UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 04, 1997

Richard F. Clement, Jr., President
Hydro Resources, Inc.
2929 Coors Blvd., NW
Suite 101
Albuquerque, NM 87120

SUBJECT: SAFETY EVALUATION REPORT FOR THE CROWNPOINT URANIUM MINING PROJECT

Dear Mr. Clement:

The purpose of this letter is to transmit the enclosed Safety Evaluation Report (SER) for Hydro Resources, Inc.'s (HRI's) Crownpoint Uranium Mining Project at Crownpoint, NM. The SER documents the Nuclear Regulatory Commission staff's safety review of the Crownpoint Project. The SER and the Final Environmental Impact Statement (NUREG-1508) for the Crownpoint Project, dated February 1997, provide the bases for NRC's decision to issue a source material license to HRI 30 days from the date of this letter.

The license will authorize HRI to construct and operate in situ leach mining facilities at the Crownpoint project for a period of five years. In preparing the SER, the NRC staff reviewed HRI's license application submittals and its Consolidated Operations Plan, Revision 2.0, dated August 15, 1997, against the applicable regulations in 10 CFR Parts 19, 20, 40, and 71. The SER supports the NRC staff's finding that issuing the license to HRI will be in accordance with the aforementioned regulations, and with all applicable safety requirements of the Atomic Energy Act of 1954, as amended.

If you have any questions concerning this subject, please contact Mr. Robert Carlson of my staff at (301) 415-8165.

Sincerely,

Joseph J. Holonich, Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

Docket No.: 40-08968

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SAFETY EVALUATION REPORT

DECEMBER 1997

HYDRO RESOURCES, INCORPORATED
LICENSE APPLICATION FOR
CROWNPOINT URANIUM SOLUTION MINING PROJECT
MCKINLEY COUNTY, NEW MEXICO

DOCKET NO. 40-8968

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Division of Waste Management

TABLE OF CONTENTS

FIGURES

1.0 INTRODUCTION

On April 25, 1988, Hydro Resources, Inc. (HRI), submitted an application to the U.S. Nuclear Regulatory Commission proposing to construct and operate an in situ leach (ISL) uranium mining facility on property in Sections 8 and 17, Township (T) 16N Range (R) 16W, near Churchrock, New Mexico (hereafter, the Churchrock site). HRI later amended its application to include ISL operations on two lease areas near Crownpoint, NM: (a) an area covering parts of Sections 15-16 and 21-23, T17N R13W, approximately 2.5 miles west of Crownpoint (hereafter, the Unit 1 site); and (b) an area covering parts of Sections 24 and 25, T17N R13W, and Sections 19 and 29, T17N R12W, adjacent to Crownpoint (hereafter, the Crownpoint site). Operations at the Crownpoint site include a central processing facility (CPF) in Section 24, T17N R13W, where yellowcake will be dried and packaged. Together, the three sites comprise HRI's Crownpoint Uranium Solution Mining Project (hereafter, the Crownpoint Project). The staff's environmental review of the Crownpoint Project is set forth in NUREG 1508, *Final Environmental Impact Statement to Construct and Operate the Crownpoint Uranium Solution Mining Project, Crownpoint, New Mexico* (hereafter, the FEIS [NRC 1997]). This safety evaluation report (SER) documents the staff's safety review of HRI's Crownpoint Project application materials.

HRI developed and submitted in 1996 a consolidated operation plan (COP) for the Crownpoint Project (COP Revision 0.0 [HRI 1996b]) in response to a staff request for additional information (NRC 1996a, Question 39). In response to additional requests for information, HRI submitted revised COPs in 1997 (Revision 1.0 [HRI 1997a] and Revision 2.0 [HRI 1997b]).

1.1 Description of the Proposed Action

This SER and the FEIS (NRC 1997) provide the bases for NRC's decision to issue a source material license to HRI 30 days from issuance of the SER. The license will authorize HRI to construct and operate ISL uranium mining facilities at the Crownpoint Project for a period of five years. In preparing the SER, the staff reviewed HRI's license application submittals and the COP Revision 2.0 (HRI 1997b) against the applicable regulations in 10 CFR Parts 19, 20, 40, and 71. The SER supports the staff's finding that issuing the license to HRI will be in accordance with these regulations, and with all applicable safety requirements of the Atomic Energy Act of 1954 (AEA), as amended.

1.2 Supplemental Information

After the FEIS (NRC 1997) was published, HRI provided sensitivity analyses of flow times from the Unit 1 site to the Town of Crownpoint wells as a function of variations in permeability, storage coefficient, aquifer thickness, porosity, and town of Crownpoint well pumping rates (HRI 1997c). HRI's report provided groundwater flow rates and velocities for average values, and then increasingly conservative and unlikely values that would produce faster flow velocities. Different flow times were calculated by holding all model parameters constant, while varying one or more other parameters. For the Unit 1 boundary nearest the town of Crownpoint, the sensitivity analysis produced average flow times that ranged from 2,103 years to 2,371 years. These are longer flow times than were calculated by the modeling study cited in the FEIS (NRC 1997). That study was based on more conservative values and produced a flow time of 1,657

years. With the exception of modeling runs based on unrealistically conservative values, calculated flow times were all above 1,500 years. Modeling runs based on unrealistically conservative values produced flow times from 1,059 years to 698 years. The sensitivity analyses showed that extremely long flow times to the Crownpoint water supply wells from the Unit 1 site are to be expected. This is in agreement with the conclusions in Section 3.3 of the FEIS (NRC 1997).

