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Docket Nos. 40-8981; 40-8958  
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04008958112S

MEMORANDUM FOR: Docket File Nos. 40-8981; 40-8958

FROM: Gary R. Konwinski  
Project Manager

SUBJECT: SAFETY EVALUATION REPORT (SER) FOR URANERZ U.S.A., INC.,  
RUTH AND NORTH BUTTE PROJECTS

Attached is the Safety Evaluation Report (SER) prepared in support of the issuance of commercial source material licenses for Uranerz U.S.A., Inc., Ruth and North Butte Projects. Several safety related license conditions have been attached to the SER. With the inclusion of these license conditions and those contained in the accompanying Environmental Assessment (EA), commercial operation of the sites will pose no significant impacts.

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Gary R. Konwinski  
Project Manager

Attachment:  
Safety Evaluation Report

bcc:

Docket File No. 40-8981  
Docket File No. 40-8958  
LFMB  
PDR/DCS  
URFO r/f  
ABBeach, RIV  
LLO Branch, LLWM  
GRKonwinski  
JHaes, RCPD, WY  
WDEQ (2)  
8981/8958/112S/GRK/90/11/23/M

PM: URFO *GRK*  
GRKonwinski/db  
12/21/90

DD: URFO *EFH*  
EFHawkins  
12/21/90

DD: URFO: RIV *REH*  
REHall  
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UNITED STATES NUCLEAR REGULATORY COMMISSION  
SAFETY EVALUATION REPORT  
PREPARED BY THE  
URANIUM RECOVERY FIELD OFFICE  
IN CONSIDERATION OF AN APPLICATION FOR TWO  
SOURCE MATERIAL LICENSE'S FOR  
URANERZ U.S.A., INC.  
RUTH AND NORTH BUTTE COMMERCIAL IN-SITU LEACH OPERATIONS  
LOCATED IN  
JOHNSON COUNTY AND CAMPBELL COUNTY, WYOMING  
DOCKET NO. 40-8958, SOURCE MATERIAL LICENSE SUA-1539  
DOCKET NO. 40-8981, SOURCE MATERIAL LICENSE SUA-1540

## 1. INTRODUCTION

By letters dated October 3, 1988 and March 7, 1989, Uranerz U.S.A., Inc., submitted applications for source material licenses to commercially operate the Ruth and North Butte in situ leach facilities. During the review process several modifications have been made to the applications in areas when further detail was necessary. Due to the related nature of the sites, both projects will be reviewed in a single document; however, two individual licenses will be issued to address the safety issues which are unique to each site. The following is a safety review of the revised application materials.

### 1.1 Description of Proposed Action

The proposed action is to issue two source material licenses allowing the commercial operation of the Ruth in situ leach project in Johnson County, Wyoming, and the North Butte in situ leach project in Campbell County, Wyoming. The Ruth facility is proposed to be a satellite facility to the main processing and drying operations located at the North Butte site. Pending the issuance of the respective licenses, Uranerz intends to produce up to 1,000,000 pounds of dried yellow cake annually. The Ruth site is designated to have a maximum 300,000 pound-annual production capability while the North Butte site is designed to produce up to 700,000 pounds of  $U_3O_8$  annually.

### 1.2 Background Information

In October 1981, Uranerz was issued Source Material License SUA-1401. This license authorized the construction and operation of the Ruth research and development (R&D) in situ leach facility in Johnson County, Wyoming. The site was operated on an R&D scale, successfully restored, partially decontaminated, and maintained in an inactive status. Total decommissioning was not pursued because the building, evaporation ponds, well field, and several process components could be utilized during the proposed commercial operation of the site.

Uranerz plans to utilize the same mining and restoration technology during the commercial operations as was proven successful during the R&D operation. Uranium will be recovered from the C, B, and A sands of a confined unit of the Wasatch Formation, brought to the surface for processing, and dried at the North Butte site. Ore depths range from 500 to 650 feet below the land surface.

### 1.3 Review Scope

This document details the staff's review of in-plant radiological safety of the licensee's proposed commercial operations. The review will include a staff analysis of the license applications as well as an analysis of previous operational data for the Ruth facility.

## 2. AUTHORIZED ACTIVITIES

The pending review process and subsequent issuance of two source material licenses will authorize commercial operation of the Ruth and North Butte sites. Uranium will be extracted from the orebody by introduction of a sodium bicarbonate lixiviant at an average rate of 1000 gpm at the Ruth site and 3000 gpm at the North Butte site.

### 2.1 Facility Description

Resins in ion exchange columns at the Ruth site will be loaded with uranium-rich solutions. The uranium-rich resins recovered from well fields developed at the Ruth site will periodically be transferred to the North Butte site for drying and packaging. The North Butte site will have numerous well fields that will directly deliver uranium-rich solutions into the processing circuit to produce a soluble product. Drying will be accomplished at the North Butte site utilizing a vacuum dryer.

The Ruth and North Butte sites are located in Johnson and Campbell Counties, Wyoming, respectively. Both sites are located near the geographical landmark known as Pumpkin Butte. Both sites are roughly 52 air-miles north of Casper, Wyoming. State Highway 387 provides access near the proposed projects from Edgerton and Wright, Wyoming. Unpaved roads provide direct access to the actual facilities.

Facilities planned for the Ruth site include an ion exchange satellite facility, complete with well fields, solar evaporation ponds, employee support areas, and access roads. The North Butte site will have similar although slightly larger process components due to its greater production capacity. All uranium produced from the Ruth and North Butte sites will be processed at the North Butte drying and packaging areas.

The operation of the proposed commercial facilities will result in two sources of liquid waste. These sources are (1) process waste water which includes filter backwash, well-field bleed, eluate bleed and water treatment brine, and (2) restoration waste which will be primarily brine from the reverse osmosis unit used for water treatment. A combination of deep-well injection and solar evaporation ponds will be used to store and evaporate and/or dispose of the liquid wastes. At the conclusion of the project, the contaminated sediments from the solar evaporation ponds will be disposed of at a licensed radioactive waste disposal site. Similarly any solid radioactive waste generated during operation of the project will be allowed to be temporarily stored onsite before being disposed at a licensed waste disposal site.

### 2.2 Operations

Uranerz proposes to proceed with commercial in-situ mining operations with an estimated production rate of 1,000,000 pounds of  $U_3O_8$  per year. As noted previously, of this total 300,000 pounds will be produced at the Ruth site with

the remaining 700,000 pounds being produced at the North Butte site. The initial years of operation will likely see production rates that are a small percentage of the total due to well field development work that will be taking place.

For each site, mining solutions will be transported by underground pipes from the plant buildings to the various well-field buildings and from the well-field buildings to the individual wells. The recovered fluids will flow from the well field through the pipeline to the process buildings. Either high density polyethylene or PVC pipe will be used for underground service. Uranerz has proposed to leak test all underground piping prior to use and will be required by license condition to be remove all pipe prior to license termination to assure that no contamination remains at the reclaimed site.

The Ruth site will be a 1000-gpm satellite facility that will rely on the North Butte main processing plant for yellowcake drying and packaging. Operations at the Ruth site will occupy the building that currently exists from the former Ruth R&D site. Similarly, the solar evaporation ponds that currently exist at the Ruth R&D site will be utilized for waste water disposal. Well field development will concentrate on the more heavily mineralized portions of the ore deposit. The plant configuration is shown in Figure 2.2.1.

The North Butte main processing plant will be equipped with ion exchange columns similar to those at the Ruth site. In addition to the ion exchange and filtering systems, numerous surge tanks will be present to support the precipitation circuit and yellowcake drying and packaging facilities. A general process circuit configuration for the North Butte site is shown in Figure 2.2.2.

The configuration of this process circuit is typical for this type of uranium recovery operation. To assure that the process circuit is not changed without adequate health and safety considerations, the licensee will be required by license condition to submit any proposed circuit change to the configurations shown in Figures 2.2.1 and 2.2.2, to the NRC for review and approval.

The licensee's proposed design provides for facilities to store up to 1,000,000 pounds of  $U_3O_8$  and 300,000 pounds of  $U_3O_8$  at the North Butte and Ruth sites, respectively. Therefore, in order to assure adequate security and safe storage, the licensee will be authorized by license condition to possess these maximum amounts at one time.

