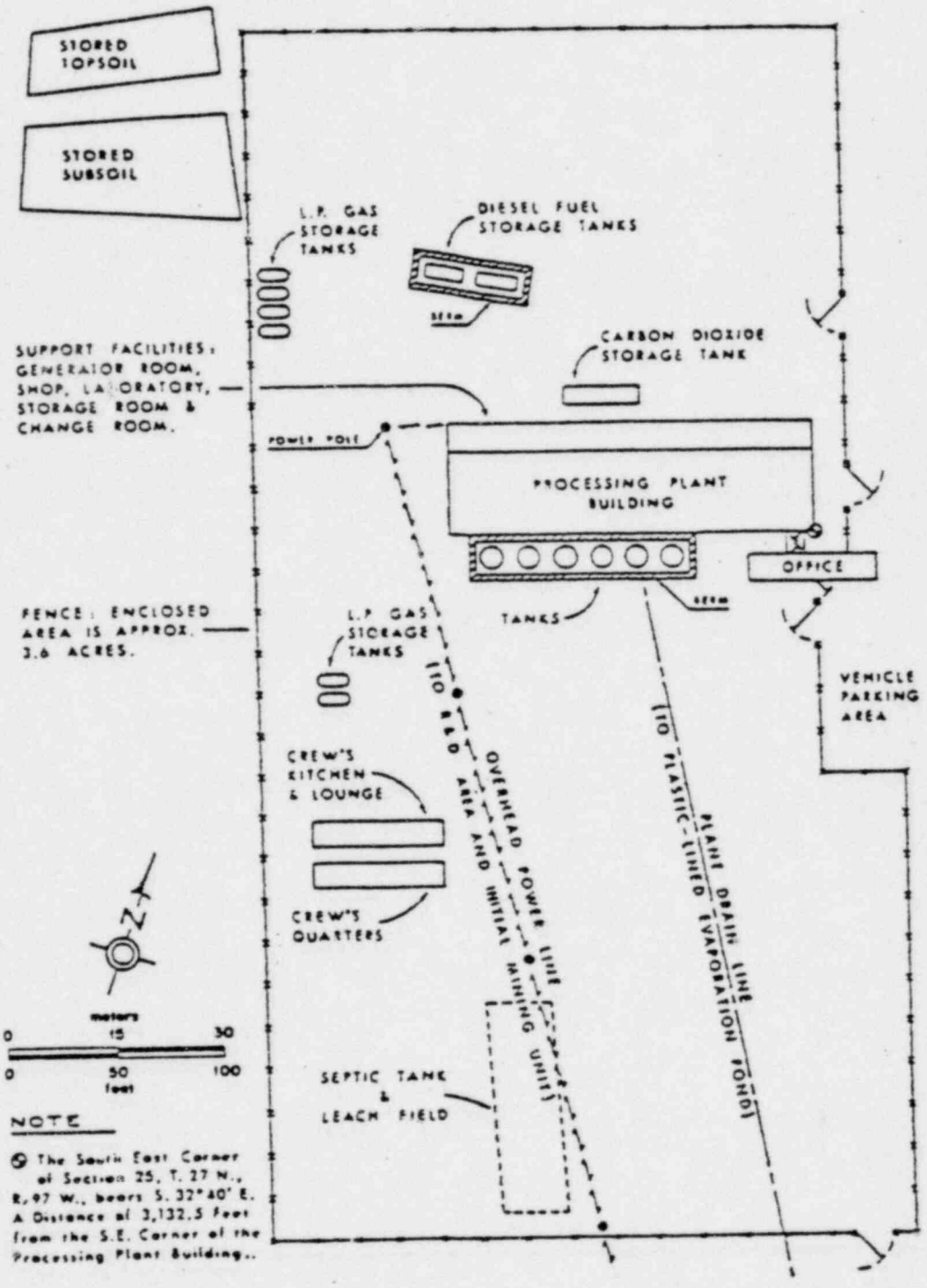


Figure 3. Plant facilities layout. Source: ER, Fig. 3.3-1.

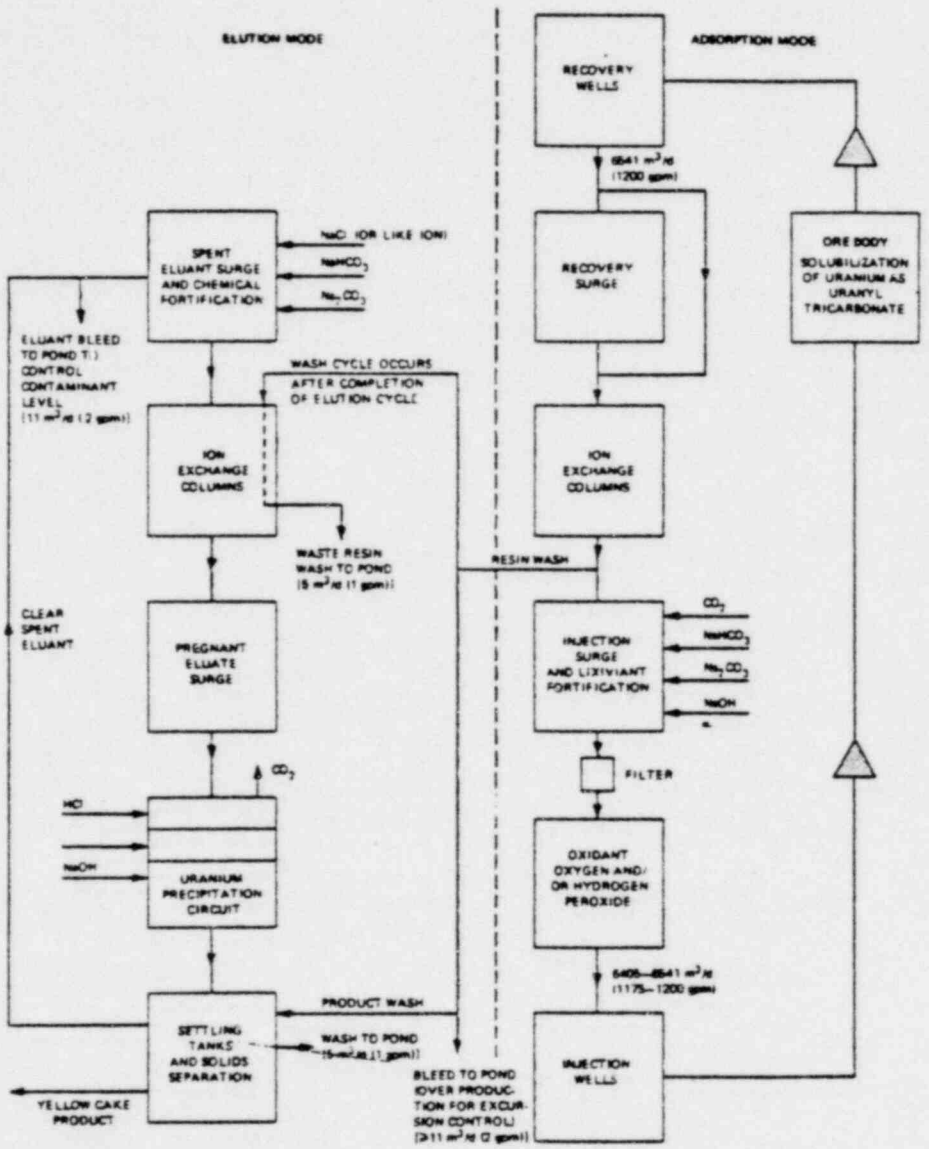


Figure 4. Uranium recovery plant schematic.
Source: ER, Fig. 3.3-2

field, it will be filtered to remove suspended solids that could plug the injection wells.

The oxidant to be used will be either hydrogen peroxide or oxygen or a combination of the two. The reconstituted leach solution, after addition of oxidants, will be metered and injected into the orebody to leach out additional uranium.

The total bleed stream routed to the evaporation ponds from various segments of the well field and elution circuits will be about 22.8 liters/min (6 gpm) as indicated in Figure 5. The net withdrawal of groundwater created by the bleed from the well field circuit will prevent well field excursions by establishing a hydraulic gradient toward the mining area and producing a constant inflow of groundwater from the surrounding aquifer. All process water used in the processing plant will be obtained from the lixiviant bleed stream.