1.3 Review Scope

This SER details the staff's safety review of HRI's radiological protection program for the Crownpoint Project, set forth in COP Revision 2.0 (HRI 1997b). While much of the SER text repeats what is stated in COP Revision 2.0 (HRI 1997b), any HRI commitments made in the COP are enforceable whether or not such commitments are stated in the SER.

Evaluation of environmental impacts and measures to mitigate those impacts are contained in the FEIS. The SER safety review focuses on those aspects of radiological protection discussed in the COP (HRI 1997b) which were not evaluated in the FEIS (NRC 1997) and is limited to those aspects of the COP (HRI 1997b) that fall within the NRC's regulatory jurisdiction. For example, the SER does not evaluate HRI's proposed land application of restoration wastewater on Section 12, T17N R13W, north of Crownpoint. Restoration wastewater disposal is not licensed by NRC, and HRI would need to obtain the appropriate licenses and/or permits from the proper regulatory authorities.

The SER text in bold print denotes matters to be controlled by specific license conditions stated in the license. HRI cannot deviate from these conditions without first obtaining NRC approval through the license amendment process. These license conditions provide reasonable assurance that HRI's Crownpoint Project operation will be in accordance with all NRC regulatory requirements. NRC will require by license condition that:

HRI shall conduct operations in accordance with all commitments, representations, and statements made in its license application submitted by cover letter dated April 25, 1988, as supplemented, and the Crownpoint Uranium Project COP, Rev. 2.0, dated August 15, 1997, except where superseded by license conditions contained in this license. Whenever the words "will" or "shall" are used in the aforementioned licensee documents, it denotes an enforceable license requirement.

2.0 AUTHORIZED ACTIVITIES

The source material license to be issued to HRI will authorize the commercial ISL operation of the Crownpoint Project. Uranium will be extracted from the ore bodies by a sodium bicarbonate lixiviant at a rate of up to 0.25 cubic meters per second (4,000 gal/min) at each site. The uranium will be extracted from the solution, and concentrated. For uranium mined at the Churchrock and Unit 1 sites, uranium concentrate, in either the form of uranium-loaded resin beads or yellowcake slurry, will be shipped by truck to the CPF, where it will be dried and packaged into a final yellowcake product. Descriptions of the well fields, mining equipment, lixiviant, processing facilities, and recovery processes to be used at the Crownpoint Project are

contained in FEIS Sections 2.1.1.1 through 2.1.1.4 (NRC 1997). The NRC will require by license condition that:

The processing plant flow rate at each site (Church Rock, Unit 1, or Crownpoint) shall not exceed 15,142 L/min (4000 gal/min), exclusive of restoration flow. Total yellowcake production from all three sites shall not exceed 1.36 million kg (3 million lbs) annually.

3.0 MANAGEMENT ORGANIZATION AND ADMINISTRATIVE PROCEDURES

3.1 Organization

Figure 1 is a partial organization chart of HRI's Crownpoint Project. The positions and duties of HRI personnel are described below, in descending order of authority. Qualifications and experience requirements are noted, where applicable. HRI will allow a Master's degree in an appropriate field to equate to two years of work experience. HRI's organizational arrangement is consistent with Regulatory Guide 8.31 (NRC 1983b). The organizational arrangement allows radiation safety matters to be considered at any management level. To ensure clear lines of communication for radiological safety matters, NRC will require by license condition that:

Any corporate organization changes affecting the assignments or reporting responsibilities of the radiation safety staff as described in the COP of the approved license application shall conform to Regulatory Guide 8.31 (NRC 1983b).

3.1.1 C.E.O. of Uranium Resources, Inc.

The C.E.O. of Uranium Resources, Inc., will have the ultimate responsibility for all operations of Uranium Resources, Inc., including its subsidiary, HRI, Inc.

3.1.2 Vice President of Health, Safety and Environmental Affairs

The Vice President of Health, Safety and Environmental Affairs (VPHSE) will have the ultimate responsibility and authority for the radiation safety, environmental compliance, and Quality Assurance program at the Crownpoint Project, in addition to off-site project development activities. The VPHSE will provide corporate audit input to the Environmental Manager, and Radiation Safety Officer (RSO) to ensure that all radiation safety, environmental compliance, and permitting/licensing programs will be conducted in a responsible manner, and in compliance with all applicable regulations, and permit/license conditions. The VPHSE will report directly to the C.E.O. of Uranium Resources, Inc.

HRI will require the VPHSE to have either a Bachelors degree in an engineering or science field from an accredited college or university, or an equivalent level of work experience. Additionally, a minimum of five years of experience in senior engineering management and operations functions will be required.

3.1.3 President of HRI

The President of HRI is responsible for the safe operations of the Crownpoint Project. The President reports directly to the C.E.O. of Uranium Resources, Inc.

3.1.4 Environmental Manager

The Environmental Manager reports directly to the President of HRI and is responsible for the development, administration and enforcement of all environmental programs for the Crownpoint Project, including radiation safety. The Environmental Manager will also interface with the VPHSE to ensure that the environmental programs are conducted consistent with the applicable regulations. The Environmental Manager will be responsible for routinely auditing all operational and monitoring procedures and the QA/QC programs, will chair the ALARA ("As Low As Reasonably Achievable") committee, will be a member of the ALARA audit team, and a member of the Safety and Environmental Review Panel (SERP). The Environmental Manager is authorized to terminate immediately any activity that may be a threat to the employees, public