### 3. FACILITY ORGANIZATION AND ADMINISTRATIVE PROCEDURES

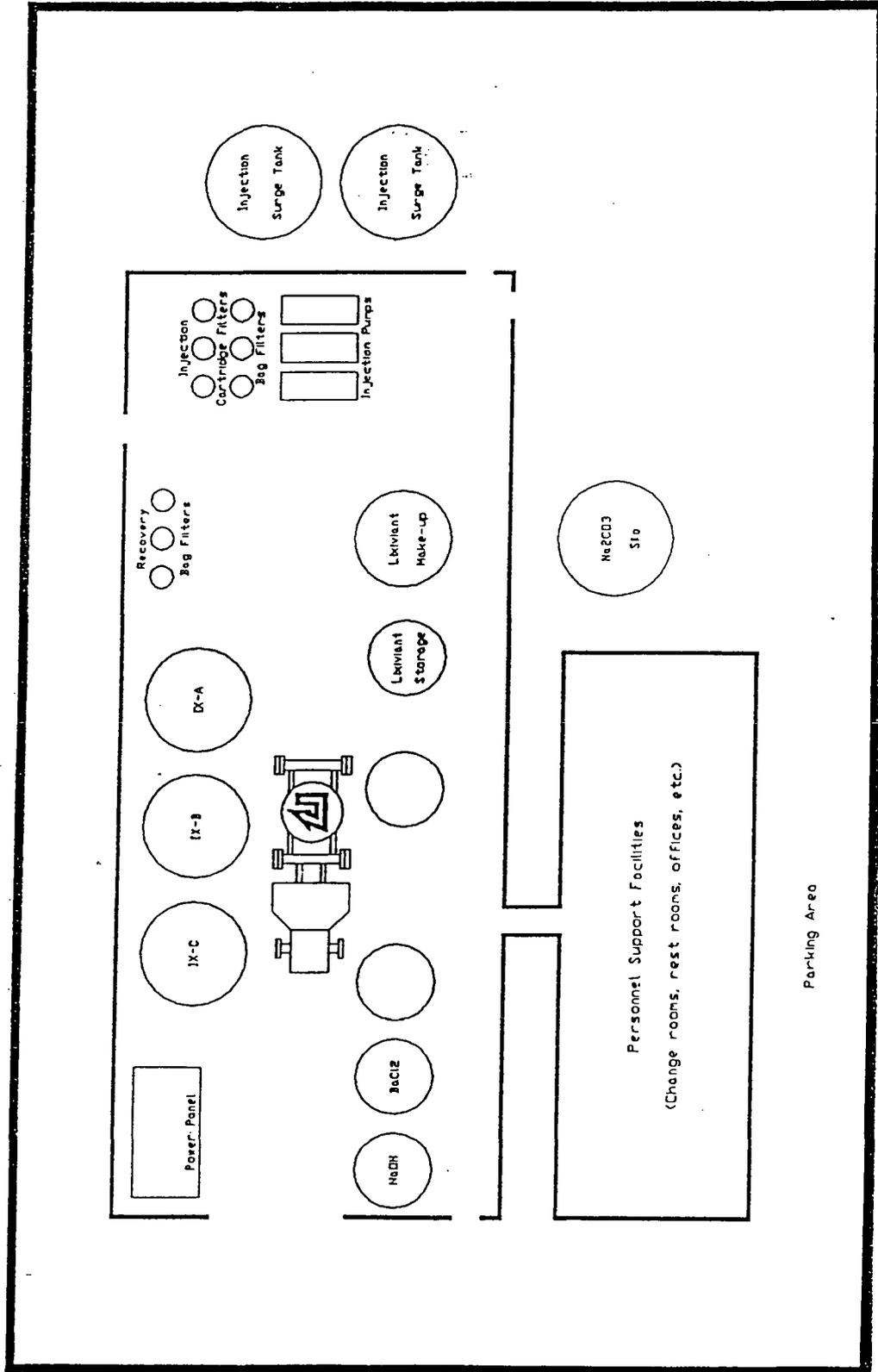
#### 3.1 Organization

A partial organization chart of Uranerz depicting the relationships of the organizational components responsible for operations, environmental protection, and radiation safety at both the Ruth and North Butte sites is shown in Figure 3.1.1. The licensee will be required by license condition to maintain this corporate structure. Should the licensee seek to alter the organizational structure, an appropriate license amendment will be required. A brief description of the organization follows.

The Uranerz corporate organizational structure as it relates to the planned uranium mining activities at the Ruth and North Butte ISL Projects will utilize individuals that have had specialized training and experience in the uranium industry. The Vice President, Mining Projects for Uranerz U.S.A., Inc., is the person in overall charge of all mining operations conducted by the company in the United States. The corporate offices for Uranerz U.S.A., Inc., are located in Denver, Colorado. The Vice President has the ultimate responsibility for ensuring that mining operations are conducted in a safe manner and in full compliance with the law. The Vice President reports to the President of Uranerz U.S.A., Inc. whose office is located in Bonn, West Germany.