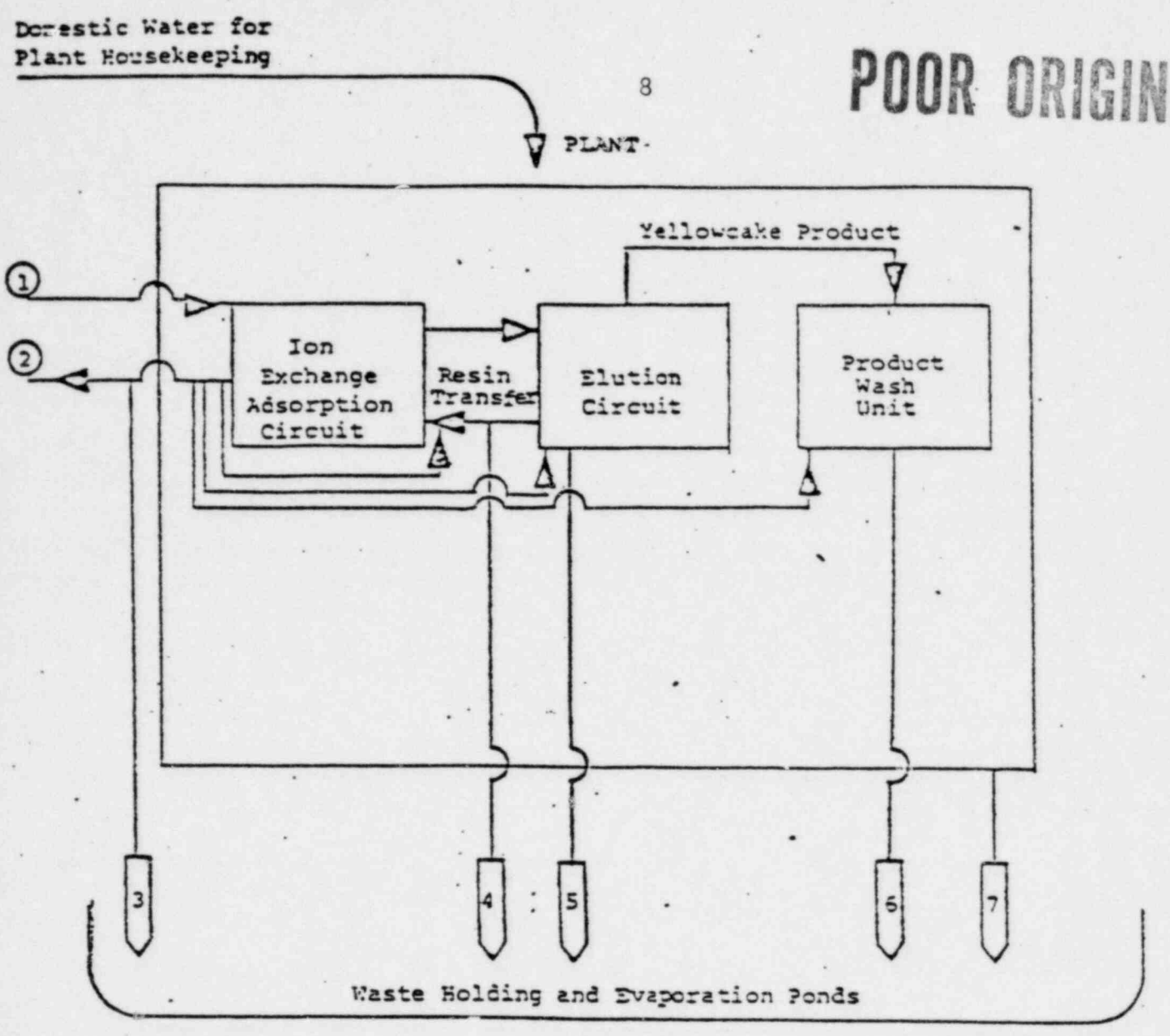
The pipeline system will consist of trunklines between the uranium recovery plant and the well field header sites and distribution flow lines from the header sites to the individual wells. The pipe proposed to be used will be either PVC, high density polyethylene, fiberglass, and/or coated and wrapped steel. The pipeline system will lie on top of the ground. All lines will be pressure-tested with compressed air before being placed in service. During operations, all pipelines will be visually inspected twice a day for leaks.

Ion exchange columns will remove uranium from pregnant lixiviant by absorption and ion exchange. During operation of the well field production circuit, the ion exchange column resins will become loaded with uranium in the form of the uranyl tricarbonate ion. It is planned to use moving bed ion exchangers. The loaded resin will be periodically eluted by batch recirculation as described in the following section.

3.2.2 Elution and Precipitation Circuit

In the elution/precipitation circuit, the uranium (as uranyl tricarbonate ion) will be eluted from the ion exchange columns by a chloride ion solution. Sodium chloride (1.5 molar) will be used as the eluting agent in conjunction with sodium carbonate or bicarbonate.

The uranium-rich eluate will be directed to a tank where hydrochloric acid will be added to break down the uranyl tricarbonate complex. Carbon dioxide will be driven off and hydrogen peroxide added. The pH will then be brought to its optimum value by the addition of sodium hydroxide. The majority of the liquid effluent from the uranium precipitation process will be fed to the eluate makeup unit for reuse. A small amount of effluent bleed (7.6 liters/min (2 gpm)) will go to the evaporation ponds. In the elution makeup unit, sodium chloride, sodium carbonate, or sodium bicarbonate will be added as necessary to reconstitute the eluant which will then be utilized in elution of uranium from a subsequent ion exchange column resin transfer.



1) From well field recovery wells up to 1200 gpm.

2) To well field injection wells up to 1194 gpm (at full flow).

3) Overproduction bleed to insure against well field excursions. (Bleed will be increased if excursion conditions require) 2 gpm

4) Resin wash and rinse. 1 gpm

5) Eluant bleed to control contiminant level in product. 2 gpm

6) Product wash stream. NOTE: All water used in the process will be obtained from spent lixiviant. This practice increases the total well field bleed and will help insure against well field excursions. 1 gpm

7) Housekeeping bleed from plant and equipment wash down. (less than 1 gpm) 6 gpm

Figure 5. Solution balance for the proposed in-situ uranium recovery facility. Source: ER, Fig. 3.3-3.

3.2.3 The Product Preparation Area

The yellowcake produced in the elution/precipitation circuit will be washed to remove absorbed contaminants prior to dewatering to a thickened slurry. The slurry will be stored in the plant building in tanks until shipment. Processing of the yellowcake slurry at the site is not planned. Instead, the yellowcake slurry (50% U_3O_8 by weight) will be shipped in specially designed and licensed trailers or in approved drums to the Kerr-McGee Nuclear Corporation hexafluoride processing plant in Gore, Oklahoma, or to one or more Rocky Mountain region uranium mills for final drying and packaging.

3.3 Possession Limits

The OPI facility will be licensed to possess onsite that amount of U_3O_8 or its equivalent produced under licensed activities.

4.0 FACILITY ORGANIZATION

4.1 Organization

An organizational chart (Figure 6) shows the responsible positions for operations and radiation safety.

The Manager of Mining, located at OPI's office in Casper, Wyoming, is responsible for the safe and efficient operation of the in situ uranium recovery and uranium processing facilities. These responsibilities include production operations, maintenance procedures, and overall security and safety practices.

The Well Field Engineer is also designated as and performs the duties of the Radiation Safety Officer (RSO) at the site. In all matters relating to radiation safety and security, the Well Field Engineer/RSO reports directly to the Manager of Mining. The RSO is responsible for the implementation of the radiation safety and environmental monitoring programs and assists the Manager of Mining in ensuring compliance with NRC regulations and license conditions. As such, the RSO and Manager of Mining have the authority to cancel, postpone, or modify any operation or process that results in increased radiological exposure to plant personnel or the public.

The WMUR staff will require by license condition that the RSO have the authority to review and approve, through written concurrence, plans for new equipment, process changes, or changes in operating procedures prior to implementation to ensure that the plans do not adversely affect radiation exposure or control. After any changes in the process circuit are completed, additional surveys and monitoring shall be performed under the direction of the RSO to determine any added impact to the environment or plant personnel. Results of these surveys and monitoring and any recommended remedial action shall be submitted to the Manager of Mining for review and action.