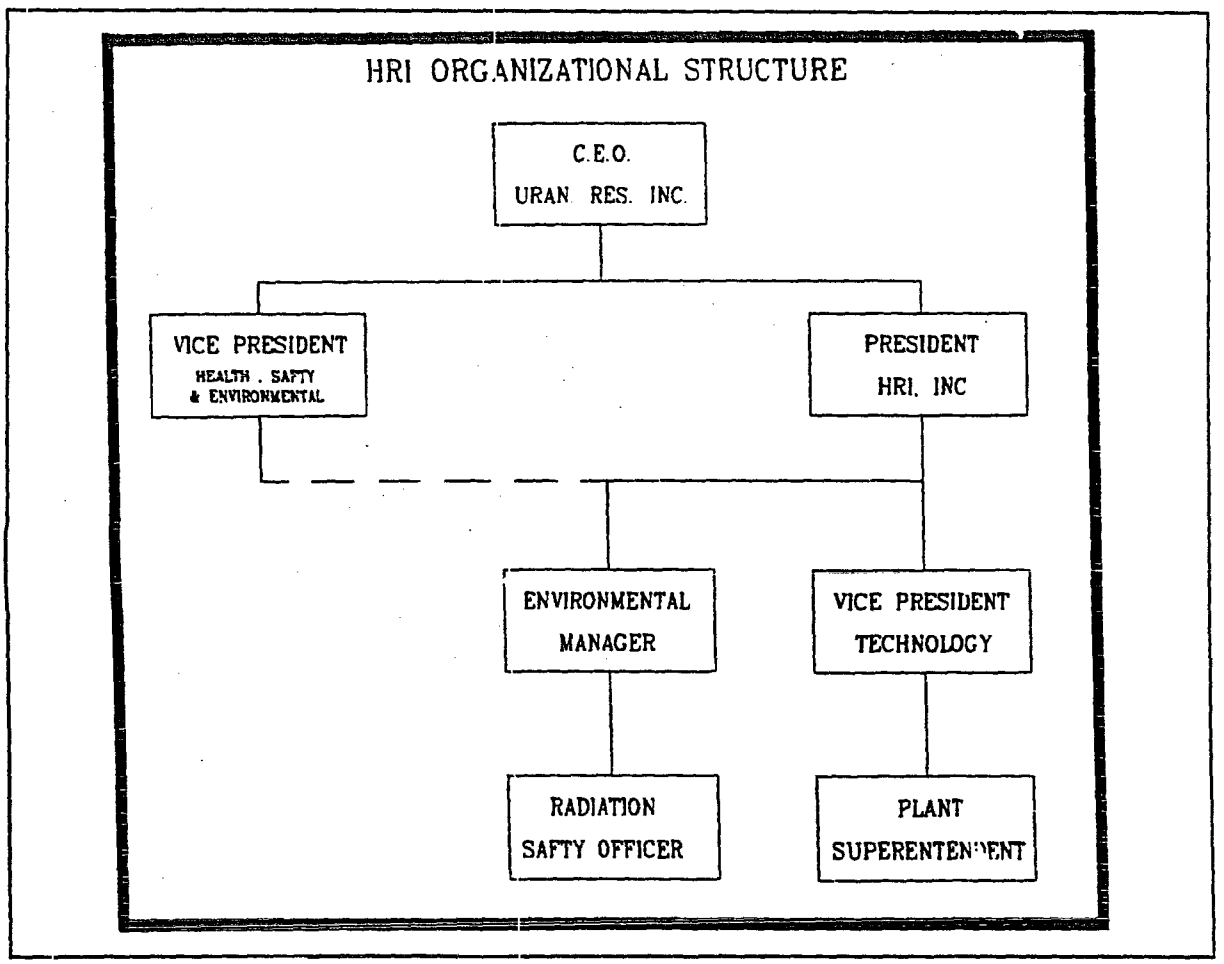

Figure 1. HRI Organization Chart.

health, or the environment, as indicated in reports from the RSO.

The Environmental Manager will develop and administer corporate radiation protection safety programs to ensure (1) employees are afforded the optimum practical protection against occupational hazards, (2) exposure of employees to radiation and radioactive materials is ALARA, and (3) all regulatory requirements are met. The Environmental Manager will assist in the development, review, and approval of sampling and analysis procedures used at the Crownpoint Project, and aid in the technical evaluation of laboratory data, as required.

HRI will require the Environmental Manager to have a bachelor's degree in the physical or biological sciences, mathematics, or engineering from an accredited college or university. Additionally, the position will require at least three years of work experience in the uranium mining industry, in the areas of applied health physics and radiation protection.

3.1.5 Vice President of Technology

The Crownpoint Project Vice President of Technology (VPT) will be directly responsible for all operations, including, implementing industrial and radiation safety, and environmental protection programs. This includes all operating procedures, radiation safety programs, industrial safety programs, environmental and groundwater monitoring programs, associated quality assurance programs, and routine and non-routine maintenance activities. The VPT will also be responsible for compliance with all regulatory license conditions, and regulations, and reporting requirements. The VPT will have the responsibility, and authority, to terminate immediately any activity that is determined to be a threat to employees, public health, or the environment. The VPT will be a member of the ALARA Committee and the ALARA audit team, and will report directly to the President of HRI.

HRI will require the VPT to have a Bachelor's degree in engineering or science from an accredited college or university, or equivalent work experience, and a minimum of five years supervisory experience. Work experience will include industrial process/production experience, and industrial process/production management.

3.1.6 Radiation Safety Officer

The RSO is responsible for the daily supervision of the environmental protection and radiation safety programs for the Churchrock, Crownpoint, and Unit 1 sites. The RSO is the designated Site QA/QC Coordinator. The RSO will be a member of the ALARA Committee, assist management with the annual ALARA Audit, and report directly to the Environmental Manager.

