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October 31, 1997

Mr. Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management,
NMSS (T-7-J9)
Office of Nuclear Material Safety
& Safeguards
U.S. Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20850

Re: License No. SUA-1534
Docket No. 40-8943
Standard Operating Procedure for Safety and Environmental Review Panel
Revised Section 5 Operations of the Renewal Application

Dear Mr. Holonich:

As per my discussion with Mr. James Park, Crow Butte Resources has revised Section 5 (p. 5-1 to 5-18) of the Source Material License Renewal Application. This Section was updated to reflect current titles and responsibilities and to more closely follow Regulatory Guide 8.31. Also enclosed is a draft of the Standard Operating Procedure for the Safety and Environmental Review Panel as requested by Mr. Park.

If you need any additional information, please contact me.

Sincerely,

Steve Collings

Stephen P. Collings
President

cc: Ross Scarano
Patrick Mackin
Rhonda Grantham

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CROW BUTTE PROJECT

OPERATING PROCEDURES MANUAL

TITLE:	Safety and Environmental Review Panel	Procedure No:
APPROVED:		
		Effective Date:
	Plant Manager	Page 1 of 4
		Revision
	Radiation Safety Officer	Revision Date:

1.0 Purpose:

The U.S. Nuclear Regulatory Commission (NRC) license for the Crow Butte Resources (CBR) ISL uranium mine is a Performance-Based License (PBL). The PBL essentially allows CBR to evaluate and implement certain changes in the licensed operation without applying for and receiving a formal amendment to the NRC license. The following procedure outlines the procedural steps to follow when making changes to the operations pursuant to the PBL or a PBLC.

2.0 Changes Allowed Under the PBL or PBLC:

Under Performance-Based Licensing, CBR may make changes in licensed activities under certain conditions as outlined in the license. Essentially, CBR may:

(1) Make changes in the facility or process, as presented in the license application,

(2) Make changes in the procedures presented in the application, or

(3) Conduct tests or experiments not presented in the application, without prior NRC approval, if CBR ensures that the following conditions are met:

- The change, test or experiment does not conflict with any requirement specifically stated in the NRC license (excluding material referenced in a PBLC), or impair CBR's ability to meet all applicable NRC regulations.

- There is no degradation in the essential safety or environmental commitments in the license application, or provided by the approved reclamation plan;

- The change, test, or experiment is consistent with NRC's conclusions regarding actions analyzed and selected in the Environmental Assessment (EA) of _____, 1997.

Otherwise, CBR is required to submit an application for a license amendment from the NRC. The determinations whether the above conditions are satisfied for a particular proposed change will be made by a Safety and Environmental Review Panel (SERP), described as follows.

3.0 Safety and Environmental Review Panel (SERP):

CBR will form a SERP to evaluate each potential change under the PBL or PBLC. The SERP will be responsible for reviewing the changes, tests, or experiments to determine whether an amendment to the NRC license is required.

The SERP shall consist of a minimum of three individuals. One member of the SERP shall have expertise in management and shall be responsible for managerial and financial approval changes; one member shall have expertise in operations and/or construction and shall have responsibility for implementing any operational changes; and one member shall have expertise in radiation safety and environmental matters with the responsibility of assuring changes conform to radiation safety and environmental requirements. Other members of the SERP may be included as appropriate to address specific technical issues.

4.0 SERP Review Procedure:

In their documented review of whether a potential change, test, or experiment (hereinafter called "the change") is allowed under the PBL or PBLC, without a license amendment, the SERP shall consider the following:

(1) Current NRC License Requirements: The SERP will conduct a review of the most current NRC license conditions to assess which, if any, conditions will have impact on or be impacted by the potential SERP action. If the SERP action will conflict with a specific license requirement, then a license amendment is necessary prior to imitating the change.

(2) Impacts on regulations: The SERP will determine in the change, test, or experiment conflicts with applicable NRC regulations (example: 10 CFR 20 requirements). If the SERP action conflicts with NRC regulations, a license amendment is necessary.

(3) Environmental Assessment: The SERP will review whether the change, test, or experiment is consistent with NRC's conclusions regarding actions analyzed and selected in the Environmental Assessment of _____, 1997. If the change causes substantive safety or environmental impacts what have not previously been evaluated in the environmental report/assessment, the proposed action must be evaluated for the need to prepare an environmental report under 10 CFR 51.60(b)(2), and whether the proposed action is categorically excluded from the need for an environmental assessment under 10 CFR 51.22(c)(11). If an environmental report or environmental assessment is necessary, a license amendment is necessary for the proposed action.