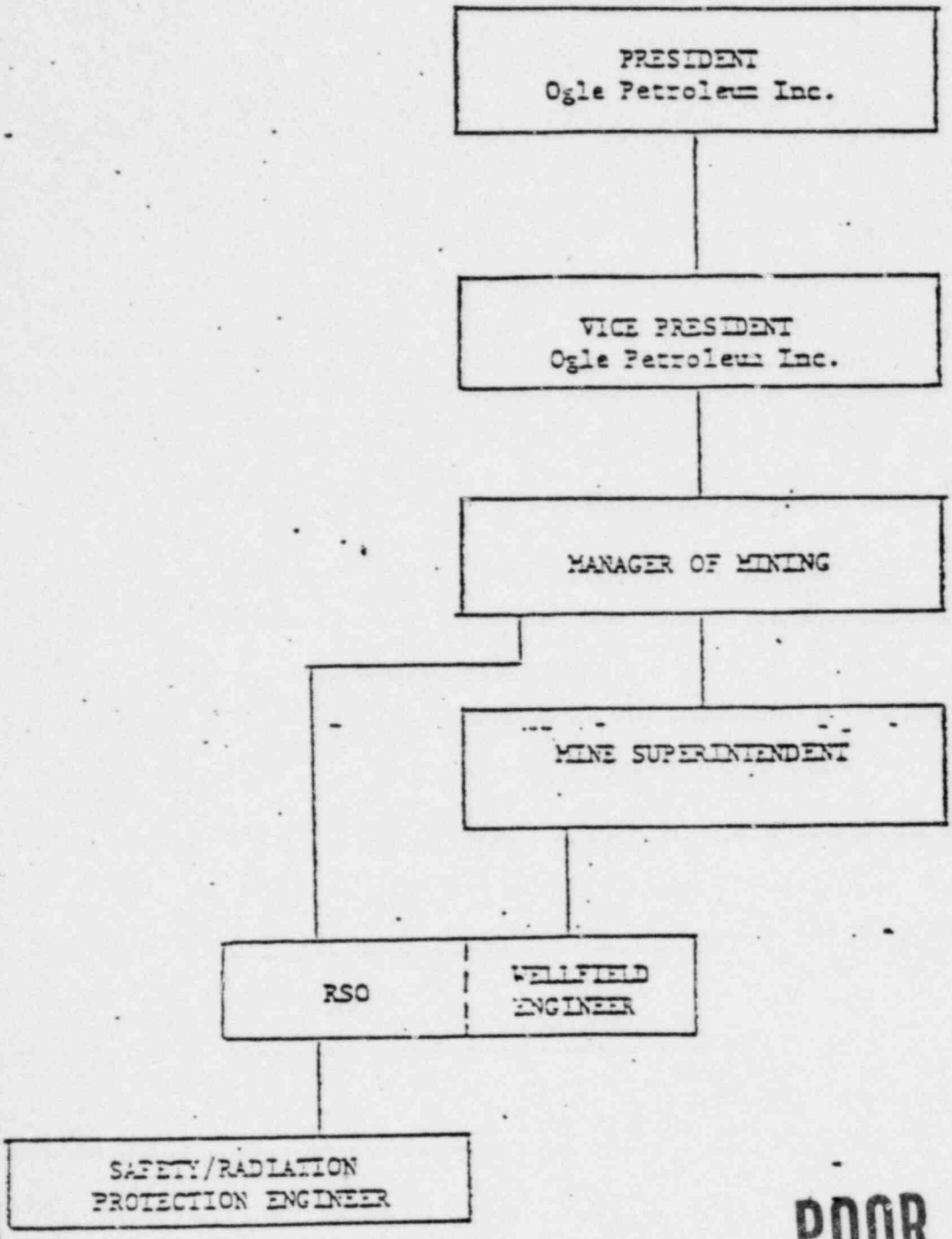


Figure 6. Facility organization.
Source: Fig. 2.1-1 of Radiological Safety Program, May, 19 1980.

4.2 Responsibilities of the Radiation Safety Staff

The applicant has provided that the RSO shall have the following responsibilities:

(1) Develops radiological protection procedures and reviews specific written procedures quarterly.

(2) Trains all personnel in radiation and industrial safety.

(3) Monitors, evaluates and maintains records of personnel exposures and plant area surveys.

(4) Monitors performance and quality control of radiological analyses.

(5) Monitors plant effluents.

(6) Provides for Radiation Safety Staff surveillance of tasks performed under Special Work Permits.

(7) Maintains plant radiation monitoring equipment.

(8) Prepares reports to regulatory agencies.

(9) Investigates personnel safety-related incidents.

(10) Performs routine inspections and submits monthly reports on these inspections to management.

A Safety/Radiation Protection Engineer assists the RSO in implementing the radiological safety program at the site. He may be assigned other tasks, but these activities must not be production-related, and must not impair his performance of radiological safety duties. The staff has determined that the RSO's responsibilities are adequate to ensure that the radiation safety program is conducted properly and are consistent with the current WMUR licensing position on the subject.

4.3 Qualifications of Radiation Safety Personnel

The applicant has described minimum qualifications for the following positions:

Manager of Mining - A Bachelor's Degree in engineering or a related physical science from an accredited college or university; a minimum of five years of management experience, three years of which must have been in the uranium in situ mining industry; demonstrated knowledge and competence in administration and personnel management; and working knowledge of radiation instruments and the biological effects of radiation.

Radiation Safety Officer (RSO) - A Bachelor's Degree in environmental engineering or physical science from an accredited college or university, equivalent relevant experience in radiation safety and contamination control at a mining facility, or a combination of relevant experience and education. He shall

have at least one year of experience in the performance of radiation safety, environmental and occupational health activities and must have a working knowledge of radiation detection instruments, biological effects of radiation and dose assessment. He must have received formal classroom instruction in the radiation safety, environmental and occupational health areas as well as instruction regarding radiation detection instruments, biological effects of radiation and dose assessment.

Safety/Radiation Protection Engineer (SRPE) - A high school diploma, sufficient exposure and/or training to enable him to perform assigned surveillance, sampling and analytical duties, and formal classroom instruction in radiation monitoring and safety and contamination control. In addition, he must have received special training and instruction from the RSO regarding the execution of his specific tasks and what is required to assist the RSO.

The staff notes that the RSO designate for the Bison Basin facility has a Bachelor's Degree in physical science and over one year of experience as a designated RSO at an operational in situ uranium solution mining operation. He has received limited formal classroom training and on-the-job experience in radiological safety and monitoring.

Since the staff recognizes that the day-to-day operation of the radiation safety program is under the control of the RSO and the SRPE then it will require by a license condition that the RSO meet the minimum qualifications of an RSO as described in Section 2.4.1 of Regulatory Guide Task OH 941-4, "Information Relevant to Ensuring that Occupational Radiation Exposures at Uranium Mills will be as Low as is Reasonably Achievable." The Safety/ Radiation Protection Engineer shall, likewise, also meet the minimum requirements of a Health Physics Technician as outlined in Section 2.4.2 of the aforementioned guide. These are:

Radiation Safety Officer

In addition to the above qualifications, the RSO shall have one year of work experience in applied health physics, radiation protection, industrial hygiene, or similar work. This experience should involve actually working with radiation detection and measurement equipment rather than only administrative or "desk" work. Furthermore, the RSO shall have completed a formalized intensive course in health physics of at least 4 weeks duration. At least 1 week of the course should be specifically applicable to health physics problems associated with uranium recovery facilities. Also, the RSO shall attend a health physics refresher course every two years. Finally, the RSO shall have a thorough knowledge of the proper application and use of all health physics equipment used in the facility, the chemical and analytical procedures used for radiological sampling and monitoring, and methods used to calculate personnel exposure to uranium and its daughters.

Safety/Radiation Protection Engineer

The SRPE shall have an associate degree in the physical sciences, engineering, or a health-related field. Alternatively, a high school diploma plus two years of relevant work experience in applied radiation protection are

acceptable. In addition, the SRPE shall have one year of previous work experience in an uranium recovery facility or related industry involving radiation protection. Furthermore, one year of work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in an uranium recovery facility shall be required. The SRPE shall have completed at least 4 weeks of formalized training in radiation health protection for uranium recovery facilities. Finally, a working knowledge of the proper operation of health physics instruments used in the facility, surveying and sampling techniques, and personnel dosimetry requirements shall be required.

5. RADIOLOGICAL SAFETY AND ENVIRONMENTAL ADMINISTRATION

5.1 Administrative Procedures

The applicant has committed to the establishment of written operating procedures in its overall management program that will control all aspects of the uranium processing operations, including the radiation safety program and the environmental monitoring and control program. These operating procedures will be reviewed and approved in writing by the RSO prior to implementation. All administrative policies and procedures for sampling, analyses, surveys, monitoring, equipment calibration, training, auditing and reporting will be documented in order to clearly delineate the various authorities and responsibilities for each level within the organization structure with regard to safety-related activities.

A Health and Safety Manual will comprise all health and safety procedures and will 1) provide details of the health and safety procedures used for radiological protection, 2) define monitoring and reporting procedures, 3) describe monitoring equipment and its locations and uses, and 4) describe the use of Special Work Permits (SWPs). The Manual will be available to all employees. In addition, specific written procedures shall be kept in the plant areas to which they apply, and these procedures will be reviewed at least quarterly.