The RSO has responsibility for the daily supervision of all radiation and safety protection procedures, equipment and controls, including emergency procedures. Responsibilities will include developing and implementing all radiation safety and environmental programs, ensuring that all records will be correctly maintained, and assisting the VPT in ensuring compliance with NRC regulations and license conditions. The RSO will conduct routine training programs for the supervisors and employees with regard to the proper application of radiation protection, emergency response, and environmental control programs. The RSO will inspect the facilities to verify compliance with all applicable radiological health and safety requirements and the

QA/QC program. Additionally, the RSO will annually review all operating procedures to ensure that radiation exposures will be maintained ALARA.

HRI will require the RSO to have a bachelor's degree in the physical or biological sciences, or engineering. Additionally, the RSO must have at least three years of appropriate experience in environmental compliance, permitting, radiation protection, and technical supervision. At least two of the three years experience will be in a position at an operation where knowledge of radiation protection programs has been obtained. The RSO position will also require 40 hours of formal radiation protection training on a biennial basis. This is consistent with the guidance in Regulatory Guide 8.31 (NRC 1983b). To emphasize the importance of the RSO's background, the NRC will require by license condition that:

The RSO, or his designee, shall have the education, training, and experience as specified in Regulatory Guide 8.31 (NRC 1983b).

3.1.7 Plant Superintendent

The Crownpoint, Churchrock, and Unit 1 sites will each have a Plant Superintendent, who will be responsible for the site's operational and maintenance activities and procedures. The Plant Superintendents will implement, and annually review, a training program for operation and maintenance personnel. The Plant Superintendents will report to the VPT. Development and review of procedures involving radiological safety concerns will be coordinated with the radiation staff.

3.1.8 Radiation Safety Technicians

At least one radiation safety technician (RST) will be present at each site. The RSTs will conduct the sampling, surveys and other duties necessary as part of the established environmental protection and radiation safety programs for the Churchrock, Crownpoint, and Unit 1 sites. The RSTs will be members of the ALARA Committee, assist management with the annual ALARA Audit, and report directly to the RSO.

The RSTs will conduct environmental and radiological surveys; collect air, water, soil, and vegetation samples; perform analyses; collect data for the radiation safety program; perform calculations of employee radiation exposures; generate records; and conduct various other activities associated with implementation of the environmental and radiation protection programs. The RSTs will report all radiation protection data to the RSO prior to submittal to the Environmental Manager.

HRI has proposed to require that a minimum of a high school diploma, or alternatively, an equivalent combination of experience and training in uranium mill radiation protection for prospective RSTs. A Bachelor's degree in physical or biological sciences, engineering, or a related discipline from an accredited college or university with no experience will also be acceptable to HRI. This is not completely consistent with the guidance in Regulatory Guide 8.31 (NRC 1983b). The NRC will require by license condition that:

The RSTs shall have the qualifications specified in Regulatory Guide 8.31 (NRC 1983b). Any person newly hired as an RST shall have all work reviewed and approved by the RSO as part of a comprehensive training program until appropriate course training is completed, and at least for 6 months from the date of appointment.

3.1.9 Conclusions

HRI has described its management and organization to show that the RSO and RSTs will be responsible for implementing the daily environmental protection and radiation safety programs for the Crownpoint Project. Their responsibilities are to ensure that HRI's radiation safety programs are complied with by all HRI employees and visitors, and that radiation exposures are maintained in accordance with ALARA principles. The RSTs report to the RSO, who in turn reports to the Environmental Manger, who has overall responsibility for HRI's radiation safety program. HRI has an acceptable corporate organization that defines management responsibilities and authority at each level. HRI's definition of the responsibilities with respect to development, review, approval, implementation, and adherence to operating procedures, radiation safety programs (including record keeping and reporting), environmental and groundwater monitoring programs, QA programs, routine/non-routine maintenance activities, and changes to any of these is acceptable. The qualifications required for personnel conducting the radiation safety program at the Crownpoint Project are acceptable, as they are consistent with the guidance in NRC Regulatory Guide 8.31 (NRC 1983b).

Based on the information provided in the application and the detailed review conducted of the corporate organization for HRI, the NRC staff has concluded that the proposed corporate organization, modified as above by the stated license conditions, is acceptable. The NRC staff also concludes that HRI's proposed organizational structure will help ensure implementation of an effective radiation protection program, in accordance with 10 CFR 20.1101(a).

3.2 Management Control Program

3.2.1 Performance-Based Licensing Condition

The following license condition describes the process under which HRI will have the latitude to initiate changes and conduct tests without obtaining prior NRC review and approval. All changes made by HRI at the Crownpoint Project are subject to NRC inspection and enforcement actions. The inclusion of the following condition in the license does not alter or affect NRC's inspection function, nor does it allow HRI to change license conditions without first obtaining NRC review and approval. Requesting changes to license conditions would require filing license amendment applications pursuant to 10 CFR 40.44.

HRI may, without prior NRC review or approval: (a) make changes in the Crownpoint Project's facilities or processes as described in Revision 2.0 of the COP; (b) make changes in its standard operating procedures; and (c) conduct tests or experiments, if HRI ensures that the following conditions are met:

(1) the change, test, or experiment does not conflict with any requirement specifically stated in HRI's license, or impair HRI's ability to meet all applicable NRC regulations;

(2) there is no degradation in the safety or environmental commitments made in COP Revision 2.0 (HRI 1997b), or in the approved reclamation plan for the Crownpoint Project; and

(3) the change, test, or experiment is consistent with NRC's findings in the FEIS (NRC 1997) and the SER dated December 1997 for the Crownpoint Project.