(4) Financial Surety: The SERP will review the proposed action to determine if any adjustment to the financial surety arrangement or approved amount is required (Condition No. ____ of the license.) If the proposed action will require an increase to the existing surety amount, the financial surety instrument must be increased accordingly. The surety estimate must also be updated either through a license amendment or through the course of the annual surety update to the NRC. The NRC incorporates the annual surety update by license amendment.

(5) The SERP will assure that there is no degradation in the essential safety or environmental commitment in the license application, or as provided by the approved reclamation plan.

5.0 Documentation of Review Process:

(1) After the SERP conducts the review process for a proposed action, it will document its findings, recommendations and conclusions in a written report format. All members of the SERP shall sign off in concurrence on the final report. If the report concludes that the action meets the appropriate PBL or PBLC requirements and does not require a license amendment, the proposed action may then be implemented. If the report concludes that a license amendment is necessary prior to implementing the action, the report will document the reasons why, and what course CBR plans to pursue. The SERP report shall include the following:

- A description of the proposed change, test or experiment (proposed action).
- A listing of all SERP members conducting the review, and their qualifications (if a consultant or other additional member).
- The technical evaluation of the proposed action including all aspects of the SERP review procedures listed above.
- Conclusions and recommendations.

- Signatory approvals of the SERP members.

- Any attachments such as all applicable technical, environmental or safety evaluations, reports or other relevant information including consultant reports.

(2) All SERP reports and associated records of any changes made pursuant to the PBL or PBLC shall be maintained through termination of the NRC license.

(3) On an annual basis, CBR will include with the ALARA report a section that describes all changes, tests or experiments made pursuant to the PBL or PBLC. The report will include a summary of the SERP evaluation of each change. In addition, CBR will annually submit any pages of the license renewal application to reflect changes of the December, 1995 License Renewal Application, or supplementary information submitted by letters dated April 1, 1997, June 25, 1997, and October 31, 1997.

6. OPERATIONS

Crow Butte Resources, Inc. (CBR) operates a commercial scale in-situ leach uranium mine (the Crow Butte Uranium Project) near Crawford, Nebraska. CBR maintains a headquarters in Denver, Colorado where site licensing actions originate. All CBR operations, including the Crow Butte Uranium Project operations, are conducted in conformance with applicable laws, regulations and requirements of the various regulatory agencies. The responsibilities described below have been designed to both ensure compliance and further implement CBR's policy for providing a safe working environment with cost effective incorporation of the philosophy of maintaining radiation exposures as low as is reasonably achievable (ALARA).

6.1 CORPORATE ORGANIZATION/ADMINISTRATIVE PROCEDURES

The CBR organizational chart, as it pertains to the responsibility for radiation safety and environmental protection at the Crow Butte Uranium Project facility is given as Figure 6.1-1. The personnel identified are responsible for the development, review, approval, implementation, and adherence to operating procedures, radiation safety programs, environmental and groundwater monitoring programs, as well as routine and non-routine maintenance activities. Specific responsibilities of the organization are provided below.

6.1.1 PRESIDENT

The overall responsibility for the radiation, environmental, and safety activities of the Crow Butte Facility rests with the President of CBR. In addition, the President of CBR is responsible for all Crow Butte commercial production facilities, reporting directly to the Board of Directors of CBR. The President is also responsible for license development and license modifications. The Vice President will, in the absence or disability of the President, perform the duties of the President.

6.1.2 VICE PRESIDENT OPERATIONS

The Vice President Operations is responsible for all uranium production activity at the project site. The Vice President Operations is also responsible for implementing any safety and/or monitoring programs associated with operations, including yellowcake handling procedures. The Vice President Operations is authorized to immediately implement any action to correct or prevent radiation safety hazards. The Vice President Operations reports directly to the President.