Figure 2.2.1

The Ruth Satellite Facility



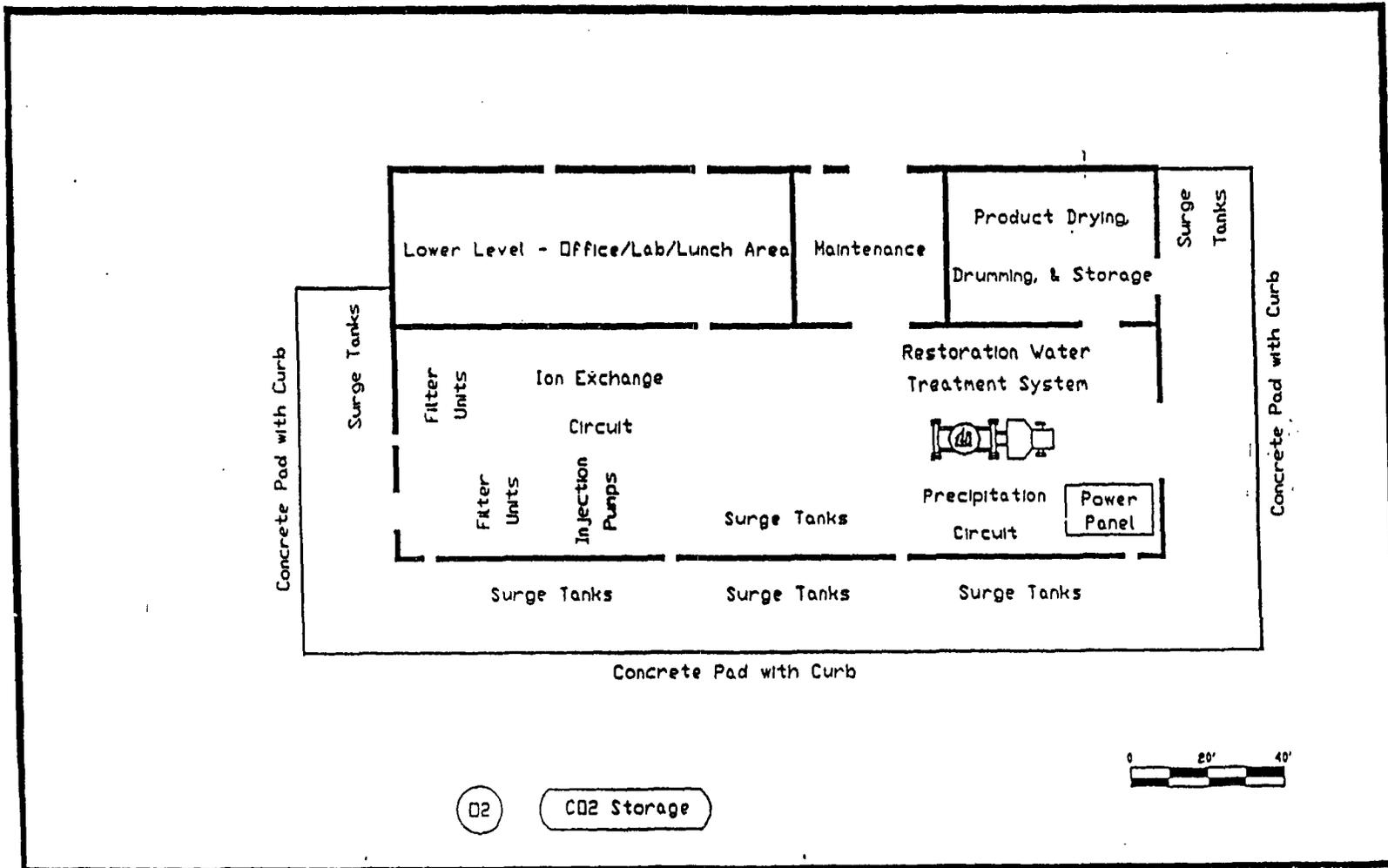
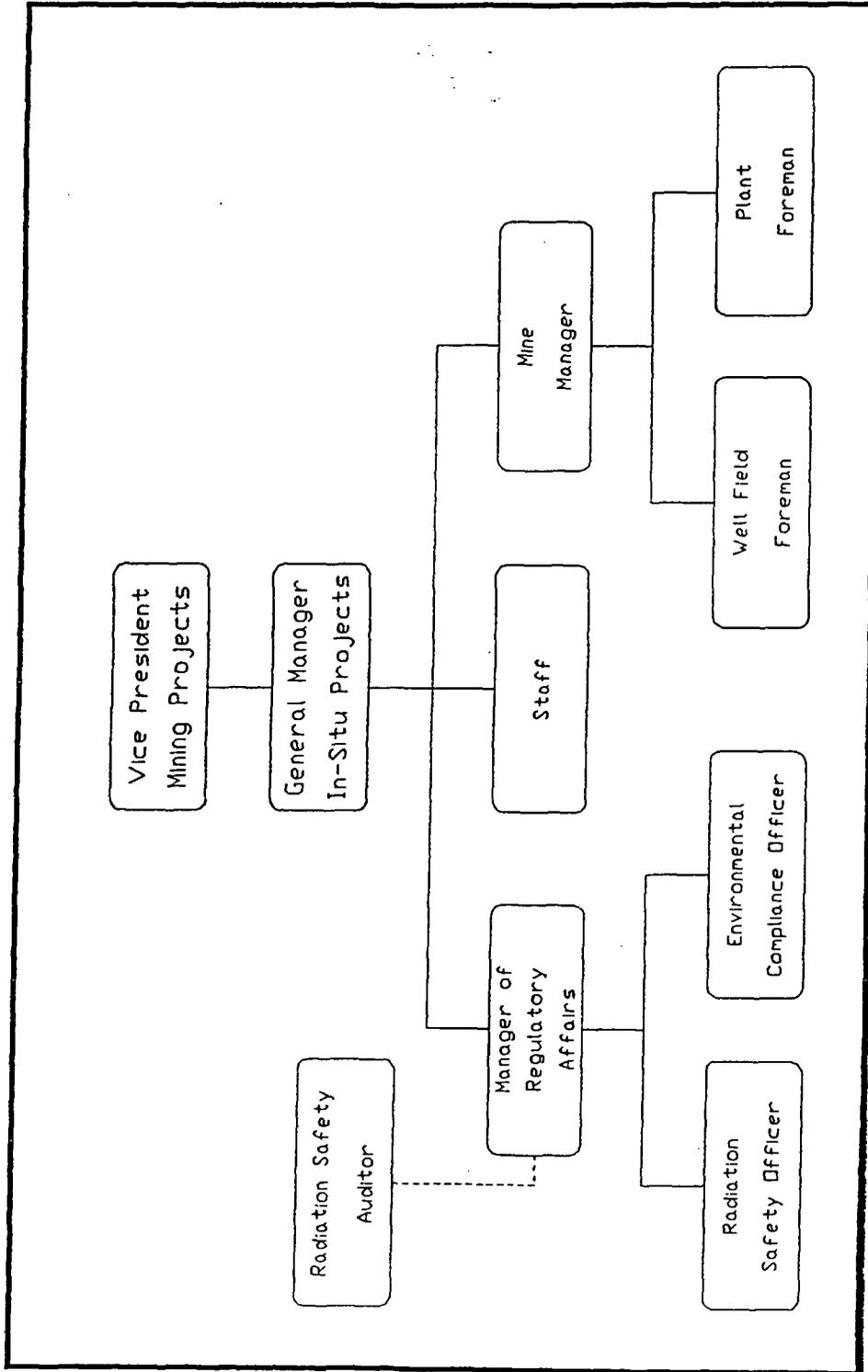


Figure 2.2.2  
North Butte Main  
Processing Plant

Figure 3.1.1  
Uranerz In-situ Mining  
Organizational Chart



The General Manager In Situ Leach Projects has the management responsibility for the safety and environmental programs at all in situ mining operations in the United States. The General Manager, In Situ Leach Projects is responsible for the development and eventual operation of the proposed Ruth and North Butte ISL projects and will supervise the work of the Mine Manager and the Manager of Regulatory Affairs to ensure that all operations are conducted in a safe manner in full compliance with the law. The General Manager, In Situ Leach Projects reports directly to the Vice President, Mining Projects. The office of the General Manager, In Situ Leach Projects will be located in Casper, Wyoming.

The Mine Manager is responsible for the day-to-day operations that will take place at the Ruth and North Butte ISL Projects. The Mine Manager will be responsible for developing, implementing, and monitoring all operating procedures. The Mine Manager must ensure that all operating procedures conform to the requirements of the radiation safety and environmental protection programs. The Mine Manager is also responsible for ensuring that all operations and activities conducted at the mine are performed in a safe manner. This individual has the authority to suspend or terminate any activities that may be dangerous to personnel or damaging to the environment. The Mine Manager reports directly to the General Manager of In Situ Leach Projects.

The Manager of Regulatory Affairs has the primary responsibility for the development and implementation of radiation safety programs, industrial safety programs, and environmental protection programs at the Ruth and North Butte ISL Projects. This individual must ensure that operating plans and procedures conform to the license conditions, to the law, and appropriate regulations. The Manager of Regulatory Affairs is responsible for the fulfillment of quality assurance programs and for compliance with regulatory reporting requirements. The Manager of Regulatory Affairs reports directly to the General Manager of In Situ Leach Projects.

The Radiation Safety Officer (RSO) is responsible for the development, implementation, and day-to-day supervision of the radiation and safety programs at the Ruth and North Butte ISL Projects. The RSO is responsible for ensuring that all mining operations comply with license conditions, with the law, and applicable regulations. This individual has direct responsibility for radiation and general safety training. By way of personal inspections and monitoring, the RSO will ensure compliance with the radiation safety programs. The RSO also has the responsibility of keeping the Mine Manager and the Manager of Regulatory Affairs advised as to the status of the radiation safety programs. The RSO has the authority to suspend any work activity that is unsafe or in violation of license conditions. The RSO reports directly to the Manager of Regulatory Affairs.

The Environmental Compliance Officer is responsible for the day-to-day implementation of the environmental monitoring and reporting program. This individual will be in charge of the proper collection of all samples required to comply with license conditions, the law, and applicable regulations. The Environmental Compliance Officer will maintain records of all sampling activity and monitoring data. Depending on qualifications, this individual may also serve in the capacity of Radiation Safety Technician, in which case he/she will

to Ensuring That Occupational Radiation Exposures at Uranium Mills Will Be As Low As Reasonably Achievable."

The minimum qualifications of the RSO in Regulatory Guide 8.31 are as follows:

- o Education: A bachelors degree in physical science or engineering from an accredited college or university, or an equivalent combination of relevant experience and training in uranium recovery radiation protection.
- o General Experience: One year supervisory experience and one year in a uranium recovery facility or related nuclear experience.
- o Health Physics Experience: One year of work experience in applied health physics, radiation protection, industrial hygiene, or similar work.
- o Specialized Training: At least 4 weeks of formal specialized courses in health physics and radiation protection.
- o Specialized Knowledge: A thorough knowledge of the proper application and use of all the health physics equipment used at the Ruth and North Butte sites, the procedures for radiological sampling and monitoring, and methods of exposure calculation.

The minimum qualifications for the ECO, who is similar to a health physics technician described in Regulatory Guide 8.31, are as follows:

- o Education: An associates degree in the physical sciences, engineering or a health-related field. Alternately, a high school diploma plus 2 years of relevant work experience in applied radiation protection and environmental sampling.
- o General Experience: One year of work experience in a uranium recovery facility or related industry involving radiation protection and environmental monitoring.
- o Health Physics Experience: One year of work experience using sampling and analytical laboratory procedures that involve health physics, industrial hygiene or industrial safety.
- o Specialized Training: At least 4 weeks of formal specialized training in radiation health protection.
- o Specialized Knowledge: Knowledge of the proper operation of health physics instruments used for monitoring and surveying at the mine and personnel dosimetry requirements.