Prior to commencing uranium extraction operations, OPI will develop and document a system for routine preventive maintenance to assure the reliability of plant safety equipment. A schedule for preventive maintenance will be developed and carried out in accordance with approved procedures. A Special Work Permit (SWP) will be required for work on non-routine maintenance jobs where the potential exists for exposures to airborne concentrations in excess of 25 percent of 10 CFR Part 20 limits and where no written standard operating procedures previously exist. The procedure for obtaining a SWP will be as follows:

1) The need for the nonroutine activity will be defined and approved in writing by the Mine Superintendent. Definition of the work to be performed will include specific work location, duration of time at the location, types of work to be performed, and personnel to be employed.

2) The RSO will review the SWP to determine the health hazards of the proposed work to personnel. The RSO's written approval of the proposal will include designation of any precautions necessary to reduce exposures to personnel. The Radiation Safety Staff will provide appropriate respiratory equipment and surveillance for the operation.

All supervisors will be trained in the use of SWPs. SWPs will be kept on file for five years.

In addition to the above, the staff will require, by a license condition, that the Health and Safety Manual be reviewed annually by the RSO. The RSO should indicate by signature and date his completion of the annual review. Furthermore, if the RSO is not available to review the SWPs, that authority shall be delegated to the Safety/Radiation Protection Engineer or other supervisory personnel who have received specialized training in the review and approval of SWPs.

Furthermore, all sampling and monitoring data, calibration records, reports on audits, inspections, and other analyses, training records, and safety meeting minutes, as well as 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 years. With the addition of these requirements, the staff has determined that these administrative procedures are adequate to assure that all operations are reviewed for health and safety problems, documented, and maintained.

5.2 Inspection and Audit Programs

5.2.1 Inspection Program

The RSO and/or the Safety/Radiation Protection Engineer will conduct daily walk-through inspections of the work area to ensure proper implementation of good safety practices, including good housekeeping and cleanup practices, and operation of ventilation equipment. Any findings of noncompliance with operating procedures, license requirements or safety practices affecting radiological safety will be reported to the RSO.

A monthly, unannounced walk-through inspection of all work and storage areas will be conducted and documented by the RSO and/or the Safety/Radiation Protection Engineer to ensure the effectiveness of the radiation safety program.

Appropriate actions will be taken promptly by the RSO to correct any problems or deficiencies noted during inspections. The RSO will document inspection results and follow-up actions in a monthly report to the Manager of Mining.

The WMUR staff has concluded the following additional inspections and reports are necessary to achieve an adequate review of radiological practices. These include:

Documentation of the daily walk-through inspection. Problems observed should be noted in writing in a daily inspections' logbook. The entries should be dated, signed, and maintained on file. The RSO should review each day's findings of violations of radiation safety procedures or other potentially hazardous problems with the Manager of Mining and other facility employees who have authority to correct the problem. Also, the RSO should review the daily workorder and shift logs on a regular basis to determine that all jobs and operations having a potential for exposing personnel to uranium, especially

those jobs that would require a radiation survey and monitoring, were approved in writing by the RSO or his staff prior to initiation of work on a SWP.

A weekly inspection by the Safety/Radiation Protection Engineer of all work and storage areas and a brief summary report submitted to the RSO on any items of noncompliance with operating procedures, license requirements, or safety practices affecting radiological safety.

In addition to the monthly inspection routine specified by the applicant, the RSO shall review all monitoring and exposure data for the month. The RSO's monthly report to the Manager of Mining shall also contain (1) a summary of personnel exposure data, including bioassays and time-weighted calculations, and (2) a summary of all pertinent radiation survey records. The report shall provide a description of unresolved problems and the proposed corrective measures. Monthly summary inspection reports signed and dated by the RSO, shall be maintained on file.

5.2.2 Independent Audit

The applicant has committed to an annual audit of all aspects of the in-plant radiation protection program to be conducted by another corporate official or an outside consultant. The results of this audit will be documented in a report which identifies problem areas and necessary corrective actions which must be taken by the RSO. Where actions identified as being necessary in the audit are not taken, the reasons for not taking such actions will be documented. The outside consultant shall also perform an audit once per quarter during the first year of operation and will be available to the RSO for telephone consultations during the first year of operations.

The staff has concluded that the independent audits should be conducted more frequently to permit the recommendations of the audit to be incorporated into the operational program in a timely fashion. Also, the proposed audit description lacks essential details concerning its review of ALARA efforts. Consequently, the following will be required by license condition. The frequency of the independent audit shall be semiannual rather than annual. If the RSO does not perform the audit, the qualifications of the independent consultant shall at a minimum meet the qualifications required of an RSO as presented in Section 4.3 of this SER. The semiannual audit report of the consultant shall be submitted to the Manager of Mining, the Uranium Recovery Licensing Branch, and I&E, Region IV. In order to evaluate the ALARA objective, the applicant shall review the following records as part of the semiannual audit.

1. Exposure records (external and time-weighted calculations)

2. Bioassay results

3. Log entries and summary reports of all inspections by the radiation safety staff

4. Training program activities

5. Safety meeting minutes and attendance records

6. In-plant radiological survey and sampling data

7. Environmental radiological effluent and monitoring data

8. Reports on overexposures submitted to NRC, MSHA, or the State

9. Reviews of operating and monitoring procedures completed during this time period

10. Review of Special Work Permits (SWPs) which required that additional radiological monitoring and sampling be performed.

Since the primary purpose of the audit is to evaluate the ALARA program, it shall specifically discuss the following:

1. Trends in personnel exposures for identifiable categories of workers and types of operational activities

2. Trends in radiological effluents

3. The performance of exposure and effluent control equipment; whether it is being properly used, maintained, and inspected

4. Recommendations on ways to further reduce personnel expsoure and effluent releases of uranium and its daughters.

5.3 Management Commitment to ALARA

OPI has committed to maintaining occupational radiation exposure as low as is reasonably achievable (ALARA) at the Bison Basin site. This commitment shall be reflected in company policy and all personnel training programs. Annual ALARA program audit reports will include a review of all inspections and audits performed during the year as well as employee exposures, effluent release data and environmental data to determine (1) if any upward trends are developing in personnel exposures or effluent releases, (2) if exposures and effluents might be reduced under the ALARA concept, and (3) if equipment for exposure and effluent control is being properly used, maintained and inspected. This review shall encompass previously collected data from the radiation safety and environmental monitoring programs.

The proposed management commitments were found to be inadequately expressed to assure the staff that the ALARA program would be adequately reviewed. The staff will require that more detailed audits as specified in Section 5.2.2 of this document be performed more frequently; semiannually rather than annually.

5.4 Training

The applicant has proposed that all persons, both process and administrative personnel, to be employed at the site will receive at least a three-hour orientation briefing covering the following topics: 1) the plant process, 2) radiation dose limits, 3) inhalation of radon and its progeny, 4) the radiation monitoring program, and 5) the radiation training manual. Each employee will be required to pass a written test on his understanding of radiation safety and hygiene. Test results will be maintained in each employee's file.

Short refresher sessions of no less than thirty minutes in length will be given to each employee once per month. Every two years each employee will receive a regular three-hour refresher session.

Additional written instructions will be provided to each employee who is required to work in the process building. Specific instructions will be provided for handling spills and maintaining clean working conditions, personal hygiene and basic radiological safety practices. Special training in the use of monitoring and safety equipment will also be provided.

In addition to the above, the staff will require by license condition that workers who fail the test shall be retested. These tests and results shall be maintained on file. Each permanent worker shall be provided the full refresher training course annually rather than every two years. Documented successful completion of the retraining course shall also be maintained on file. Retraining shall include relevant information that has become available during the past year, a review of safety problems that have arisen during the year, changes in regulations and license conditions, exposure trends, and other current topics. Retraining shall be given to employees whenever procedures or processes are changed.

Furthermore, all new workers, including supervisors, shall be given specialized instruction on the health and safety aspects of the specific jobs they will perform. This instruction shall be in the form of individualized on-the-job training. Supervisors shall be provided additional specialized training on their supervisory responsibilities in the area of worker radiation protection. All employees shall sign a statement verifying that they received job-specific safety training. The statement shall indicate the dates the training was received and be cosigned by the instructor. Also, at least once every two months all workers shall attend general mill safety meetings with radiation safety matters being offered for discussion at the meeting.

All visitors who have not received training shall be escorted by someone properly trained and knowledgeable about the hazards of the facility. As a minimum, visitors shall be instructed specifically on what is necessary to avoid possible hazards in the areas of the facility they will be visiting.

Contractors having work assignments in the facility shall also be given appropriate training and safety instruction. Contract workers who will perform work on contaminated equipment shall receive the same training and safety

instruction normally required of all permanent workers. Only job-specific safety instruction is necessary for contract workers who have previously received full training on prior work assignments at the facility within the last year.