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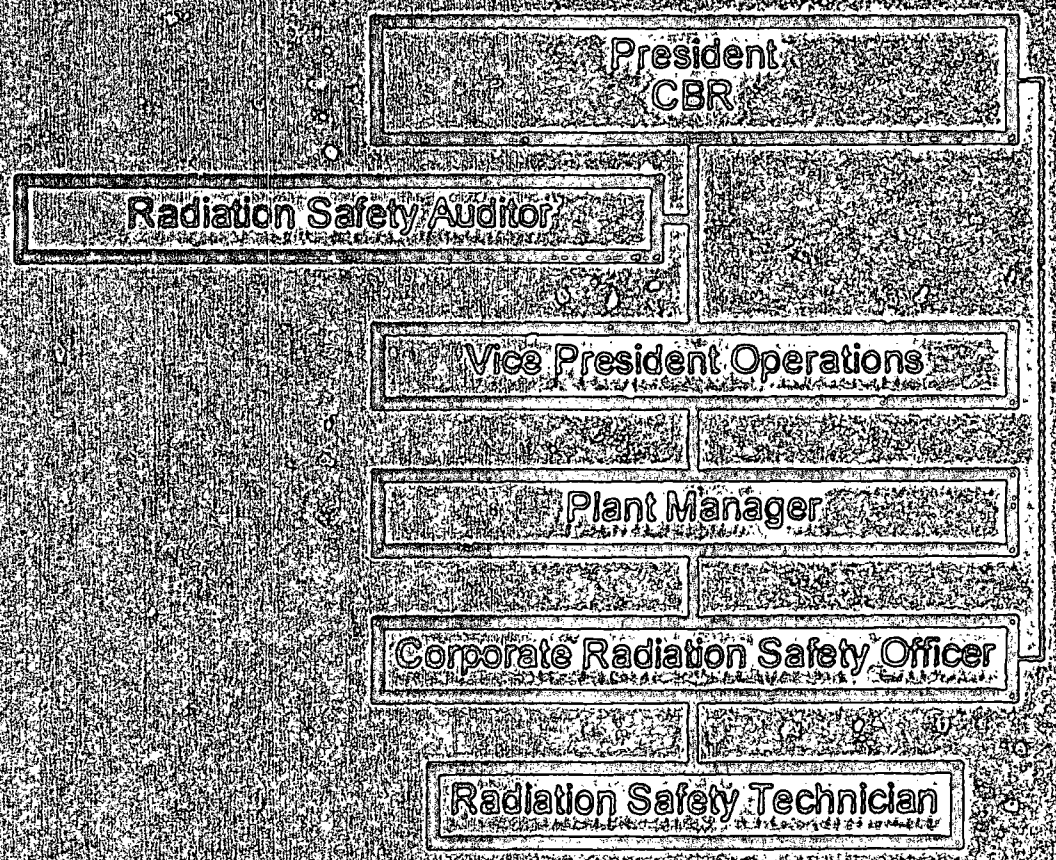
Figure 5.1-1: Crow Butte Resources Organizational Chart



5.1.3 PLANT MANAGER

The Plant Manager has direct oversight of the facility operations including yellowcake handling procedures. The Plant Manager is responsible for carrying out any procedures or actions implemented by the Corporate Radiation Safety Officer (CRSO) or Vice President Operations to correct or prevent radiation safety hazards. The Plant Manager supervises the CRSO to ensure that these programs are conducted in a manner consistent with regulatory requirements. The Plant Manager reports directly to the Vice President Operations.

5.1.4 CORPORATE RADIATION SAFETY OFFICER

The CRSO is responsible for the development, administration and enforcement of all radiation safety programs. The CRSO is authorized to conduct inspections and to immediately order any change necessary to preclude or eliminate radiation safety hazards and/or maintain regulatory compliance. The CRSO is responsible for the implementation of all on-site environmental programs, including emergency procedures. The CRSO inspects facilities to verify compliance with all applicable requirements in the areas of radiological health and safety. The CRSO works closely with all supervisory personnel to insure that established programs are maintained. The CRSO is also responsible for the collection and interpretation of employee exposure related monitoring, including data from radiological safety. The CRSO makes recommendations to improve any and all radiological safety related controls. The CRSO has no production related responsibilities. The CRSO will report to the Plant Manager on matters of radiation safety. The CRSO also has the responsibility to advise the President on matters involving radiation safety and to implement changes and/or corrective actions involving radiation safety authorized by the President.

5.1.5 HEALTH PHYSICS TECHNICIAN

The Health Physics Technician (HPT) assists the CRSO with the implementation of the radiological and industrial safety programs. The HPT is responsible for the orderly collection and interpretation of all monitoring data, to include data from radiological safety and environmental programs. The HPT reports directly to the CRSO.

5.1.6 RADIATION SAFETY AUDITOR

CBR may utilize an outside radiation protection auditing service to provide assurance that all radiation health protection procedures and license condition requirements are being conducted properly at the Crow Butte Uranium Project facility. Any outside service used for this purpose is qualified in radiation safety procedures as well as environmental aspects of solution mining operations. The auditor will meet the minimum qualifications for education and experience as for the CRSO as described in Section 5.4.