The RSO is the individual that carries full responsibility of the day-to-day radiation safety aspects of the operation. Due to this responsibility, the NRC will require by license condition that this individual receive formal radiation safety or health physics refresher training at least every 2 years. Prior to commencement of operations, the license will be required by license condition

to submit the RSO and ECO experience, education, and specialized training to the NRC for review and approval. Additionally, due to the complexity and potential safety and health hazards associated with the drying and packaging operations, the licensee will be required by license condition to ensure that the RSO, or an individual meeting the minimum qualifications of the RSO, including training in respiratory protection, is physically present at the North Butte site during drying and packaging operations.

### 3.4 Administrative and Operation Procedures

All routine work tasks will be conducted in accordance with standard written operating procedures that will be maintained in an operations manual. Supervisory and management personnel will routinely observe their employees at work and thus will be able to ensure adherence to the written procedures. The licensee will be required by license condition to ensure that all new standard written operating procedures which may affect radiation safety are reviewed and concurred in by the radiation safety staff. This will assure that radiological safety issues are stressed in all procedures that are modified. In new facilities such as the Ruth and North Butte site, there is a need to assure that the predicted radiological environment is the environment that actually exists. Similarly, the operating procedures may become obsolete in the early states of uranium recovery. Therefore, annual review and approval of standard written operating procedures by the RSO will be required to ensure that radiation exposures are maintained as low as reasonably achievable.

A copy of the current standard written operating procedures will be required by license condition to be kept in the areas of the Ruth and North Butte production facilities where they are applied. This will assure that operators can consult these informational guides during their duties. The licensee will be further required by license condition to have all operational and nonoperational activities reviewed and approved in writing by the RSO prior to implementation. This practice stresses the importance of radiological safety with the operations and production staff.

Uranerz has proposed that all nonroutine work task or maintenance activities which may result in personnel exposure to radioactive materials will be carried out in accordance with a special work permit (SWP). Due to the potential health and safety hazards associated with nonroutine operations, the licensee will be required by license condition to use and issue a SWP, as well as maintain a work record for all nonroutine work not covered by an existing procedure where the potential for exposure to radioactive materials exist and for which no standard written operating procedure exists. All SWPs shall be accompanied by a breathing zone air sample or an applicable area air sample. The SWP shall be issued by the RSO or trained assistant, qualified by way of specialized radiation protection training, except when the work to be performed is in the yellowcake drying and packaging areas. Work in these areas will require that the SWP be issued by the RSO or an individual with equivalent training and experience. The SWP shall at least describe the following:

- ° The scope of the work to be performed;

- ° Any precautions necessary to reduce exposure to uranium and its daughters;
- ° The supplemental radiological monitoring and sampling necessary prior to, during and following completion of the work.

In addition, the RSO shall perform and document a quarterly review of all nonroutine activities to assure that the tasks have had the appropriate radiological safety controls applied, to see that exposures are reduced to levels as low as reasonably achievable.

### 3.5 Audits and Inspections

#### 3.5.1 Inspections and Monthly Audit

Uranerz has proposed that the RSO prepare a written monthly report to the Mine Manager and the Manager of Regulatory Affairs on the radiation safety status of Ruth and North Butte ISL Projects. The monthly report will include a discussion of all radiation monitoring and exposure data for the month. Any actual or potential safety problems will be presented in the report and a comparison of the radiological data to the ALARA (As Low As Reasonably Achievable) program will be made in order to define any unsatisfactory trends. If deemed necessary, the RSO will make recommendations in the monthly report to improve the radiation safety programs.

In addition to the monthly audit Uranerz has proposed that the RSO or his trained assistant will conduct a weekly inspection of the Ruth and North Butte plant buildings to determine the general radiation and non-radiation safety condition of the plant and the ongoing operations. The weekly inspection will be documented in writing. Any problem areas or items of non-compliance will be brought to the attention of the Mine Manager and the Manager of Regulatory Affairs.

Uranerz did not propose to conduct a daily plant walkthrough for either the Ruth or North Butte facilities. Because a recommendation for a daily frequency is in Regulatory Guide 8.31 and is considered necessary to adequately account for housekeeping in the facilities, performance and documentation of daily walkthroughs will be required by license conditions.

#### 3.5.2 ALARA Audit

Uranerz has proposed to conduct an annual ALARA Audit which will include an inspection of the facilities and review of radiation records. The ALARA audit team will consist of the Radiation Safety Auditor, the Manager of Regulatory Affairs, and the Mine Manager. Although the RSO will accompany the audit team during the inspection and be present during the records review, the RSO will not be a member of the team. Copies of the annual ALARA Audit report will be forwarded to the General Manager In Situ Leach Projects and the Vice President Mining Projects.

The annual ALARA Audit team will review the following:

- Bioassay results;
- Employee exposure records;
- Training records;
- Visitor and the inspection logs;
- Radiological monitoring data;
- Safety meeting reports;
- Over exposure reports;
- Approved changes in operating procedures; and
- Quality assurance program.

The annual ALARA Audit report will discuss any trends in personnel exposures and, if appropriate, suggest changes that will further reduce the potential radiation exposure to employees. Where possible, recommendations regarding the overall improvement in the ALARA program will be presented in the report.

Uranerz has proposed an annual frequency for the ALARA audit review and report. This is generally considered adequate for operating facilities; however, due to the scope of the Ruth and North Butte proposals, a semiannual ALARA audit frequency will be specified in the license. Such a frequency will bring in outside expertise to review the radiological features of the site during the initial phases of operation when effluent control devices and ventilation systems are being tested. The more frequent review will assure that these systems are adequately designed to cope with the radiological environment that is assumed to exist when operations begin.

### 3.6 Radiation Safety Training

Uranerz has committed in the application to training all Ruth and North Butte employees in radiation safety principals and general safety instruction. The training will include both classroom and on the job training, which will be administered by the RSO or other qualified individuals. The proposed training is a recommendation of Regulatory Guide 8.31 as well as other issues that are unique to the solution mining industry. Training records will be kept on each individual and the records will be maintained for a period of five years. Subjects relating to radiation safety that will be covered during training include theory of radiation, site security, personal radiation monitoring, radiation protection equipment, decontamination procedures, ventilation, emergency procedures for personnel exposure, personal and plant hygiene, prenatal exposure risk for women, and source material handling. The Operations Manual will have a section entitled "Radiation Safety Training" which will be required reading of all site employees.

#### 4. RADIATION SAFETY CONTROLS AND MONITORING

##### 4.1 Ventilation and Effluent Control

Radon gas and uranium particulates are the major effluents at solution mining sites. The Ruth site due to the lack of product drying, is expected to have few uranium particulates; therefore radon gas will be the major effluent to be monitored. The North Butte site can be expected to have a similar radon monitoring need as the Ruth site. Additionally, due to the product drying and packaging facilities, there will be potential for uranium particulates and, therefore, particulate monitoring will be more rigorous at the North Butte site.

Radon gas will be released primarily in the recovery tanks and associated process equipment. To cope with this situation, all tanks will be covered and vented to the atmosphere to minimize personnel exposures. In addition to the specific venting, the various plant buildings will be equipped with general area exhaust fans.

##### 4.2 In-Plant Monitoring Data

The in-plant radiation and airborne radioactivity monitoring program for the Ruth and North Butte sites is discussed briefly in Section 19 of the applications. Uranerz proposes to sample both radon daughters and uranium particulates at the Ruth and North Butte facilities. At the Ruth site uranium particulate monitoring and radon daughter sampling will take place on a monthly frequency at a single location near the resin transfer station. Uranerz has proposed that if an action level of 25 percent of MPC is reached, the sampling frequency will be increased to weekly. A similar sampling program is proposed for the North Butte site; however, two locations will be sampled. One of the air monitoring stations will be located in the product drying room and the other will be near the precipitation area.