The staff has determined that the scope of the OPI training program as supplemented by the requirements added by the WMUR staff is adequate and comparable to the training programs conducted by similar facilities.

5.5 Restricted Area Markings and Access Control

The plant facilities and evaporation ponds will be fenced to restrict access. All entrances to the plant will be posted with the warning "CAUTION-ANY AREA OR ROOM WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

The WMUR staff will provide, through a license condition, that the applicant be exempted from the requirements of Section 20.203 of 10 CFR Part 20 for posting areas within the process facility.

6. RADIATION SAFETY CONTROLS AND MONITORING

6.1 Effluent Control Techniques

6.1.1 Radon and Other Gaseous Effluents

The only radionuclide expected to be released in significant quantities during operation of the processing plant is radon-222 and its progeny. The primary source of release will be the surface of solutions originating from the well field. In order to prevent the buildup of radon concentrations in the process facility, the surge tanks containing recovery solutions will be located outside the building. Lesser sources of in-plant radon contamination, such as the ion exchange columns, will be vented to the outside via hoods and evacuation fans. Operations shall be immediately suspended in the affected areas of the facility if any of the fans or hoods become inoperative.

If radon gas released into the process building is not purged, then the subsequent buildup of radon progeny could present a significant inhalation hazard. When confined, radon progeny can reach 95% of equilibrium within two hours after release of the precursor, assuming no removal mechanism such as plateout occurs.

The primary nonradioactive gas produced will be carbon dioxide released from the precipitation curcuit during acidification of the uranyl tricarbonate by hydrochloric acid. Other gaseous releases will occur from electrical generators and will be exhausted to the outside of the building.

The staff will require by license condition that the data from the first six months of the in-plant airborne monitoring program, presented in Section 6.5, be submitted to the Uranium Recovery Licensing Branch for review to determine the adequacy of the ventilation equipment.

6.1.2 Liquid Effluents

During uranium recovery, liquid effluents from the plant will be directed to four evaporation ponds. The waste stream flow will be approximately 22.8 liters/min (6 gpm). Aquifer restoration will contribute 65 liters/min (17 gpm) of waste brine to the waste stream at a later stage of operation.

The staff will require by license condition that all liquid effluents including sink and shower discharges and laundry wastes from the process plant buildings and change or shower rooms, with the exception of sanitary wastes, shall be returned to the process circuit, discharged to the solar evaporation pond, provided that there is no adverse reaction with the liner, or solidified for offsite disposal.

6.2 In-Plant External Radiation Monitoring Program

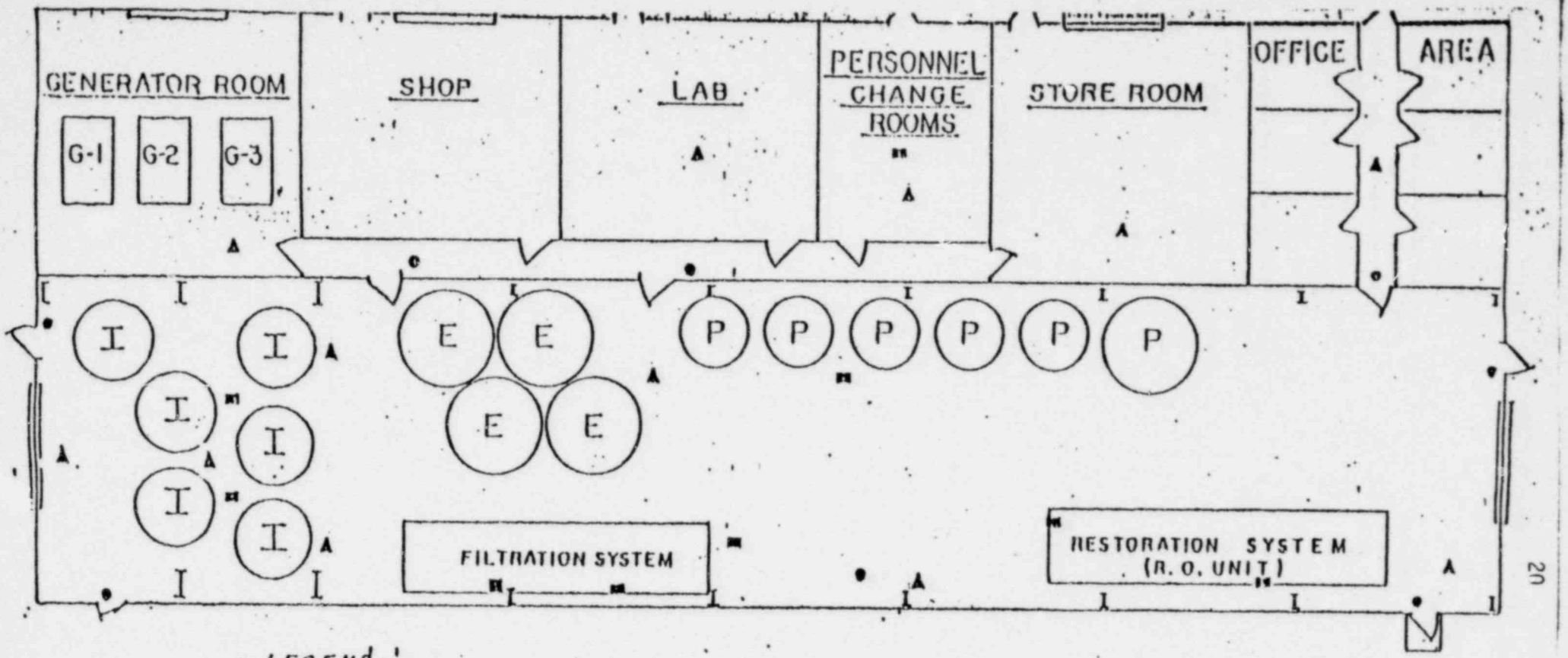
The restricted area will be surveyed on a quarterly basis to determine gamma radiation exposure rates (in mR/hr) using a beta-gamma survey meter. The nine initial survey locations are shown in Figure 7. Results of the initial survey will determine the sampling locations for normal plant operations.

The staff will require by license condition that any changes made in the external radiation survey locations shall require the review and approval of the NRC in the form of a license amendment. Also, the staff will require that the first six months of in-plant external gamma data be submitted to the Uranium Recovery Licensing Branch for review to determine the adequacy of the monitoring program. Subject to the above conditions, the WMUR staff has determined that OPI's in-plant external radiation monitoring program is adequate for hazards anticipated and is consistent with standard health physics practices.

6.3 Personnel External Radiation Dose Monitoring

Whole body TLD badges will be used to estimate external exposures to all employees at the facility. The badges will be read and documented at least once per quarter. Results will be recorded in total dose equivalent (mrem) to the skin (nonpenetrating) and dose equivalent of penetrating radiation to the total body.

The staff has concluded and will require by license condition that the personnel dosimeters shall be exchanged on a monthly basis. In addition, the applicant will be required to submit to the Uranium Recovery Licensing Branch a statistical summary report of the first twelve months of exposure data and the copies of the monthly exposure data. Both the annual summary and the monthly data shall have the employee exposures listed by work classification. This data will then be reviewed by the staff to determine whether a continuing personnel dosimetry program for external radiation shall be required.



— LEGEND —

I ION EXCHANGE COLUMNS

E ELUANT TANKS

P PRECIPITATION TANKS

GAMMA RADIATION EXPOSURE MEASUREMENT

ALPHA SURFACE CONTAMINATION SURVEYS

RADON GAS AND RADON PROGENY

SCALE: 1/16" ≈ 1 FOOT

Figure 7.
Source: OPI July 18, 1980 submittal.

6.4 Contamination Control Program

6.4.1 Area and Personnel Contamination Controls

The applicant has proposed that all clean areas (e.g., administration offices, eating areas, change rooms, and control rooms) will be surveyed for alpha surface contamination at least once per quarter. The frequency of these surveys may be increased based on results obtained. Contamination survey records will be maintained in terms of dpm/100 cm^2 total and removable alpha activity. Total alpha activity will be monitored using an alpha survey meter. Removable alpha activity will be monitored using dry swipes. The staff has concluded that alpha contamination control surveys as specified by the applicant are acceptable with the following exceptions:

1. Surveys of change rooms and eating areas shall be on a weekly basis. Surveys of control rooms and administrative offices shall be on a monthly basis. If the licensee proposes to analyze urine bioassay samples at an onsite laboratory, the licensee shall also survey all surfaces used for sample preparation preceding the bioassay analyses.