5.2 MANAGEMENT CONTROL PROGRAM

5.2.1 OPERATING PROCEDURES

Written Standard Operating Procedures (SOPs) have been developed for all process activities, including those activities involving radioactive materials, for the Crow Butte Uranium Project facility. Where radioactive material handling is involved, pertinent radiation safety practices are incorporated into the SOP. Additionally, written SOPs have been developed for non-process activities including environmental monitoring, health physics procedures, emergency procedures, and general safety. Written SOPs have been developed, reviewed and approved by the appropriate supervisors including the CRSO. All written SOPs are reviewed for radiological protection aspects and approved by the CRSO prior to implementation. Additionally, the CRSO reviews all SOPs on an annual basis. Applicable current SOPs are referenced throughout this document. SOPs are revised as necessary to meet changing operational and regulatory requirements. Any revisions made to the SOPs are reviewed and approved by the CRSO and appropriate supervisor prior to implementation. Written SOPs are kept in the areas of the plant facility where they are used for easy access by employees.

For the performance of non-routine work or maintenance activities where the potential for radiation exposure exists and for which written operating procedures have not been prepared, a Radiation Work Permit (RWP) is required. The RWP specifies the necessary radiological safety precautions, equipment or specialized clothing, and radiological surveys required for performing the job. RWPs are issued by the CRSO or designee by way of specialized training.

5.2.2 SAFETY AND ENVIRONMENTAL REVIEW PANEL (SERP)

The existing Source Materials License SUA-1534 held by CBR for the Crow Butte Uranium Project is scheduled for renewal at the end of 1995. At this time, it is anticipated that CBR will request that the Nuclear Regulatory

Commission consider issuance of a performance based license. If a performance based license is issued, one of the requirements is the development of a Safety and Environmental Review Panel (SERP). The SERP consists of a minimum of three individuals. One member of the SERP has expertise in management, one member has expertise in operations and/or construction, and one member has expertise in radiation safety and environmental matters with responsibility of assuring changes conform to radiation safety and environmental requirements. Other members of the SERP may be included as appropriate to address specific technical issues.

The SERP is responsible for monitoring any proposed change in the facility or process, making changes in procedures, and conducting tests or experiments not contained in the current NRC license. As such, they are responsible for insuring that any such change results in no degradation in the essential safety or environmental commitments of the operator.

5.3 MANAGEMENT AUDIT AND INSPECTION PROGRAM

The following internal inspections, audits and reports are performed for the Crow Butte Uranium Project operations:

Daily

A daily walkthrough inspection of the plant is conducted by the CRSO, HPT or a qualified designated operator. The inspection entails a visual examination of compliance or other problems which are reviewed with the Plant Superintendent.

Monthly

The CRSO provides a written summary of the month's radiological activities at the Crow Butte Uranium Project facilities. The report includes a review of all monitoring and exposure data for the month, a summary of worker protection activities, a summary of all pertinent radiation survey records, a discussion of any trends in the ALARA program, and a review of adequacy of the implementation of the USNRC license conditions. Recommendations are made for any corrective actions or improvements in the process or safety programs.

Quarterly

Quarterly inspections are performed of the evaporation ponds in accordance with the guidance contained in USNRC Regulatory Guide 3.11.1.

"Operational Inspection and Surveillance of Embankment Retention Systems for Uranium Mill Tailings".

Annually:

On an annual basis, an audit of the radiation protection and ALARA program is conducted in accordance with USNRC Regulatory Guide 8.31, "Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Mills Will Be As Low As Reasonably Achievable". A written report of the results submitted to corporate management. The auditor may be an outside radiation safety auditor as identified in Figure 5.1-1. The CRSO may accompany the auditor, but may not participate in the conclusions.

The annual ALARA audit report summarizes the following data:

1. Employee exposure records
2. Bioassay results
3. Inspection log entries and summary reports of mine and process inspections
4. Documented training program activities
5. Applicable safety meeting reports
6. Radiological survey and sampling data
7. Reports on any overexposure of workers
8. Operating procedures that were reviewed during this time period

The ALARA audit report specifically discusses the following:

1. Trends in personnel exposures
2. Proper use, maintenance and inspection of equipment used for exposure control
3. Recommendations on ways to further reduce personnel exposures from uranium and its daughters.

The ALARA audit report is submitted to and reviewed by the President and the CRSO. Implementation of the recommendations to further reduce

employee exposures, or improvements to the ALARA program, are discussed with the ALARA auditor.

An audit of the Quality Assurance/Quality Control (QA/QC) program is also conducted on an annual basis. The audit is performed by an individual qualified in analytical and monitoring techniques who does not have direct responsibilities in the areas being audited. The results of the QA/QC audit are documented and reported to the President and the CRSO. The CRSO has the primary responsibility for the implementation of the QA/QC programs at the Crow Butte Uranium Project facilities.

5.4 QUALIFICATIONS

CBR project staff are highly experienced in the management of uranium development, mining and operations. The following minimum personnel specifications and qualifications are strictly adhered to.