The locations and frequencies for air monitoring proposed by Uranerz indicates that they are appropriate to determine the air environment that will exist at the facilities. It may however, be necessary for particulate sampling at the dryer location to take place every time the dryer is utilized and on not less than a weekly frequency. Therefore Uranerz will be required by license condition to modify the North Butte sampling frequency. This modification will determine if the effluent control system to be installed with the dryer is maintaining the air environment in an acceptable manner.

In addition to the air monitoring program, gamma surveys will be conducted quarterly at specified locations in the plant. Because these are new facilities and may be subject to radium accumulation and corresponding elevated gamma levels, monthly gamma surveys will be required by license condition. The increased frequency will help to verify if the licensee's predictions of gamma levels within the facilities are correct. Should the data support a less intense monitoring program, a license modification maybe requested. The surveys will build upon a background study that will be done prior to startup of the

facilities. Uranerz proposed that the gamma surveys have an action level of 1.0 mR/hr. This action level will require that a corrective action program be initiated to ensure that exposures are as low as reasonably achievable.

The various monitoring locations at the Ruth and North Butte facilities are shown on Figures 4.2.1 and 4.2.2 respectively. These monitoring locations with the frequencies specified above will be required by license condition.

#### 4.3 Personnel Monitoring Data

Uranerz has proposed that the calculation of internal exposure to radon or its daughters and uranium particulates be based on a time-weighted exposure calculation incorporating a consideration of both occupancy time and average airborne concentration. Occupancy factors will be determined from actual time card data or may be based upon a time study approach. Occupancy times will be determined from an initial time study that will be based on occupancy time in worker occupied locations. The time study will be performed on an annual basis after the initial study.

As proposed by Uranerz, the MPC-hour method for determining quarterly employee intake will be used for both airborne uranium particulates as well as radon daughters. If necessary, weekly intakes will be calculated. The data will be reviewed to ensure that no employees exceed the quarterly and annual doses. Because Uranerz did not propose a time frame for determining exposures and to assure that quarterly and annual doses are appropriately allocated, Uranerz will be required by license condition to determine exposure calculations within one week of the end of the calendar quarter.

Uranerz has proposed to have a set of procedures that discusses how routine maintenance tasks and work assignments should be performed. These procedures and adherence to them are an integral component of accurately calculating employee exposures. There are many nonroutine tasks that will need to be performed at the site, these tasks will be conducted under special work permits. The special work permits will detail the appropriate radiation safety and monitoring requirements as well as the equipment and any special clothing needed to safely complete the job. Work related to special work permits may involve exposure to radionuclides. This exposure will be added to that routinely calculated as part of the time-study program. There was no proposal by Uranerz to incorporate these exposures into routine exposure calculations in a timely manner. Therefore, to assure that quarterly exposure limits are not exceeded for any employee, the licensee will be required by license condition to perform and document occupational exposure calculations within 1 week of the end of each monitoring period.

Individual external radiation exposure monitoring will be accomplished by gamma surveys and personnel dosimeters. Gamma surveys and area monitoring results will be used in conjunction with the individual occupancy times to assist in estimating employee exposures, identification of radiation areas, and in calculating occupancy times. Personnel dosimeters will be issued for individual monitoring in accordance with 10 CFR 20.101.

Figure 4.2.1

Ruth Radiological  
Sampling Stations

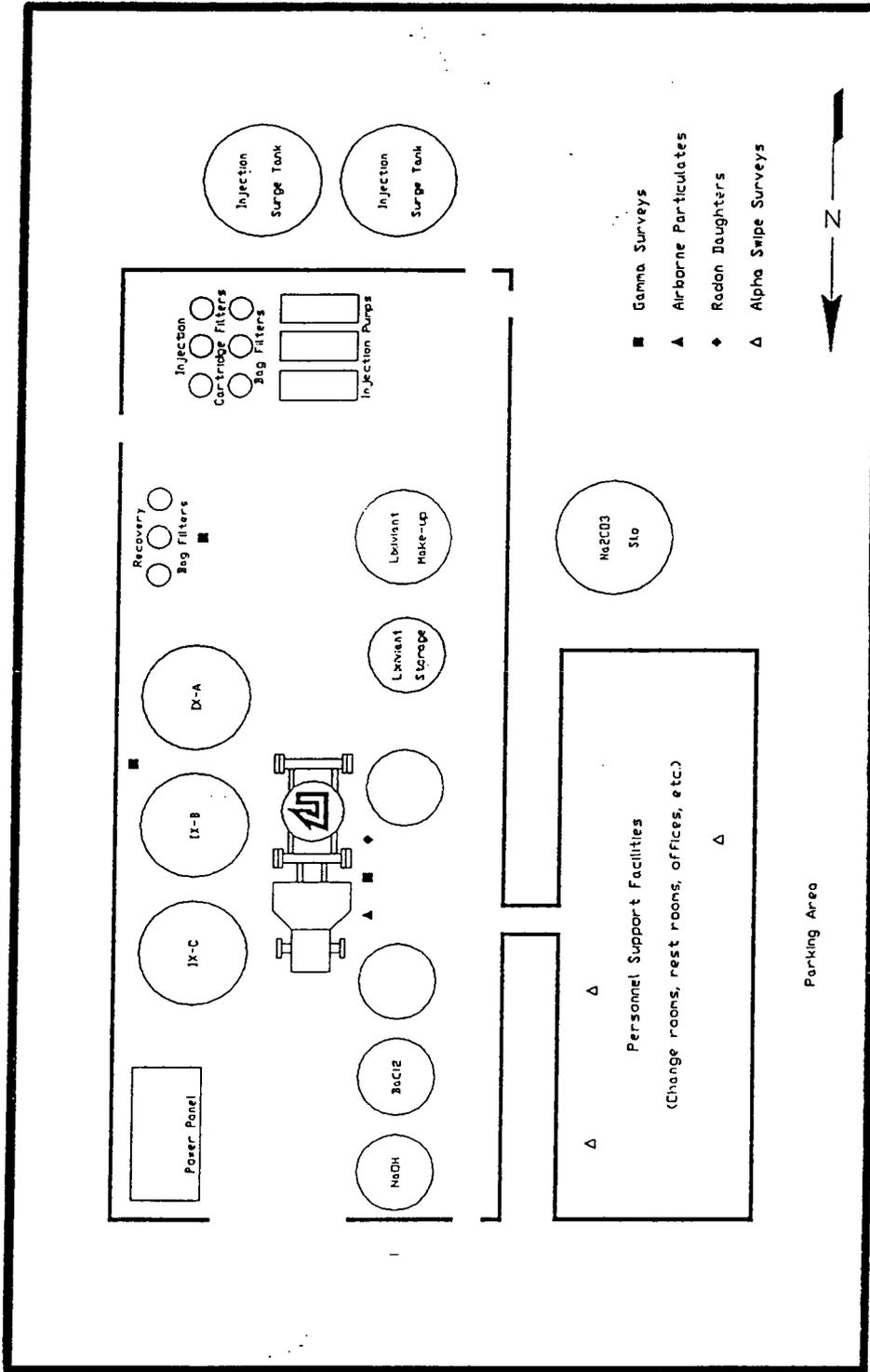
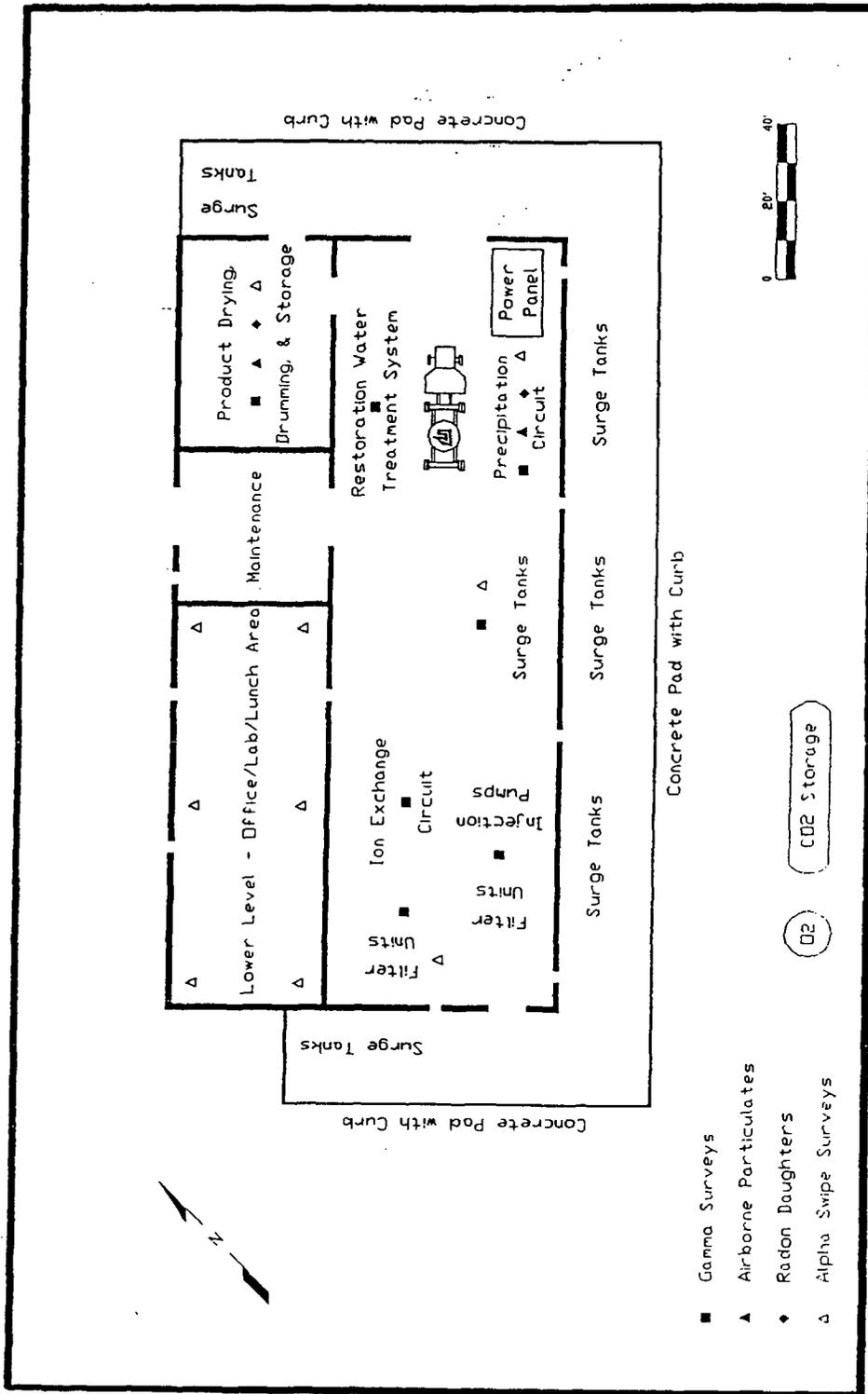