If any of these conditions are not met for the change, test, or experiment under consideration, HRI is required to submit a license amendment application for NRC review and approval. HRI's determinations as to whether the above conditions are met will be made by a Safety and Environmental Review Panel (SERP). All such determinations shall be documented, and the records kept until license termination. All such determinations shall be reported annually to the NRC. The retained records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining whether or not the conditions are met.

HRI shall provide an annual report to NRC that describes all changes, tests, and experiments, including a summary of the safety and environmental evaluation of each such action. As part of this annual report, HRI shall include any COP pages revised in accordance with the performance-based license condition.

3.2.2 Safety and Environmental Review Panel

The SERP shall operate as required by the following license condition:

The SERP shall consist of a minimum of three individuals employed by HRI, and one of these shall be designated the SERP Chairperson. 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 be the Environmental Manager, with the responsibility of ensuring that changes conform to radiological safety and environmental requirements. Additional members may be included in the SERP as appropriate, to address technical aspects such as health physics, ground-water hydrology, surface water hydrology, earth sciences, and other technical disciplines. Temporary members, or permanent members other than the three identified above, may be consultants.

3.2.3 Record Keeping

The record keeping program outlined by HRI in its COP Revision 2.0 (HRI 1997b) deals with two aspects of facility operation. The first is a commitment to keep records of any changes authorized by the SERP until license termination. The records will include written safety and environmental evaluations made by the SERP as part of its analysis for determining if applicable changes were made consistent with the license. Additionally, in the COP Revision 2.0 (HRI 1997b) HRI describes the employee exposure records system that it will implement. These records will include exposures monitored in accordance with Regulatory Guide 8.34, as well as NUREG 8.22. HRI employees will be advised of their annual exposure consistent with 10 CFR 20.2106, and Regulatory Guide 8.7. Posting of employee annual doses will be performed quarterly, and will contain the equivalent of information found on NRC Form 5.

Although HRI has not specified in its application the length of time records will be maintained, 10 CFR Part 20, Subpart L specifies the NRC requirements for record keeping and retention. Adequate record keeping is necessary to allow NRC to inspect and review the performance of a licensee. In addition to the applicable requirements of 10 CFR Part 20, Subpart L, the NRC will require by license condition that:

The results of the following activities, operations, or actions shall be documented: sampling; analyses; surveys or monitoring; survey/monitoring equipment calibrations; reports on audits and inspections; emergency generator use and maintenance records; all meetings and training courses required by the license; and any subsequent reviews, investigations, or corrective actions. Unless specified otherwise in NRC regulations or the license, all documentation required by the license shall be maintained for a period of at least five (5) years by HRI at its facility, and is subject to NRC review and inspection.

Compliance with the requirements of 10 CFR 20.2108 will be reviewed if HRI, after obtaining any necessary permits, chooses to dispose of waste on-site.

3.2.4 Standard Operating Procedures

All principal work assignments will be conducted in accordance with written standard operating procedures (SOPs). Supervisory and management personnel will routinely observe their employees at work and thus will be able to ensure adherence to the written procedures. If employees are found deviating from a procedure, they will be counseled by their supervisor(s), and instructed to adhere to the written procedures. Follow up supervision will also occur to ensure the success of the counseling session. Such deviations and follow-up counsel will be documented, and the documentation maintained on file at the project site. Prior to implementation, all new, or revised, operating procedures affecting radiation safety will be reviewed by the SERP. The Environmental Manager will annually audit all operational and monitoring procedures to assure they are still appropriate and are not in conflict with newly established radiation safety policies or regulatory requirements. Additionally, the RSO will annually review all operating procedures to ensure that radiation exposures will be maintained as low as reasonably achievable (ALARA). The NRC views the use of SOPs to be critical to safe operations. Therefore, the NRC will require by license condition that:

Written SOPs shall be established and followed for: (1) all operational activities involving radioactive materials that are handled, processed, stored, or transported by employees; (2) all non-operational activities involving radioactive materials including in-plant radiation protection and environmental monitoring; and (3) emergency procedures for potential accident/unusual occurrences including significant equipment or facility damage, pipe breaks and spills, loss or theft of yellowcake or sealed sources, and significant fires. The SOPs shall include appropriate radiation safety practices to be followed in accordance with 10 CFR Part 20. SOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. A copy of the current written procedures shall be kept in the area(s) of the production facility where they are utilized. All SOPs for activities described in the COP shall be reviewed and approved as presently described in the COP.

3.2.5 Radiation Work Permits

Non-routine work or maintenance activities which may result in personnel exposure to radioactive materials and are not covered by an active SOP will be carried out in accordance with a radiation work permit (RWP). The RWP may require additional monitoring or safeguards when performing the non-routine work, such as respirators. The procedures for developing an RWP include contacting the radiation safety staff prior to the start of work. The RSO, or RST, will survey the area for radiation and/or contamination levels, as appropriate, and conduct a discussion of precautions to be taken during the planned work to minimize exposures. RWPs will be supervised with the job supervisor directing the work to minimize exposures. Air samples will be taken, as necessary, to evaluate the exposures of all involved personnel. To ensure that RWPs contain the proper information and that RWPs are not used in lieu of SOPs, NRC will require by license condition that:

RWPs shall include, at a minimum, the information described in Section 2.2 of Regulatory Guide 8.31 (NRC 1983b).

3.2.6 Conclusions

HRI has an acceptable management control program that assures that all activities can be conducted according to written operating procedures. HRI has acceptably identified radiation protection, maintenance activities (especially in radiation areas), development of well fields, and SERP reviews as areas where SOPs are acceptable. HRI has demonstrated that non-routine work or maintenance activity will comply with radiation safety requirements and has included, as one means of comparison, the issuance of radiation work permits for activities where SOPs do not apply.