The minimum qualifications for the Corporate Radiation Safety Officer (CRSO) are as follows:

- Education - A Bachelor's Degree in the physical sciences, industrial hygiene, environmental technology or engineering from an accredited college or university or an equivalent combination of training and relevant experience in uranium mill/solution mining radiation protection.

- Health Physics Experience - A minimum of 1 year of work experience relevant to uranium mill/solution mining operations in applied health physics, radiation protection, industrial hygiene or similar work.

- Specialized Training - A formalized, specialized course(s) in health physics specifically applicable to uranium milling/solution mining operations, of at least 4 weeks duration. The CRSO attends refresher training on uranium mill health physics every two years.

- Specialized Knowledge - The CRSO, through classroom training and on-the-job experience, possesses a thorough knowledge of the proper application and use of all health physics equipment used in the operation, the procedures used for radiological sampling and monitoring, methods used to calculate personnel exposures to uranium and its daughters, and a thorough undeHPTanding of the solution mining process and equipment used and how hazards are generated and controlled during the process.

The Health Physics Technician (HPT) will have one of the following combinations of education, training and experience:

1. Education - An associate degree or 2 years or more of study in the physical sciences, engineering or a health-related field.

   Training - At least a total of 4 weeks of generalized training in radiation health protection applicable to uranium mills/solution mining operations.

   Experience - 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 mill/solution mining operation.

2. Education - A high school diploma.

   Training - A total of at least 3 months of specialized training in radiation protection relevant to uranium mills of which up to 1 month may be on-the-job training.

   Experience - Two years of relevant work experience in applied radiation protection.

5.5 TRAINING

All site employees, and contracted personnel when present, at the Crow Butte Uranium Project are administered a training program based upon the CBR Radiation Safety Training Plan covering radioactive material handling and radiological emergency procedures. This training program is administered in keeping with standard radiological protection guidelines. The technical content of the training program is under the direction of the CRSO. Training is conducted by the CRSO or a qualified designee.

5.5.1 TRAINING PROGRAM CONTENT

<u>Visitors</u>

Visitors to the Crow Butte Uranium Project who have not received training are escorted by on site personnel properly trained and knowledgable about the hazards of the facility. At a minimum, visitors are instructed specifically on what they should do to avoid possible hazards in the area of the facility that they are visiting.

Contractors

Any contractors having work assignments at the facility are given appropriate training and safety instruction. Contract workers who will be performing work on heavily contaminated equipment receive the same training normally required of permanent workers.

Permanent Employees

The CBR Radiation Safety Training Program incorporates the following topics discussed in USNRC Regulatory Guide 8.31, "Information Relevant to Ensuring That Occupational Radiation Exposures at Uranium Mills Will Be As Low As Reasonably Achievable":

Fundamentals of health protection

- Using respirators when appropriate.
- Eating, drinking and smoking only in designated areas.
- Using proper methods for decontamination.

Facility-provided protection

- Cleanliness of working space.
- Safety designed features for process equipment.
- Ventilation systems and effluent controls.
- Standard operating procedures.
- Security and access control to designated areas.

Health protection measurements

- Measurements of airborne radioactive material.
- Bioassay to detect uranium (urinalysis and in vivo counting).
- Surveys to detect contamination of personnel and equipment.
- Personnel dosimetry.

Radiation protection regulations

- Regulatory authority of NRC, MSHA and state.
- Employee rights in 10 CFR Part 19.
- Radiation protection requirements in 10 CFR Part 20.

Emergency procedures

All new workers, including supervisors, are given specialized instruction on the health and safety aspects of the specific jobs they will perform. This instruction is done in the form of individualized on the job training. Retraining is done annually and documented. Every two months, all workers attend a general safety meeting.

5.5.2 TESTING REQUIREMENTS

A written test with questions directly relevant to the principals of radiation safety and health protection in the facility covered in the training course is given to each worker. The instructor reviews the test results with each worker and discusses incorrect answers to the questions with the worker until worker understanding is achieved. Workers who fail the exam are retested and test results remain on file.

5.5.3 ON-THE-JOB TRAINING

HPT

On-the-job training is provided to HPTs in radiation exposure monitoring and exposure determination programs, instrument calibration, plant inspections, posting requirements, respirator programs and Health Physics Standard Operating Procedures.

5.5.4 REFRESHER TRAINING

Following initial radiation safety training, all permanent employees receive on-going radiation safety training as part of the routine bimonthly safety meetings. This on-going training is used to discuss problems and questions that have arisen, any relevant information or regulations that have changed, exposure trends and other pertinent topics.