Figure 4.2.2

North Butte Radiological  
Sampling Stations



- Gamma Surveys
- ▲ Airborne Particulates
- ◆ Radon Daughters
- △ Alpha Swipe Surveys

O<sub>2</sub> CO<sub>2</sub> Storage



#### 4.4 External Radiation Control Program

##### 4.4.1 Occupational Exposure

The proposed method for monitoring external radiation exposure will be utilization of thermoluminescent dosimeters (TLD). Each employee assigned to the Ruth and North Butte Projects will be issued a TLD that will be exchanged and read on a quarterly basis. Counting of TLDs as well as their supply will be done by an outside vendor.

##### 4.4.2 External Radiation Surveys

Uranerz has proposed to conduct gamma exposure rate surveys at the Ruth site on a semiannual frequency and at the North Butte facility on a quarterly frequency. The surveys will be performed at the locations shown in Figure 4.2.1 and 4.2.2. Because these are new facilities and there is an unknown potential for gamma exposures, due to solutions high in radium, the frequencies proposed by Uranerz are not adequate. Uranerz will, therefore, be required by license condition to perform gamma surveys on a monthly frequency for both the Ruth and North Butte sites. After the sites have been characterized and if the data supports it, a reduction in monitoring frequency may be appropriate after review and approval by NRC.

#### 4.5 Internal Radiation Control Program

Radiation exposures at the various worker stations are primarily functions of the time spent at the station and the concentration of radioactive material. The licensee will provide venting of the facility as well as the use of a vacuum dryer to significantly reduce the concentration of airborne radioactivity. A vacuum dryer has the advantage that the product is isolated from the operator as well as the environment through the utilization of a negative pressure chamber. The yellowcake during the drying procedure does not come into contact with the burning fuel. Therefore stack effluents are minimal. This drying procedure does however produce a soluble yellowcake product. To assure that the dryer is performing as designed, applicable air samples, consisting of breathing zone or general area air samples, will be required by license condition during operations in the dryer room or packaging room.

##### 4.6 Bioassay

Uranerz has proposed a bioassay program that consists of collecting urine samples for all Ruth and North Butte employees. A sample will be collected from all persons initially assigned to the site. Following this sample a urine specimen will be collected from each site employee on a monthly frequency and analyzed for natural uranium.

Uranerz proposed to utilize action levels of 15 ug/l and 30 ug/l, but did not elaborate on reporting or follow-up analysis that would be conducted. Therefore Uranerz will be required by license condition to expand their bioassay program to comply with the following.

Any time an action level of 15 ug/l for urinalysis is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22, dated January 1987. This documentation will be required by license condition to be submitted to the NRC as part of the semiannual report required by 10 CFR 40.65. Any time an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis is reached or exceeded, the licensee will be required to document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation will also be required by license condition to be submitted to the NRC within 30 days of exceeding the action level.

Uranerz has proposed to dry the yellowcake product at the North Butte site, but did not propose a respiratory protection program to support this operation. It is highly likely that dryer maintenance as well as product packaging will result in worker exposure to soluble yellowcake, which would require some form of respiratory protection to avoid potential over exposure. In consideration of the potential need for respiratory protection, Uranerz will be required by license condition to implement an NRC-approved respiratory protection program prior to operating the North Butte site.

#### 4.7 Contamination Control

##### 4.7.1 Personnel Contamination

Uranerz will require all employees and visitors leaving the restricted areas to monitor themselves for alpha contamination or shower. Failure to meet the Uranerz action level of 1000 dpm/100 cm<sup>2</sup> requires the employee to decontaminate and resurvey themselves. In addition to the personnel contamination program proposed by Uranerz, documented alpha contamination spot checks should also be performed by the RSO on at least a quarterly frequency at both the Ruth and North Butte sites. Such checks will assure that employees are adequately surveying prior to leaving the site. Therefore, this procedure will be required by license condition.

##### 4.7.2 Surface Contamination

Uranerz has proposed to conduct monthly alpha surveys in designated eating areas, change rooms and office areas to determine contamination levels. The change rooms and offices are not designed to be in the restricted area at either the Ruth and North Butte facilities. Alpha survey locations at the Ruth site will include the personnel trailer. No alpha survey locations are planned for the process building. A review of these survey locations indicates that the process building should at a minimum have alpha surveys conducted near the resin transfer area as well as in the filter areas. Both of these areas have the potential to accumulate yellowcake, if adequate housekeeping practices are not implemented. Therefore alpha surveying in these areas will be required by license condition.

The proposed alpha survey locations at the North Butte site include the office, change rooms, and lunch areas as well as several locations within the process building. These locations appear to be appropriate.

The monthly frequency that Uranerz proposes to utilize does not assure that contamination levels are adequately monitored. Previous experience at other solution mining sites indicates that alpha contamination can accumulate over a few days to levels that requires decontamination. Therefore, Uranerz will be required by license condition to perform documented alpha surveys on a weekly frequency.

#### 4.7.3 Disposal of Contaminated Equipment

Uranerz has pursued waste disposal options at several sites in the western United States. To date they have not formulated an agreement with a specific site. However, they are continuing their search for a site. Consistent with current NRC policy they will be allowed to store waste on site in a designated area until a permanent disposal site has been located. The staff will also, require by license condition that all equipment leaving the facility shall be surveyed in accordance with, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct and Source Materials," which will be an attachment to both the Ruth and North Butte licenses.

#### 4.8 Quality Assurance and Calibration

Uranerz has discussed the components of their effluent and radiological monitoring programs in Section 19 of their license application. However, a specific quality assurance program has not been proposed. Uranerz will be required by license condition to propose quality assurance programs for the effluent and radiological monitoring at both the Ruth and North Butte sites. The quality assurance programs should be based upon the guidance provided in Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operations)-Effluent Streams and Environment."