HRI will establish a SERP with at least three individuals representing expertise in management/financial, operations/construction, and radiation safety matters. HRI has committed that specific technical issues will be dealt with by the SERP, with support from other qualified staff members, or consultants, as appropriate. Annually, HRI will furnish a written report to the NRC that provides the bases for any changes in the approved programs along with any appropriate page changes.

Based on the information provided in the application and the detailed review conducted of the management control program for the Crownpoint Project, the NRC staff has concluded that the management control program, modified as above by the stated license conditions, is acceptable. The use of a SERP to approve changes to the facility commensurate with licensed activities is in accordance with 10 CFR 20.1101(a). The SOPs and RWPs described above are procedures to maintain radiation doses ALARA, in accordance with the applicable requirements of 10 CFR 20.1101(b). The record keeping provisions described above ensure compliance with the applicable requirements of 10 CFR Part 20, Subpart L.

3.3 Audits and Inspections

3.3.1 Inspections

The RSO will conduct weekly inspections of all work and storage areas and shall document all findings pertaining to compliance with license conditions and radiation safety practices. The RSO, or designated radiation safety technician, will conduct daily walk-through inspection of all work and storage areas of the CPF to ensure proper implementation of good radiation safety procedures. Results of these inspections, including any corrective actions or preventive maintenance required by the inspection, will be documented and maintained on site. In addition to the site maintenance inspections, daily visual inspections will be made for locating yellowcake contamination on surfaces in areas of yellowcake processing. To ensure that the results of inspections can provide management with the information necessary to conduct an appropriate ALARA program, NRC will require by license condition that:

Site inspections and reviews shall be completed and documented by HRI as described in Section 2.3.1 and 2.3.2 of Regulatory Guide 8.31 (NRC 1983b).

3.3.2 ALARA Audit

Members of the HRI ALARA Audit team will conduct annual audits of the radiation protection and ALARA program, under the direction of the Environmental Manager and the VPHSE. The audit will address the topics listed in Section 2.3.3 of Regulatory Guide 8.31 (NRC 1983b). The results of the audit, including any ALARA-based corrective actions recommended in the audit findings, will be reviewed and approved by the President of HRI, prior to submittal to NRC.

3.3.3 QA/QC Audit

An annual audit of the water quality sampling and analysis program, radiological monitoring sampling, and QA/QC programs will be conducted in conjunction with the annual ALARA audit by the Environmental Manager, and the VPHSE. The Environmental Manager may designate individuals qualified in chemistry and monitoring techniques who will not have direct responsibilities in the areas being audited to assist in the audit. Audit results will be reviewed with the RSO, VPT, and President of HRI. The results of the audit, and any corrective actions to be taken based on the audit results, will be documented and maintained on site.

3.3.4 Conclusions

Based on the information provided in the application and the detailed review conducted of the management audit and inspection programs, modified as above by the stated license condition, for the Crownpoint Project, the NRC staff has concluded that the proposed programs are acceptable and ensure compliance with 10 CFR 20.1101(c), which requires periodic reviews of the radiation protection program.

HRI has acceptable management audit and inspection programs that provide frequencies, types, and scopes of audits and inspections sufficient to implement the proposed actions. HRI will fully document and maintain records of audits and inspections results, including any corrective actions to be taken based on the results.

3.4 Radiation Safety Training

A training program on radioactive material handling and radiological safety will be administered to all new site employees at the Crownpoint Project. Information provided in the training will be consistent with the information found in NUREG 1159 (McElroy 1986) and Regulatory Guide 8.29 (NRC 1996b). The RSO, or his or her designee, will conduct the training. The level of training will be based on the trainee's expected degree of access to the restricted area. Each employee's understanding of the training materials will be assessed. A written record of all training and testing will be maintained on site.

The radiation protection standards (10 CFR Part 20) have changed since the publishing of NUREG 1159 (McElroy 1986). To ensure proper training of individuals in accordance with the revised 10 CFR Part 20, NRC will require by license condition that :

HRI shall implement and maintain a training program for all site employees as described in Regulatory Guide 8.31, and as detailed in the COP. All training materials shall incorporate the information from current versions of 10 CFR Part 19 and 10 CFR Part 20. Additionally, classroom training shall include the subjects described in Section 2.5 of Regulatory Guide 8.31 (NRC 1983b). All personnel shall attend annual refresher training, and HRI shall conduct regular safety meetings on at least a bi-monthly basis, as described in Section 2.5 of Regulatory Guide 8.31 (NRC 1983b).

COP Revision 2.0 (HRI 1997b) contains an operational definition of a "Uranium Work Area" for contamination control and radiation protection purposes. Any areas in HRI processing facilities in which employees could potentially come into contact with yellowcake will be designated by HRI as Uranium Work Areas. These areas include the filter press area, elution area, IX columns, sand filters, RO unit area, dryer area, and yellowcake drum storage area. HRI will require employees to survey as described in SER Section 4.5.1 before exiting a Uranium Work Area.

3.4.1 Operations Personnel

Personnel who work within a Uranium Work Area will be provided operations personnel training. These individuals will typically be required to work with radioactive materials. In addition to

classroom instruction consistent with NUREG 1159 (McElroy 1986), operational personnel will receive on-the-job training from plant supervisors and the RSO. As part of each plant employee's annual job performance appraisal, the employee's performance with respect to radiation protection will be evaluated. If necessary, plant employees will be retrained in deficient areas. In addition, as noted in SER Section 3.2.4, plant supervisors will conduct routine observation of work habits to ensure adherence to the SOPs.