   If the alpha contamination levels exceed those listed in the enclosed "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", dated November 1976, the area shall be decontaminated. The source of the contamination shall be shall be determined, control measures shall be initiated, and the results shall be documented. Additionally, any contamination outside the process building shall be maintained as low as is reasonably achievable.

2. The criteria for the release of equipment from the restricted area shall be in accordance with the enclosed "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," dated November 1976.

3. Additional surveys shall be conducted at the direction of the RSO following any spill or leakage of radioactive solutions which could present an airborne hazard after drying.

The applicant has committed to providing protective clothing whenever significant contamination can occur and providing all facility personnel with change room and shower facilities. An alpha radiation survey meter will be available in the change room for employees to monitor their skin and clothing. Alpha contamination on skin or clothes greater than 1,000 dpm/100 cm^2 will be cause for additional showering or decontamination and an investigation by the RSO.

The staff has concluded that the above commitments do not ensure a personnel contamination control program that provides maximum protection to the worker. Accordingly, the staff will require by license condition that workers who are involved in the packaging or transport of the yellowcake product and maintenance workers who work on process equipment containing yellowcake wear

protective clothing including coveralls and boots or shoe covers. Workers that package or transport the yellowcake product shall be provided gloves. Before leaving the restricted area any worker who is involved with the handling of yellowcake product or maintenance of equipment which contains yellowcake shall either shower and/or monitor their face and hands using a calibrated alpha survey instrument. Where alpha monitoring is used, exclusive of showering, the monitoring results shall be documented and maintained on file. In addition, the licensee shall perform spot surveys for alpha contamination at least quarterly on workers leaving the facility proper.

Records shall be maintained of the investigations in which alpha contamination on skin or clothes has exceeded 1000 dpm/100 cm^2.

The addition of the above license requirements will provide for an acceptable area and personnel contamination control program that meets standard health physics practices.

6.4.2 Contaminated Wastes

All contaminated wastes, according to the applicant's proposal, will either be transported off-site in approved containers to a licensed disposal facility or be disposed of in the evaporation ponds. Wastes in the evaporation pond will be finally disposed in a licensed disposal facility. OPI will file a plan, within one year of receiving the license, that will describe the final disposal of the radioactive wastes including identifying the probable disposal site.

The staff has determined and will require by a license condition that only liquid wastes shall be disposed of into the evaporation pond. Solids wastes, including degraded resin and any ore zone core samples, shall be placed in containers for disposal offsite at a commercial low-level disposal site or a NRC licensed uranium tailings impoundment.

Subject to the above requirements, the WMUR staff has concluded that the program for the control of contaminated wastes is adequate and consistent with current licensing policy at uranium recovery facilities.

6.5 In-Plant Airborne Radiation Monitoring Program

OPI has committed to monitoring for in-plant airborne radiation. When monitoring for radon gas, radon progeny, and airborne particulates, all measurements shall be taken under conditions typical of employee exposures. In addition, where there is spill cleanup or maintenance that may lead to suspension of airborne particulates, there shall be a portable airborne particulate measurements made using portable instruments.

6.5.1 Radon-222 and Progeny

The applicant has proposed to monitor for both radon gas and radon progeny. Radon gas air samples will be collected using scintillation cells near the ion exchange columns where workers may be present and at a total of twelve locations in the process building (see Figure 7). Sampling frequency will be determined

by radon concentrations measured during the first few months of operation but is presently proposed to be monthly. Radon progeny will be monitored using the modified Kusnetz method. The sampling locations and frequency will be similar to those presented above for radon-222 samples.

Although NRC regulations permit measurements of concentrations of either radon-222 itself or the radon daughters, the staff considers measurements of the radon progeny to be more appropriate measurements and more relevant in terms of hazard to the worker, as well as being easier to obtain. The staff has concluded that the above sampling locations, methods, and associated sensitivities as presented by the applicant are adequate to determine the concentrations of radon-222 and its progeny. The sampling frequency shall be monthly to provide sufficient data to permit quarterly working level determinations. If radon progeny or radon concentrations are found to exceed 8 pCi/l or 0.08 WL (Working Levels), respectively, surveys shall be performed on a weekly basis. Such weekly sampling shall be maintained until four consecutive weekly samples are less than 8 pCi/l or 0.08 WL. Any changes in the monitoring locations or methods shall require a license amendment.

6.5.2 Airborne Uranium Particulates

Since the final product is in slurry form, the applicant considers that contamination by airborne particulates should not be a significant problem during normal operations. The only other source of radioactive airborne dust other than radon progeny is from the resuspension of dried yellowcake spilled from process equipment. Maintenance and housekeeping procedures at the facility will ensure a small source term. Immediate cleanup of spills to activity levels consistent with ambient background levels should preclude potential problems with airborne dust.

The staff has concluded that exposure to airborne particulates may still result from the drying of yellowcake spills or maintenance activities. The applicant has proposed to collect monthly air samples at several locations within the facility and count for gross alpha activity. However, this method is unacceptable due to U-238's very low specific activity. Considering this, and conservatively assuming that U-238 is totally soluble, monthly air monitoring for uranium shall be required in all process areas from the precipitation phase through packaging or loading of the yellowcake slurry. The frequency shall be increased to weekly for any restricted area meeting the limits of an "airborne radioactivity area" as defined in 10 CFR Part 20.203(d) and an investigation of the high levels shall be made. Any changes in the monitoring locations or methods shall require a license amendment.

Furthermore, the calculation of internal exposure to radon and/or uranium shall be based on a TWE (time weighted exposure) calculation incorporating a consideration of both occupancy time and average airborne concentration. If occupancy times are established as an average for each category of worker, then the licensee shall also be required to review, by means of a semiannual documented time study, the basis upon which average occupancy periods are established.

If an employee reaches an action level of 25 percent of the maximum permissible exposure on calculated TWE for the week or calendar quarter, dependent on the solubility of the material, then the RSO shall initiate an investigation of the employee's work record and exposure history to identify any problem areas. If any probem areas are noted, they shall be studied and the necessary corrective measures shall be taken to ensure reduction of future exposures to as low as is reasonably achievable. Records shall be maintained of these investigations. These requirements are contained in a license condition.

6.6 Bioassay Program

The applicant has proposed no routine bioassay program since the uranium product will be present only in a solution or slurry form. However, the applicant did commit to obtaining baseline urine samples from all employees prior to initial assignment at the facility. When a potential inhalation has occurred due to a spill or other identifiable hazard, urine samples will be taken for urinalysis from all personnel potentially exposed. Air particulate sample results indicating consistent elevation above 25 percent at the permissible limit or derived air concentrations shall be cause for implementation of a more extensive bioassay program.

The staff has concluded that bioassay, in the form of an urinalysis program, shall be required by license condition. While workers are not routinely exposed to dry yellowcake, exposure may occur due to the drying of spills or during maintenance activities. The probability of ingestion also exists, expecially for those workers who routinely handle the soluble yellowcake product. Also, a bioassay program helps to determine whether the airborne monitoring program is adequate. The staff shall require, by license condition, the implementation of an urinalysis program as prescribed in Regulatory Guide 8.22 "Bioassay at Uranium Mills," with the following exceptions.

1. The licensee shall perform baseline urinalyses for all permanent employees prior to inital assignment at the facility.

2. The frequency of urinalysis sample collection and analysis shall be monthly.

3. Anytime an action level of 15 µg U/l of urine is reached or exceeded for any worker, the licensee shall provide documentation to the U.S. Nuclear Regulatory Commission indicating what corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22. This information shall be included and submitted with the semiannual ALARA audit report.

   Anytime an action level of 30 µg U/l for four consecutive urine specimens is reached or exceeded, the licensee shall provide documentation within 30 days to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, and U.S. Nuclear Regulatory Commission, Region IV, Office of Inspection and Enforcement, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011, indicating what corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22.

6.7 Quality Assurance Program and Instrument Calibration

The applicant has committed to a documented quality assurance program for all sampling and analyses performed as part of the in-plant radiological safety program. All check sources will be National Bureau of Standards traceable. The staff will require by license condition that the applicant submit to the Uranium Recovery Licensing Branch for review and approval before the initiation of uranium recovery operations complete specifications of a quality assurance program that includes all of the elements recommended in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."

The staff has determined that the applicant shall recalibrate all radiation monitoring, sampling, and detection equipment after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. Records shall be maintained of the repairs, modifications, and calibration of all instruments. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each use. Furthermore, for airborne radioactive particulate samplers, air flow rates through filters shall be determined by calibrating pumps for the filter paper used and the altitude of the facility.

7. EMERGENCY PROCEDURES

The RSO will establish emergency procedures for the project. A detailed Spill Prevention Countermeasure and Control Plan will also be prepared prior to commencing uranium extraction. Accidents which are possible for this type of activity have been identified in Section 4 of the FES (NUREG-0687). Precautions and measures which the applicant will take to reduce the possibility of occurrence of these accidents include the following:

1. Surface Piping

   Most of the piping at Bison Basin will be at the surface for ready detection and repair of leaks.