Uranerz has proposed to calibrate all instruments used to perform radiation surveys, based upon the manufacturers specifications or annually, whichever is sooner. Uranerz did not indicate that instrument calibration would take place following repairs. Additionally a semiannual calibration of radiation and effluent monitoring equipment is considered necessary to assure accurate measurements as are calibrations following repairs. The licensee will be required by license condition to calibrate radiation detection instruments, portable air sampling equipment and fixed continuous air samplers after each repair and at least semiannually, or at the manufacturer's suggested interval, whichever is more frequent. To assure proper response of the instruments, Uranerz has proposed that all radiation detection instruments be checked each time the sampler head is changed. Because the sample leads are rarely changed and to be certain that radiation survey equipment is operating as assigned, the licensee will be required by license condition to operationally check each instrument daily during its use. Documentation of all instrument calibration, operational checks and repairs shall be maintained by the licensee.

## 6. EMERGENCY PROCEDURES AND PREVENTATIVE MEASURES

Uranerz has proposed to formulate a plan to be implemented in case of emergencies. Sufficient detail was not supplied in the application materials; therefore, Uranerz will be required by license condition to establish emergency procedures for natural disasters, significant equipment or facility damage, uncontrolled plant shutdowns, yellowcake spills, loss or theft of yellowcake or sealed sources, employee overexposure and unauthorized discharges of radioactive materials. The procedures will be required to include appropriate individuals to contact as well as health and decontamination procedures and cleanup methods.

Accidents involving the uncontrolled discharge of waste solutions are expected to be extremely remote. As required by license condition, the licensee will perform a daily inspection of the solution disposal system. The licensee will also be required by license condition to immediately notify the NRC by telephone of any failure of the solution disposal system which results in a release of radioactive material and/or of any unusual conditions which if not corrected could lead to such a failure. This procedure will keep the NRC informed of any radiological situations which may need regulatory response.

## 7. EVAPORATION POND EVALUATION

The Ruth and North Butte operations will result in two primary sources of liquid waste. They are eluant bleed and production bleed. These waste streams are routed to water treatment or the evaporation ponds as well as land application areas or disposed of via deep well injection. A complete discussion of these methods is contained in the accompanying Environmental Assessment.

## 8. DECOMMISSIONING AND RECLAMATION

Uranerz will be required by license condition to decommission and reclaim the Ruth and North Butte sites to appropriate radiation protection standards. This will include radium-226 standards for the well field and other earthen areas as well as assure that all materials leaving the site or left at the site meet unrestricted release requirements. Additionally, the well fields will be required to be abandoned in accordance the State of Wyoming standards for abandonment of wells as proposed in the Uranerz application. Additional site reclamation and aquifer restoration information is contained in the accompanying Environmental Assessment.

## 9. SURETY REQUIREMENTS

The staff will require by license condition that the applicant maintain a surety bond or other acceptable financial instrument, for reclamation and decommissioning costs of the Ruth and North Butte facilities. The bond amount shall be calculated based on hiring a contractor to perform the work. The bond shall be renewed annually in order to allow readjustment of the bond total value due to changing conditions, inflation and other similar considerations. The submittals that Uranerz prepared for financial assurance were reviewed and found adequate to reclaim the sites as proposed to be operated; therefore, bonding amounts can be established. Although these amounts have been established, the licensee will only be required to maintain financial assurance for those facilities that actually exist. Therefore the actual bond for The Ruth site will only cover the costs associated with the R&D operation. There will be no bond required for the North Butte site because no construction has taken place. However, 3 months prior to construction activities, the total approved bond will be required to be in effect.

## 10. CONCLUSION INCLUDING SAFETY LICENSE CONDITIONS

Upon completion of the safety review of the application for the two source material licenses it has been concluded that the operation of the Ruth and North Butte Projects in accordance with the licensee's applications and the following license conditions, will be protective of health and safety and fulfills the requirements of 10 CFR Part 20.

Ruth site safety related conditions:

- The authorized place of use shall be the licensee's Ruth facility in Johnson County, Wyoming.
- For use in accordance with statements, descriptions and representations contained in Sections 15, 16.1 to 16.4, 16.6 to 16.11, and 19 of the licensee's revised application submitted by cover letter dated October 3, 1988.

Notwithstanding the above, the following conditions shall override any conflicting statements contained in the licensee's application and supplements.

- The annual throughput shall not exceed a flow rate of 1000 gallons per minute, exclusive of restoration flow resulting in a production rate not to exceed 300,000 pounds of  $U_3O_8$ .
- Any significant changes in the process circuit as show in Figure 15.19 of the application, dated October 3, 1988, shall require approval by the NRC, Uranium Recovery Field Office, in the form of a license amendment.
- Release of equipment or packages from the restricted area shall be in accordance with the attachment to this license entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials," dated September 1984.
- The results of the sampling, analyses, surveys and monitoring, the results of calibration of equipment, reports on audits and inspections, all meetings and training courses required by this license and any subsequent reviews, investigations and corrective actions, shall be documented. Unless otherwise specified in the NRC regulations, all such documentation shall be maintained for a period of at least 5 years.
- Standard operating procedures (SOPs) shall be established for all operational process activities involving radioactive materials that are handled, processed or stored. Standard operating procedures for operational activities shall enumerate pertinent radiation safety practices to be followed. Three months prior to the planned initiation of operations the SOPs shall be submitted to the NRC, Uranium Recovery Field Office in the form of a license amendment for review and approval. Additionally, written procedures shall be established for nonoperational activities to

include in-plant and environmental monitoring, bioassay analyses and instrument calibrations. An approved, current copy of each written procedure shall be kept in the process area to which it applies.

- All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the Radiation Safety Officer before implementation, whenever a change in a procedure is proposed, and at least annually, to ensure that proper radiation protection principles are being applied.
- In addition to the inspection and audit program described in Section 19.1.3 of the application, dated October 3, 1988, the RSO or trained assistant shall document a daily walkthrough of the facility to determine if radiation control practices are being implemented.
- The licensee shall submit to the NRC, Uranium Recovery Field Office, a copy of the annual ALARA audit report as specified in Section 19.1.3 of the application dated October 3, 1988, 2 months of the end of the reporting period. The report shall also include a summary of the daily walkthrough inspections.
- The licensee shall implement the radiological surveys specified in Sections 19.1.7.2, 19.1.7.5, 19.1.7.6, and 19.1.7.8 at the locations specified in Figure 19.2 of the application dated, October 3, 1988. Additionally, alpha surveys, at the designated locations shall be conducted weekly and gamma surveys shall be performed monthly.
- The licensee shall, 2 months prior to operation propose alpha survey locations in the resin transfer and filter areas.
- In addition to the bioassay program discussed in Section 19.1.7.4 of the application, dated October 3, 1988, the licensee shall comply with the following:
  - (1) Anytime an action level of 15 ug/l uranium for urinalysis is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22, dated January 1987. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR Part 40.65.
  - (2) Anytime an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis or 16 nCi uranium for an in vivo measurement is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, within 30 days of exceeding the action level.
  - (3) All in vivo measurements shall be performed in accordance with the recommendations contained in Revision 1 of Regulatory Guide 8.22.

- Employees shall monitor themselves with an alpha survey instrument prior to exiting the restricted area. Should the results of monitoring exceed an action level of 1000 dpm/100 cm<sup>2</sup>, employees shall decontaminate themselves to less than the action level. If decontamination cannot be accomplished, the employee shall report the incident to the RSO for investigation. Additionally, the RSO shall perform and document unannounced quarterly spot checks of employees leaving the process area.
- All radiation and environmental monitoring, sampling and detection equipment shall be recalibrated after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each day's use.
- Any changes to the organizational chart as illustrated in Figure 19.1 of the application dated October 3, 1988, shall require approval by the NRC, Uranium Recovery Field Office, in the form of a license amendment.
- At least 3 months prior to operations the licensee shall submit to NRC, Uranium Recovery Field Office, the training and education documents and resumes for the General Manager In-Situ Projects, Manager of Regulatory Affairs, Radiation Safety Officer, and Environmental Compliance Officer.
- The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.203(3)(2) and with the words, "ANY AREA WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."
- The licensee shall be required to use a Special Radiation work permit (SWP) for all work or nonroutine maintenance jobs where the potential for significant exposure to radioactive material exists and for which no standard written operating procedure exists. All SWPs shall be accompanied by a breathing zone air sample or an applicable area air sample. The SWP shall be issued by the RSO or trained assistant, qualified by way of specialized radiation protection training. The SWP shall describe at least the following:
  - (1) The scope of the work to be performed.
  - (2) Any precautions necessary to reduce exposure to uranium and its daughters.
  - (3) The supplemental radiological monitoring and sampling necessary prior to, during and following completion of the work.