5.5.5 TRAINING RECORDS

Records of training are kept for a period of five years for all process employees.

5.6 SECURITY

The entrance to the Crow Butte Uranium Project site is a gravel road to the west of the facility. The entrance to the site is posted indicating that permission is required prior to entry. The gate on the access route can be locked. The plant site is within the fenced permit area and property posted in accordance with 10 CFR § 20.1902 (e). The evaporation ponds are also fenced and posted. All visitors entering the restricted areas on the Crow Butte Uranium Project site are required to register at the main office and are not permitted inside the plant or wellfield areas without proper authorization. Inexperienced visitors are escorted unless they are frequent visitors who have been instructed regarding areas to be avoided.

The plant will normally operate 24 hours per day and 7 days per week, so CBR employees will normally be on-site except for occasional shutdowns. All plant personnel are instructed to immediately report any unauthorized persons to their supervisors. The supervisor will contact the reported unauthorized person and make sure that they have been authorized for entry. If the person is unauthorized, and has no business on the property, they will be escorted to the main entrance for departure.

5.7 RADIATION SAFETY CONTROLS AND MONITORING

CBR has a strong corporate commitment to and support for the implementation of the radiological control program at the Crow Butte Uranium Project facility. This corporate commitment to maintaining personnel exposures as low as reasonably achievable (ALARA) has been incorporated into the radiation safety controls and monitoring programs described in the following sections. This license renewal application contains the results of the radiological control program since 1990. Each area in this section describes the historical program and the results of monitoring since 1990. Where the monitoring results indicate that the program should be modified, proposed changes in the program are also discussed.

5.7.1 EFFLUENT CONTROL TECHNIQUES

5.7.1.1 GASEOUS AND AIRBORNE PARTICULATE EFFLUENTS

Under routine operations, the only radioactive effluent at the Crow Butte facility is the release of radon-222 gas from the production solutions. A vacuum dryer is used for drying the yellowcake product. There is no airborne effluent from the vacuum dryer system.

The radon-222 is found in the pregnant lixiviant which comes from the wellfield into the plant. The production flow is directed to the process building for separation of the uranium. The uranium is separated by passing the recovery solution through fluidized bed upflow ion exchange units. Radon gas is released from the solution in the ion exchange columns and in the injection surge tanks. The vents from the individual vessels are connected to a manifold which is exhausted outside the plant building through the plant stack.

Venting to the atmosphere outside of the plant building minimizes personnel exposure. Small amounts of radon-222 may be released in the plant building during solution spills, filter changes and maintenance activities. The plant building is equipped with exhaust fans to remove any radon that may be released in the plant building. No significant personnel exposure to radon gas has been noted during operation of the Crow Butte facility. Results of radon daughter monitoring in the process areas are discussed in Section 5.7.3

5.7.1.2 LIQUID EFFLUENTS

The liquid effluents from the Crow Butte Uranium Project can be classified as follows:

- Water generated during well development - This water is recovered groundwater and has not been exposed to any mining process or chemicals. The water is discharged directly to one of the solar evaporation ponds and silt, fines and other natural suspended matter collected during well development are settled out.

- Liquid process waste - The operation of the process plant results in two primary sources of liquid waste, an eluant bleed and a production bleed.

- Aquifer restoration - Following mining operations, restoration of the affected aquifer commences which results in the production of waste

water. The current groundwater restoration plan consists of four activities: 1) Groundwater Transfer, 2) Groundwater Sweep, 3) Groundwater Treatment, and 4) Wellfield Circulation. Only the groundwater sweep and groundwater treatment activities will generate waste water.

During groundwater sweep, water is extracted from the mining zone without injection causing an influx of baseline quality water to sweep the affected mining area.

Groundwater treatment activities involve the use of process equipment to lower the ion concentration of the groundwater in the affected mining area. A reverse osmosis (RO) unit may be used to reduce the total dissolved solids of the groundwater. The RO unit produces clean water (permeate) and brine. The permeate is either injected into the formation or disposed of in the waste disposal system. The brine is sent to the waste water disposal system. The permeate may be further treated if necessary to meet the quality requirements of the NPDES permit for land application disposal.

The existing USNRC License allows CBR to dispose of waste water by three methods:

- Evaporation from the evaporation ponds;
- Deep well injection; and
- Land application.

The design, installation and operation criteria for the solar evaporations ponds are those found to be applicable in USNRC Regulatory Guide 3.11, "Design, Construction and Inspection of Embankment Retention Systems For Uranium Mills." Each commercial pond is nominally 900 feet by 300 feet by 17 feet in depth. The ponds are membrane lined with a leak detection system under the membrane and are designed to allow the contents of any given pond to be transferred into another pond in the event of a pond problem.