2. Evaporation Pond

   OPI will sample the standpipes of the leak detection system of the evaporation ponds once every two weeks for presence of liquid. If liquid is present, OPI will analyze the liquid to determine if the pond is leaking. In the event of a leak, the content of the pond can be emptied into an adjacent pond and the leak repaired.

   In addition, the impoundment embankments and capacity design will be reviewed and approved by the NRC prior to commencing uranium extraction at the site. The embankments will be routinely inspected during the plant life.

3. Spill Prevention and Containment

OPI will equip tanks containing hazardous liquids with high- and low-level alarms to minimize the probability of spillage due to tank overflow or leakage. A sump will be constructed in the plant building to drain any leaks from the tanks. Dikes and/or curbs shall be constructed around process chemical and fuel storage tanks that are outside of the plant building. Each area enclosed by the dikes and curbs shall be large enough to contain the full contents of at least a single tank. The staff will require by a license condition that the dikes or curbs be large enough to contain the full contents of the largest tank.

8. DECOMMISSIONING

All surface lands disturbed in the in situ uranium recovery operation will be reclaimed to the pre-mining use of wildlife and livestock grazing in conformance with the U.S. NRC "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," November 1976, and with U.S. EPA Environmental Standards for cleanup of open lands and building in effect at the time. This topic is covered in detail in Section 2.3.10.5 of the FES (NUREG-0687).

9. SURETY REQUIREMENTS

The applicant has secured bonding to ensure the availability of funds to complete restoration and reclamation in order to satisfy bonding requirements of the state of Wyoming. The NRC's regulations also require that financial surety be provided to ensure the availability of adequate funds for site decomissioning, decontamination, reclamation, and any long-term surveillance that may be required. However, because the existing bond may not fully satisfy NRC requirements, the NRC will stipulate by license condition that surety arrangements satisfying NRC regulations be in place and approved by the NRC prior to the commencement of mining operations beyond the research and development well-field area. The staff will require that surety arrangements be reviewed and revised annually to account for current costs and project status factors.

10. CONCLUSION

Upon completion of the safety review of the applicant's license application and supplements, the WMUR staff has concluded that the proposed OPI operations described in this SER and the FES (NUREG-0687), subject to all conditions imposed by the staff, will be protective of public health and safety and fulfills the requirements of 10 CFR Part 20.

The staff, therefore, recommends that OPI be issued a license subject to the following conditions:

9. The authorized place of use shall be the licensee's permit area, as defined in Appendix C of the approved Wyoming State Mine Permit application document submitted to NRC under cover letter dated April 7, 1981. The permit area, containing approximately 751 acres, consists of Section 25, T27N, R97W, and a portion of Section 30, T27N, R97W, located in Fremont County, Wyoming.

10. The authorized use shall be for the recovery of natural uranium by in situ solution mining of uranium ore bodies underlying not more than a total of 16.6 ha (41 acres) of well field area in accordance with statements, representations, conditions, and commitments contained in the licensee's Environmental Report (ER) Sections 2.1, 2.6.1.7, 3.2, 3.3, 3.4, 4.1, 4.3, 5.5, 6.1, 6.2, 6.4.2.2, 6.9, 7.1, 9.1.4, and 9.2, dated August 10, 1979, and supplements dated May 19, 1980, and July 18, 1980. With respect to the named supplements and ER Sections, whenever the word "will" is used, it shall denote a requirement. Notwithstanding the above, the following conditions shall override any conflicting statements contained in the licensee's ER and supplements.

11. The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR Part 20 for areas within the plant, provided that all entrances to the plant are conspicuously posted in accordance with Section 20.203(e)(2) and with the words, "CAUTION - ANY AREA OR ROOM WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

12. The Radiation Safety Officer (RSO) shall concur in writing on plans for new equipment, process changes, or changes in operating procedures prior to implementation to ensure that they do not adversely impact radiation safety. The RSO shall certify the need and extent of additional surveys and monitoring required due to changes in plant facilities, equipment, or the process. The RSO shall provide the results of such surveys and recommended remedial actions, when necessary, to the Manager of Mining for review and approval.

13. In addition to the qualifications specified in Section 2.3 of the "Radiological Safety Program" submittal, dated May 19, 1980, the RSO shall have one year of work experience in applied health physics, radiation protection, industrial hygiene, or similar work. This experience shall involve actually working with radiation detection and measurement equipment rather than only administrative or "desk" work. Furthermore, the RSO shall have completed a formalized intensive course in health physics of at least 4 weeks duration. At least 1 week of the course shall be specifically applicable to health physics problems associated with uranium recovery facilities.

Also, the RSO shall attend a health physics refresher course every two years. Finally, the RSO shall have a thorough knowledge of the proper application and use of all health physics equipment used in the facility, the chemical and analytical procedures used for radiological sampling and monitoring, and methods used to calculate personnel exposure to uranium and its daughters.

The Safety/Radiation Protection Engineer (SRPE) shall have an associate degree in the physical sciences, engineering, or a health-related field. Alternatively, a high school diploma plus two years of relevant work experience in applied radiation protection are acceptable. In addition, the SRPE shall have one year of previous work experience in a uranium recovery facility or related industry involving radiation protection. Furthermore, one year of work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene, or industrial safety measures to be applied in a uranium recovery facility shall be required. The SRPE shall have completed at least 4 weeks of formalized training in radiation health protection for uranium recovery facilities. Finally, a working knowledge of the proper operation of health physics instruments used in the facility, surveying and sampling techniques, and personnel dosimetry requirements shall be required.

If the licensee desires to appoint a RSO or SRPE not meeting the above requirements, prior approval must be obtained from the U.S. Nuclear Regualtory Commission in the form of a license amendment.

14. The RSO shall review annually all existing routine operating and maintenance procedures and all procedures for surveying and monitoring programs, including equipment calibration procedures, to ensure that they do not conflict with any newly established radiation protection policies. The RSO shall indicate, by signature and date, the completion of the annual review.

15. If the RSO is not available to review and authorize a Special Work Permit (SWP) then that authority shall be delegated to the Safety/Radiation Protection Engineer or to other supervisory personnel, who shall have received specialized radiation protection training to review and sign SWPs in the RSO's absence.

16. The RSO or the SRPE shall document a daily walk-through inspection in a logbook which notes violations of regulations, license requirements, or facility procedures. Any potentially hazardous situation shall be brought to the attention of the Manager of Mining. The RSO shall review all daily work logs for the previous day to assure that all jobs requiring a SWP were approved by the RSO and that any necessary surveys were completed.

The SRPE shall make a weekly inspection, excluding the weeks the RSO performs the monthly inspection, of all work and storage areas. The SRPE shall submit a written summary of the inspection to the RSO on items of noncompliance with established operating procedures or license requirements affecting radiological safety.

In addition to the monthly inspection routine specified in Section 2.5.1 of the May 19, 1980 submittal, the RSO shall review all monitoring and exposure data for the month. The RSO's monthly report to the Manager of Mining shall also contain (1) a summary of personnel exposure data, including bioassays and time-weighted calculations, and (2) a summary of all pertinent radiation survey records. The report shall provide a description of unresolved problems and the proposed corrective measures. Monthly summary inspection reports, signed and dated by the RSO, shall be maintained on file.

17. Notwithstanding Section 2.5.2 of the licensee's May 19, 1980 submittal, the licensee shall perform a semiannual ALARA audit. This audit shall be conducted by the RSO or an expert with equivalent qualifications who shall submit a formal written audit report to the Manager of Mining, the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, and U.S. Nuclear Regulatory Commission, Region IV, Office of Inspection and Enforcement, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011. In order to evaluate the ALARA objective the licensee shall review the following records as part of the semiannual audit:

    1. Exposure records (external and time-weighted calculations)

    2. Bioassay results

    3. Log entries and summary reports of all inspections by the radiation safety staff

    4. Training program activities

    5. Safety meeting minutes and attendance records

    6. In-plant radiological survey and sampling data

    7. Environmental radiological effluent and monitoring data

    8. Reports on overexposures submitted to NRC, MSHA, or the State

    9. Reviews of operating and monitoring procedures completed during this period

    10. Review of Special Work Permits (SWPs) which required that additional radiological monitoring and sampling be performed.