3.4.2 Clerical and Office Support Staff

Clerical training will be an abridged version of the operational personnel training. Staff members that classify as this type of employee will typically work outside of the Uranium Work Area.

3.4.3 Supervisory Personnel

Supervisors will receive all the training for operations personnel, as well as additional training, such as, ALARA philosophy, contamination control, and work practices. In the event that they should have to act in the absence of the RSO/RST, supervisors will be required to be cognizant of certain surveys which may be required prior to releasing equipment. In addition, supervisory personnel will be able to provide specific job related training, and evaluate their subordinates' performances.

3.4.4 RSO Training

The RSO will attend 40 hours of formal training from an outside source on a biennial basis, consistent with Regulatory Guide 8.31 (NRC 1983b). Topics may include radiation measurements, biological effects, ALARA philosophy, audit techniques, rules and regulations, and methods for controlling radiation doses.

3.4.5 Prenatal Information for Female Employees

Female employees will receive an additional detailed training session, in addition to the regular training for the job type, regarding the hazards of prenatal exposure to radiation. Such instruction will be consistent with the guidance in Regulatory Guide 8.13 (NRC 1987b), and in accordance with the requirements of 10 CFR Part 19 and Part 20.

3.4.6 Special Training for Yellowcake Transport Accidents

Members of the response team will have a good background knowledge in radiation safety as gained from initial employee training, and/or prior job experience (with respect to those members who are part of HRI's radiological safety staff). Further training of response team members in containment, recovery, decontamination, and the equipment needed to control a spill will be given on an annual basis.

3.4.7 Visitors

Visitor training will detail the hazards and proper precautions to be taken while at the site. Visitors will be instructed as to the hazards of yellowcake ingestion, and will be instructed to avoid contact with visible yellowcake in any location containing radioactive materials.

3.4.8 Conclusions

The radiological protection training program for personnel at the Crownpoint Project adheres to the guidance and acceptable approaches contained in NRC Regulatory Guides 8.31 (NRC 1983b), 8.13 (NRC 1987b), and 8.29 (NRC 1996b). The content of the training material, testing, on-the-job training, and the extent and frequency of retraining are acceptable.

Based on the information provided in the application and the detailed review conducted of the radiological protection training program, modified as above by the stated license condition, for the Crownpoint Project, the NRC staff has concluded that the radiological training program is acceptable, and in accordance with the applicable requirements of 10 CFR 20.1101. Additionally, the staff finds that the training program will ensure compliance with 10 CFR 19.12, which requires appropriate instruction to workers of radiation protection and worker responsibilities. The training described above will help ensure acceptable implementation of the radiation protection program.

4.0 RADIATION SAFETY CONTROLS AND MONITORING

4.1 Design Features for Airborne Effluent Control

At ISL facilities, there are two potential major radioactive airborne effluents: radon gas from production solutions and uranium particulates from the yellowcake drying and packaging area. FEIS Section 2.1.2.1 (NRC 1997) describes HRI's proposed engineering designs to minimize airborne effluents. As described in FEIS Section 4.1.3 (NRC 1997), to ensure environmentally safe operation of the vacuum dryer, NRC will require by license condition that:

HRI shall ensure that the manufacturer-recommended vacuum pressure is maintained in the drying chamber during all periods of yellowcake drying operations. This shall be accomplished by continuously monitoring differential pressure and installing instrumentation which will signal an audible alarm if the air pressure differential falls below the manufacturer's recommended levels. The alarm's operability shall be checked and documented daily. Additionally, yellowcake drying operations shall be immediately suspended if any emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.

As part of the environmental monitoring program, HRI will, on a quarterly basis, measure the radon release from the bleed and restoration water by sampling and conducting same time radon measurements on leach solution from the main trunkline on the pregnant side of each process facility, and on the main trunkline of the barren side of each process facility.

Based on the information provided in the application and the detailed review conducted of the radiation safety design features for airborne effluent control at the Crownpoint Project, as discussed primarily in the FEIS (NRC 1997), the NRC staff has concluded that these features are acceptable and will ensure compliance with 10 CFR 20.1301 (regarding dose limits for individual members of the public), and the applicable provisions of 10 CFR 20.1101(b), requiring the use of engineering controls to reduce doses in accordance with ALARA principles.

HRI has acceptable radiation safety controls for effluents at the Crownpoint Project and has demonstrated that important airborne effluent streams are controlled and monitored. HRI will use an acceptable pressurized processing tank system and appropriate ventilation systems in buildings where radon gas is vented. Acceptable control of the yellowcake dryer system is evidenced by the use of a vacuum dryer and other appropriate particulate scrubber equipment on the dryer stack.

4.2 Restricted Area Monitoring Programs

HRI has committed to performing monitoring of radiation levels and/or contamination levels by two main methods: fixed monitoring locations and surveys. Figure 2.1-1, Figure 2.1-2, and Table 9.4-2 of the COP (HRI 1997b) note monitoring locations for both external and airborne radioactivity. Proposed standardized survey locations, frequencies, and lower limits of detection (LLDs) are noted in Table 9.4-3 of the COP (HRI 1997a). Table 2 of Regulatory Guide 8.30 (NRC 1983c) provides NRC guidance on acceptable monitoring programs. HRI's proposed program has, for many areas, less frequent surveys and higher LLDs than Table 2 of Regulatory Guide 8.30 (NRC 1983c). To ensure adequate radiation surveys of the Crownpoint Project, NRC will require by license condition that:

For all required types of surveys, HRI shall, at a minimum, use the survey locations, frequencies, and lower limits of detection established in Table 2 of Regulatory Guide 8.30 (NRC 1983c).