Each of the ponds has the capability of being pumped for water treatment prior to discharge under the NPDES permit. A variety of treatment options exist depending upon the specific chemical contaminants identified in the waste water. In general, a combination of chemical precipitation and reverse osmosis is adequate to restore the water to a quality that falls within the NPDES parameters.

Spill Contingency Plans

The CRSO is charged with the responsibility to develop and implement appropriate procedures to handle potential spills. Personnel representing the engineering and operations functions of the Crow Butte Uranium Project facility will assist the CRSO in this effort. Basic responsibilities include:

- Assignment of resources and manpower.
- Responsibility for materials inventory.
- Responsibility for identifying potential spill sources.
- Establishment of spill reporting procedures and visual inspection programs.
- Review of past incidents of spills.
- Coordination of all departments in carrying out goals of containing potential spills.
- Establishment of employee emergency response training programs.
- Responsibility for program implementation and subsequent review and updating.
- Review of new construction and process changes relative to spill prevention and control.

Spills can take two forms within an in-situ uranium mining facility: surface spills such as pond leaks, piping ruptures, transportation accidents, etc., and subsurface releases such as a well excursion, in which process chemicals migrate beyond the wellfield, or a pond liner leak resulting in a release of waste solutions.

Engineering and administrative controls are in place to prevent both surface and subsurface releases to the environment and to mitigate the effects should a release occur.

- Surface Releases - The most common form of surface release from in-situ mining operations occurs from breaks, leaks, or separations within the piping that transfers mining fluids between the process plant and the wellfield. These are generally classified as small releases.

In general, piping from the plant to and within the wellfield is constructed of PVC, high density polyethylene pipe with butt welded joints or equivalent. All pipelines are pressure tested at operating pressures prior to operation. It is unlikely that a break would occur in a buried section of line because no additional stress is placed on the pipes. In addition, underground pipelines are protected from a major cause of potential failure - that of vehicles driving over the lines causing breaks. The only exposed pipes are at the process plant, the wellheads and in the control house in the wellfield. Trunkline flows and wellhead pressures are monitored each shift for process control. One section of underground piping that passes beneath Squaw Creek is double contained for additional protection.

- Transportation accidents - Standard Operating Procedure P-18 provides the CBR emergency action plan for responding to a transportation accident involving a yellowcake shipment. The SOP provides instructions for proper packaging, documentation, driver emergency and accident response procedures and cleanup and recovery actions. Spill response is specifically addressed in SOP C-19, Significant Solution Spills.

- Sub-surface releases - Mining fluids are normally maintained in the production aquifer within the immediate vicinity of the wellfield. The function of the encircling monitor well ring is to detect any mining solutions which may migrate away from the production area due to fluid pressure imbalance. This system has been proven to function satisfactorily over many years of operating experience with in-situ mining.

At the Crow Butte Uranium Project site, an undetected excursion is highly unlikely. All wellfields are surrounded by a ring of monitor wells located no further than 300 feet from the wellfield and screened in the ore-bearing Chadron aquifer. Additionally, monitor wells are placed in the first overlying aquifer above each wellfield segment. Sampling of these wells is done on a biweekly basis. Past experience at in-situ leach mining facilities has shown that this monitoring system is effective in detecting leachate migration. The total effect of the close proximity of the monitor wells, the low flow rate from the well patterns, and over-production of leach fluids (production bleed) makes the likelihood of an undetected excursion extremely remote.

Migration of fluids to overlying aquifers has also been considered. Several controls are in place to prevent this. First, CBR has plugged all exploration holes to prevent co-mingling of Brule and Chadron

aquifers and to isolate the mineralized zone. Successful plugging was tested by conducting two hydrologic tests prior to mining. Results indicated that no leakage or communication exists between the mineralized zone and overlying aquifers. In addition, prior to start of production a well integrity test is performed on all injection/recovery wells. This requirement of the Nebraska Underground Injection Control Regulations insures that all wells are constructed properly and capable of maintaining pressure without leakage. Lastly, monitor wells completed in the overlying aquifer are also sampled on a regular basis for the presence of leach solution.

Seepage of solutions from the evaporation ponds into ground or surface water is also a potential pollution source. However, this has not been nor should it be a problem at the Crow Butte site. Construction and operational safeguards have been implemented to insure maximum competency of the synthetic liner and earthen embankments. The underdrain leak detection system allows sampling which would detect a leak. The pond soil foundation has a low ambient moisture due to its elevation, soil type and preparation, thus should the unlikely event occur of pond fluids seeping into the compacted subsoil, the liquid would be quickly absorbed and would not migrate. Pond monitor wells are also located downstream of the evaporation ponds to detect leaks into the uppermost aquifer.