Since the primary purpose of the audit is to evaluate the ALARA objective, it shall specifically discuss the following:

1. Trends in personnel exposures for identifiable catagories of workers and types of operational activities

2. Trends in radiological effluents

3. The performance of exposure and effluent control equipment; whether it is being properly used, maintained, and inspected

4. Recommendations on ways to further reduce personnel exposure and effluent releases of uranium and its daughters

18. In addition to the training requirements specified in Section 2.7 of the May 19, 1980 submittal, the instructor shall review errors on the training test with workers until the workers demonstrate a passing knowledge of the information. Documentation on testing shall be maintained on file. All permanent workers shall receive annual retraining. Retraining shall include relevant information that has become available during the past year, a review of safety problems that have arisen during the year, changes in regulations and license conditions, exposure trends, and other current topics. Retraining shall be provided whenever procedures or processes are changed.

In addition, all new workers, including supervisors, shall be given specialized instruction on the health and safety aspects of the specific jobs they will perform. This instruction shall be in the form of individualized on-the-job training. Supervisors shall be provided additional specialized training on their supervisory responsibilities in the area of worker radiation protection. All employees shall sign a statement verifying that they received job-specific safety training. The statement shall indicate the dates the training was received and be cosigned by the instructor. Also, at least once every two months all workers shall attend general plant safety meetings with radiation safety matters being offered for discussion at the meeting.

All visitors who have not received training shall be escorted by someone properly trained and knowledgeable about the hazards of the plant. As a minimum, visitors shall be instructed specifically on what is necessary to avoid possible hazards in the areas of the plant they will be visiting.

Contractors having work assignments in the plant shall also be given appropriate training and safety instruction. Contract workers

who will perform work on contaminated equipment shall receive the same training and safety instruction normally required of all permanent workers. Only job-specific safety instruction is necessary for contract workers who have previously received full training on prior work assignments at the plant within the last year.

19. The licensee shall submit to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, for review all in-plant external gamma, radon, and airborne particulate survey data for the first six months of operation of the facility. The data shall be submitted within nine months of commencing mining operations.

20. The licensee shall submit to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, for review and approval by license amendment any proposed changes in the locations and methods for the routine surveying and monitoring programs as specified in Sections 3.2 and 3.5 of the May 19, 1980 submittal and the July 18, 1980 submittal. Such changes shall not be implemented prior to approval by license amendment.

21. The licensee shall exchange personnel dosimeters on a monthly basis. In addition, the licensee shall submit to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, a statistical report of the first twelve months of exposure data, and copies of the monthly exposure data. Both the annual and monthly data shall list the employee exposures by work classification. This data will then be reviewed by the staff to determine whether a continuing personnel dosimetry program for external radiation shall be required.

22. The criteria for the release of equipment from the restricted area shall be in accordance with the enclosed "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", dated November 1976.

23. In addition to the contamination surveys specified in Section 3.4.1 of the May 19, 1980 submittal, the licensee shall conduct:

    1. Weekly surveys of change rooms and eating areas and monthly surveys of control rooms and administrative offices. If the licensee proposes to analyze urine bioassay samples at an onsite laboratory, the licensee shall also survey all surfaces used for sample preparation preceding the bioassay analyses.

If the alpha contamination levels exceed those listed in the enclosed "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", dated November 1976, the area shall be decontaminated. The source of the contamination shall be determined, control measures shall be initiated, and the results shall be documented. Additionally, any contamination outside the process building shall be maintained as low as is reasonably achievable.

2. Additional surveys at the direction of the RSO following any spill or leakage of radioactive solutions which could present an airborne hazard after drying.

24. The licensee shall provide protective clothing in the form of coveralls and shoes or boot covers for workers who are involved with the handling of yellowcake product or the maintenance of equipment which contains yellowcake. Workers that package or transport the yellowcake product shall be provided gloves.

Before leaving the restricted area any worker who is involved with the handling of yellowcake product or the maintenance of equipment which contains yellowcake shall either shower and/or monitor their face and hands using a calibrated alpha survey instrument. Where alpha monitoring is used, exclusive of showering, the monitoring results shall be documented and maintained on file. In addition, the licensee shall perform spot surveys for alpha contamination at least quarterly on workers leaving the facility proper.

Records shall be maintained of the investigations in which alpha contamination on skin or clothes has exceeded 1,000 dpm/100 cm^2.

25. The licensee shall dispose of only liquid wastes into the evaporation pond. Contaminated solid wastes, including degraded resin and any ore zone core samples, shall be placed in containers for disposal off-site at a commercial low level disposal site or in a licensed uranium tailings impoundment.

All liquid effluents, including sink and shower discharges and laundry wastes from the process plant building and change or shower rooms, with the exception of sanitary wastes, shall be returned to the process circuit, or discharged to the evaporation pond, provided that there is no adverse reaction with the liner.

26. In addition to the In-Plant Airborne Radiation Monitoring Program contained in Section 3.5 of the May 19, 1980 submittal and the July 18, 1980 submittal, the following shall be required. The licensee shall perform surveys for natural uranium on a monthly basis with the exception that it shall be increased to weekly for any restricted area meeting the limits of an "airborne radioactivity area" as defined in 10 CFR Part 20.203(d) and an investigation of the cause of the high levels shall be made. The licensee shall perform monthly surveys for radon or its particulate daughters in all enclosed process structures inhabited by workers. The licensee shall perform radon or radon progeny surveys on a weekly basis if the radon or radon progeny concentrations are found to exceed 8 pCi/l or 0.08 WL (Working Levels) respectively. Such weekly sampling shall be maintained until four (4) consecutive weekly samples exhibit less than 8 pCi/l or 0.08 WL.

    The calculation of internal exposure to radon and its daughters uranium shall be based on a TWE (time weighted exposure) calculation incorporating a consideration of both occupancy time and average airborne working levels or activity concentration, respectively. If occupancy times are established as an average for each category of worker, then the licensee shall also determine by means of a semiannual documented time study, the basis upon which average occupancy periods are established.

    If any worker reaches or exceeds 25 percent of the maximum permissible exposure limits as specified in 10 CFR Part 20 based upon a calculated TWE for the week or the calendar quarter, dependent on the solubility of the material, the RSO shall initiate an investigation of the employee's work record and exposure history to identify the source of exposure. If any problem areas are noted, they shall be studied and the necessary corrective measures shall be taken to ensure reduction of future exposures to as low as is reasonably achievable. Records shall be maintained of these investigations.

27. The licensee shall implement an urinalysis program as prescribed in Regulatory Guide 8.22, "Bioassay at Uranium Mills," with the following exceptions:

    1. The licensee shall perform baseline urinalyses for all permanent employees prior to initial assignment at the facility.

    2. The frequency of urinalysis sample collection and analysis shall be monthly.

    3. Anytime an action level of 15 µg U/l of urine is reached or exceeded for any worker, the licensee shall provide documentation to the U.S. Nuclear Regulatory Commission indicating what

corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22. This information shall be included as part of the ALARA audit report required by License Condition No. 17.

Anytime an action level of 30 µg U/l for four consecutive urine specimens is reached or exceeded, the licensee shall provide documentation within 30 days to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, and U.S. Nuclear Regulatory Commission, Region IV, Office of Inspection and Enforcement, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011, indicating what corrective actions have been performed to satisfy the requirements of Regulatory Guide 8.22.

28. All radiation monitoring, sampling, and detection equipment shall be re-calibrated after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. Records shall be maintained of the repair, modification, and calibration of all instruments. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each use. For airborne radioactive particulate samplers, air flow rates through filters shall be determined by calibrating pumps for the filter paper used and the altitude of the facility.

29. Eating shall only be allowed in administrative offices, control rooms, and enclosed lunch areas.

30. The areas enclosed by dikes and curbs around process chemical and fuel storage tanks outside of the plant building shall be large enough to contain the full contents of the largest tank.

31. The licensee shall notify the U.S. Nuclear Regulatory Commission, Region IV, Office of Inspection and Enforcement, 611 Ryan Plaza Drive, Suite 1000, Arlington, Texas 76011, and the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, at least six weeks prior to commencing mining operations, in writing, so that an NRC inspection may be conducted to review the licensee's development and implementation of administrative and operating procedures and monitoring programs.

32. All sampling and monitoring data, calibration records, reports on audits, inspections, and other analyses, training records, and safety meeting minutes, as well as 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.

33. Any changes in the process circuit, illustrated and described in Figure 3.3-2 of the license application dated August 10, 1979, shall require the approval of the RSO and shall be submitted to the U.S. Nuclear Regulatory Commission, Uranium Recovery Licensing Branch, Washington, D.C. 20555, for approval prior to implementation in the form of a license amendment.

Jeffrey L. Kotsch
Operating Facilities Section II
Uranium Recovery Licensing Branch
Division of Waste Management

Approved by: H. J. Pettengill

H. J. Pettengill, Section Leader
Uranium Recovery Licensing Branch