In addition, the RSO shall review and document all nonroutine work activities on a quarterly frequency.

- Occupational exposure calculations shall be performed and documented within 1 week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Routine radon or radon daughter and particulate samples shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. Nonroutine samples shall be analyzed and the results reviewed by the RSO within two (2) working days after sample collection.
- 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 time weighted exposure 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 the exposure.

Necessary corrective measures shall be taken to ensure that future exposures are as low as is reasonably achievable. Records shall be maintained of these investigations and results furnished to the NRC, Uranium Recovery Field Office, in the semiannual required by Report 10 CFR 40.65.

- The licensee shall 3 months prior to initiation of operations propose in the form of a license amendment emergency procedures to be implemented in the event of natural disasters, equipment failure, facility damage, loss or theft of source material, and unauthorized discharge of radioactive materials for review and approval by the NRC, Uranium Recovery Field Office.

North Butte safety related conditions:

- The authorized place of use shall be the licensee's North Butte facility in Campbell County, Wyoming.
- For use in accordance with statements, descriptions and representations contained in Sections 15, 16.1 to 16.4, 16.6 to 16.12, and 19 of the licensee's revised application submitted by cover letter dated March 7, 1989.

Notwithstanding the above, the following conditions shall override any conflicting statements contained in the licensee's application and supplements.

- The annual throughput shall not exceed a flow rate of 3000 gallons per minute, exclusive of restoration flow resulting in a production rate of 700,000 pounds of  $U_3O_8$ .
- Any significant changes in the process circuit as show in Figure 15.21 of the application, dated March 7, 1989, shall require approval by the NRC, Uranium Recovery Field Office, in the form of a license amendment.

- Release of equipment or packages from the restricted area shall be in accordance with the attachment to this license entitled, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials," dated September 1984.
- The results of the sampling, analyses, surveys and monitoring, the results of calibration of equipment, reports on audits and inspections, all meetings and training courses required by this license and any subsequent reviews, investigations and corrective actions, shall be documented. Unless otherwise specified in the NRC regulations, all such documentation shall be maintained for a period of at least 5 years.
- Standard operating procedures (SOPs) shall be established for all operational process activities involving radioactive materials that are handled, processed or stored. Standard operating procedures for operational activities shall enumerate pertinent radiation safety practices to be followed. Three months prior to the planned initiation of operations the SOPs shall be submitted to the NRC, Uranium Recovery Field Office in the form of a license amendment for review and approval. Additionally, written procedures shall be established for nonoperational activities to include in-plant and environmental monitoring, bioassay analyses and instrument calibrations. An approved, current copy of each written procedure shall be kept in the process area to which it applies.
- All written procedures for both operational and nonoperational activities shall be reviewed and approved in writing by the Radiation Safety Officer before implementation, whenever a change in a procedure is proposed, and at least annually, to ensure that proper radiation protection principles are being applied.
- At least 3 months prior to operation of the yellowcake dryer, the licensee shall submit to the NRC, Uranium Recovery Field Office, in the form of a license amendment, a respiratory protection program, for NRC review and approval.
- In addition to the inspection and audit program described in Section 19.1.3 of the application, dated March 7, 1989, the RSO or trained assistant shall document a daily walkthrough of the facility to determine if radiation control practices are being implemented.
- The licensee shall submit to the NRC, Uranium Recovery Field Office, a copy of the ALARA report as specified in Section 19.1.3 of the application dated March 7, 1989, within 2 months of the end of the reporting period. The report shall also include a summary of the daily walkthrough inspections.
- The licensee shall implement the radiological surveys described in Sections 19.1.7.2, 19.1.7.5, 19.1.7.6, and 19.1.7.8 at the locations specified in Figure 19.2 of the application dated, March 7, 1989.

Additionally, alpha surveys, at the designated locations shall be conducted weekly and air particulate monitoring shall be performed every time the dryer is utilized. When the dryer is not being used particulate monitoring shall be administered on a weekly frequency. Gamma surveys shall be performed monthly.

- In addition to the bioassay program discussed in Section 19.1.7.4 of the application, dated March 7, 1989, the licensee shall comply with the following:
  - (1) Anytime an action level of 15 ug/l uranium for urinalysis is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22, dated January 1987. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, as part of the semiannual report required by 10 CFR Part 40.65.
  - (2) Anytime an action level of 35 ug/l for two consecutive specimens or 130 ug/l uranium for one specimen for urinalysis or 16 nCi uranium for an in vivo measurement is reached or exceeded, the licensee shall document the corrective actions which have been performed in accordance with Revision 1 of Regulatory Guide 8.22. This documentation shall be submitted to the NRC, Uranium Recovery Field Office, within 30 days of exceeding the action level.
  - (3) All in vivo measurements shall be performed in accordance with the recommendations contained in Revision 1 of Regulatory Guide 8.22.
- Employees shall monitor themselves with an alpha survey instrument prior to exiting the restricted area. Should the results of monitoring exceed an action level of 1000 dpm/100 cm<sup>2</sup>, employees shall decontaminate themselves to less than the action level. If decontamination cannot be accomplished, the employee shall report the incident to the RSO for investigation. Additionally, the RSO shall perform and document unannounced quarterly spot checks of employees leaving the process area.
- All radiation and environmental monitoring, sampling and detection equipment shall be recalibrated after each repair and as recommended by the manufacturer or at least semiannually, whichever is more frequent. In addition, all radiation survey instruments shall be operationally checked with a radiation source before each day's use.
- Any changes to the organizational chart as illustrated in Figure 19.1 of the application dated March 7, 1989, shall require approval by the NRC, Uranium Recovery Field Office, in the form of a license amendment.
- At least 3 months prior to operations the licensee shall submit to NRC, Uranium Recovery Field Office, the training and education documents resumes for the General Manager In-Situ Projects, Manager of Regulatory Affairs, Radiation Safety Officer, and Environmental Compliance Officer.

- The licensee is hereby exempted from the requirements of Section 20.203(e)(2) of 10 CFR 20 for areas within the facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.203(3)(2) and with the words, "ANY AREA WITHIN THIS FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."
- The licensee shall be required to use a special work permit (SWP) for all work or nonroutine maintenance jobs where the potential for significant exposure to radioactive material exists and for which no standard written operating procedure exists. All SWPs shall be accompanied by a breathing zone air sample or an applicable area air sample. The SWP shall be issued by the RSO or trained assistant, qualified by way of specialized radiation protection training, except when the work to be performed is in the drying and packaging areas. The RWP for these areas shall be issued by the RSO. The SWP shall describe at least the following:
  - (1) The scope of the work to be performed.
  - (2) Any precautions necessary to reduce exposure to uranium and its daughters.
  - (3) The supplemental radiological monitoring and sampling necessary prior to, during and following completion of the work.

In addition, the RSO shall review and document all nonroutine work activities on a quarterly frequency.

- Occupational exposure calculations shall be performed and documented within 1 week of the end of each regulatory compliance period as specified in 10 CFR 20.103(a)(2) and 10 CFR 20.103(b)(2). Routine radon or radon daughter and particulate samples shall be analyzed in a timely manner to allow exposure calculations to be performed in accordance with this condition. Nonroutine samples shall be analyzed and the results reviewed by the RSO within two working days after sample collection.
- 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 time weighted exposure 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 the exposure.

Necessary corrective measures shall be taken to ensure that future exposures are as low as is reasonably achievable. Records shall be maintained of these investigations and results furnished to the NRC, Uranium Recovery Field Office, in the semiannual report required by 10 CFR 40.65.

- The licensee shall 3 months prior to initiation of operations propose in the form of a license amendment emergency procedures to be implemented in the event of natural disasters, equipment failure, facility damage, loss or theft of source material, and unauthorized discharges of radioactive materials for review and approval by the NRC, Uranium Recovery Office.