In addition to the spills described above, the accumulation of sediment or erosion of existing soils can lead to potential releases of pollutants. The likelihood of significant sediment or erosion problems is greatest during construction activities, which are completed at this time. Future construction activities could include additional wellfield development, or additional pond construction. During construction, there is a possibility that sediment load may increase in Squaw Creek. If rain, producing runoff, occurs during construction a small amount of the fill may be carried into the creek. Significant precipitation during pond construction and plant facilities might also produce the same effect. Plant cover for erosion control will be established as soon as possible on exposed areas. Little additional suspendable material should be produced during mining operations and restoration activities. Site reclamation in the future with backfilling of ponds, grading the plant site, and replacing the topsoil will also expose unsecured soil for suspension in runoff waters. The increased sediment load as a result of precipitation during future construction or reclamation activities should not significantly effect the quality of Squaw Creek as the more sensitive areas of the stream are located upstream form the point of entry of the tributary.

Runoff from precipitation events should be controlled to minimize any exposure to pollutants on the site. At the Crow Butte Uranium Project site runoff is not considered to be a major issue given the engineering design of the facilities, as well as the existing engineering and administrative controls. Rainwater entering a pond leading to a pond overflow would be the greatest item of concern. The design and operation of the ponds precludes a runoff induced overflow as a realistic possibility. Should there be high runoff concurrent with a pipeline failure, some contamination could be spread depending upon the relative saturation of the soils beneath the leaking area. In any event, as only minimal releases of solutions would occur in the event of a pipeline failure, and migration of pollutants due to runoff would still be minimal.

5.7.2 EXTERNAL RADIATION EXPOSURE MONITORING PROGRAM

5.7.2.1 GAMMA SURVEY

Program Description

External gamma radiation surveys have been performed routinely at the Crow Butte Uranium Project. The required frequency is quarterly in designated Radiation Areas and semiannually in all other areas of the plant. Surveys are performed at specified locations in worker occupied stations and areas of potential gamma sources such as tanks and filters. CBR establishes a Radiation Area if the gamma survey exceeds the action level of 5.0 mR/hr for worker occupied stations. An investigation is performed to determine the probable source and survey frequency for areas exceeding 5.0 mR/hr is increased to quarterly. Records were maintained of each investigation and the corrective action taken. If the results of a gamma survey identified areas where gamma radiation is in excess of levels that delineate a "radiation area", access to the area is restricted and the area is posted as required in 10 CFR §20.1902 (a).

External gamma surveys are performed with survey equipment which meets the following minimum specifications:

1. Range - Lowest range not to exceed 100 microRoentgens per hour (µR/hr) full-scale with the highest range to read at least 5 milliRoentgens per hour (mR/hr) full scale;

2. Battery operated and portable;

Examples of satisfactory instrumentation which meets these requirements are the Eberline Instruments Corporation Model ESP-1 with a HP-270 probe or

equivalent. Gamma survey instruments were calibrated every six months and were operated in accordance with the manufacturer's recommendations. Instrument checks were performed each day that an instrument was used.

Historical Program Results

Routine gamma surveys have been performed as required at the Crow Butte Uranium Project. A Radiation Area has been established around the injection filter system since the beginning of commercial operations due to gamma levels above 5.0 mRem/hr. Engineering controls such as lead sheeting have been employed around the filters to maintain personnel exposures ALARA. Results of the gamma survey program are maintained at the Crow Butte Uranium Project site.

Proposed Gamma Survey Program

CBR proposes to institute the same gamma exposure monitoring program at the Crow Butte Uranium Project that has been performed to date with the following changes:

- Based upon operating experience, CBR proposes to perform gamma exposure rate surveys at the locations shown in Figure 5.7-1. CBR believes that these locations will provide accurate monitoring of plant radiological conditions.

Gamma exposure rate surveys will be performed in accordance with the instructions currently contained in Standard Operating Procedure C-13, "Gamma Surveys". Gamma survey instruments will be checked each day of use in accordance with the manufacturer's instructions.

6.7.2.2 PERSONNEL DOSIMETRY

Program Description

All employees working in the process facility or wellfield operations who are assigned full-time to the Crow Butte Uranium Project facility have been issued Thermoluminescent Dosimeters (TLD) for determination of external gamma exposure since the beginning of commercial operations. TLDs have been provided by TMA Eberline which is accredited by NVLAP of the US Department of Commerce as required in 10 CFR § 20.1501. The TLDs have