4.2.1 External Monitoring Program

Each work area at the Crownpoint Project will receive a baseline monitoring prior to plant startup. During operation, each work area and all vessels containing radioactive material will be monitored with thermoluminescent dosimeters (TLDs), which will be read quarterly. On a quarterly basis, a gamma survey of the work areas will be performed.

HRI has committed to issuing TLD badges for at least the first year of operations. Badging frequencies will be on a quarterly basis. As per 10 CFR 20.1502, on an annual basis, HRI can evaluate the external hazards and decide whether TLD badging is necessary.

4.2.2 Airborne Monitoring Program

In the dryer/packaging area at the CPF, HRI will perform continuous monitoring of airborne uranium concentrations during yellowcake operations. The sampling will utilize a low volume pump (e.g., an Eberline RAS-1). During continuous yellowcake operations, the filters will be changed and analyzed as needed to maintain proper airflow rates through the pump. During

discontinuous yellowcake operations, filters from each batch will be analyzed. During periods that drying/packaging activities are not occurring, filters will be changed and analyzed on a weekly basis.

On a monthly basis, grab samples will be taken beneath each site's filter presses to survey for airborne particulate levels. Surveys of all other areas of the process facilities will be performed on a quarterly basis. During non-routine work activities, area air samples or breathing zone samples will be utilized to determine airborne uranium particulate levels.

Prior to each site's start up, a background evaluation of radon daughter concentrations on the plant scaffolding will be performed. After startup, radon daughter measurements will be performed on a monthly basis. In addition, non-routine sampling will be performed, as required, for an RWP.

HRI has committed to having an airborne monitoring program consistent with guidance in Regulatory Guides 8.25 (NRC 1992a) and 8.30 (NRC 1983c).

4.2.3 Conclusions

HRI has acceptable restricted area radiation exposure monitoring programs at the Crownpoint Project. HRI has provided an acceptable set of charts that depict the facility layout and the location of both external and airborne radiation monitors. The radiation monitors are acceptably placed. HRI has established appropriate criteria to determine which employees should receive external radiation monitoring. HRI has committed to using radiation monitors with the appropriate range and sensitivity that will support protection of health and safety of employees during the full range of facility operations. All planned radiation surveys are acceptable. Planned documentation of radiation exposures and surveys is acceptable. HRI's external monitoring program is acceptable to protect workers from beta and gamma radiation. HRI's program for monitoring of uranium and sampling of radon or its daughters is acceptable and the results of this monitoring will be used for employee exposure calculations.

Based on the information provided in the application and the detailed review conducted of the restricted area monitoring programs at the Crownpoint Project, as modified above by the stated license condition, the NRC staff has concluded that the restricted area monitoring programs are acceptable and ensure compliance with the applicable requirements of (1) 10 CFR 20.1101; (2) 10 CFR Part 20, Subpart C (occupational dose limits); and (3) 10 CFR Part 20, Subpart F (requirements for surveys and monitoring).

4.3 Environmental Monitoring Program

HRI has committed to performing environmental monitoring, including sampling and monitoring of air effluents, process fluids, groundwater, surface water, sediment, soil and sludge, as described in Table 9.5-1 of the COP (HRI 1997b). Three months prior to operations at each site, sampling and monitoring will begin at each environmental monitoring station. The types of samples, general locations, sampling frequency, and analyses described in Table 9.5-1 of the COP (HRI 1997b) are consistent with the guidance in Regulatory Guide 4.14 (NRC 1980). HRI has committed to implementing a quality assurance/quality control program for the

environmental monitoring program, as discussed in SER Section 4.7, consistent with the guidance in Regulatory Guide 4.15 (NRC 1979). The NRC will require by license condition that:

Prior to injecting lixiviant at any of the sites, HRI shall submit an NRC-accepted, procedure-level, detailed effluent and environmental monitoring program.

The detailed program will indicate SOPs, such as sampling methods, equipment, analytical procedures, and lower limits of detection. The program will indicate proposed environmental monitoring locations based on "as built" construction, and provide rationales for their selection.

To ensure proper development and implementation of the procedure-level, detailed environmental monitoring program, NRC will require by license condition that:

HRI shall develop and administer its radiological effluent and environmental monitoring program consistent with Regulatory Guide 4.14 (NRC 1980). HRI shall maintain, at a minimum, three airborne effluent environmental monitoring stations at each site, at the locations described in COP Table 9.5-1 (HRI 1997b).

Each monitoring station will contain a TLD (for gamma measurement), and a track-etch detector (for radon measurement). Exact positions for the sampling stations will be provided as part of the detailed environmental program HRI will submit. Environmental monitoring for uranium is not required as emissions are expected to be minimal and not a significant contributor to public doses, as found in FEIS Section 4.6.1.1 and 4.6.1.2 (NRC 1997). NRC will require by license condition that:

HRI shall submit the required effluent reports in accordance with 10 CFR Section 40.65. HRI shall submit information specified in Section 7 of Regulatory Guide 4.14 (NRC 1980), in addition to the reports required by 10 CFR 40.65.

Based on the information provided in the application and the detailed review conducted of the airborne effluent and environmental monitoring program at the Crownpoint Project, as modified above by the stated license conditions, the NRC staff has concluded that the airborne effluent and environmental monitoring program is acceptable and will ensure compliance with 10 CFR 20.1302 (regarding dose limits for individual members of the public); and 10 CFR 20.1501 (survey and monitoring requirements).

HRI has established in the COP (HRI 1997b) an acceptable airborne effluent and environmental monitoring program at the Crownpoint Project. The overall program is consistent with guidance in Regulatory Guide 4.14 (NRC 1980). HRI will sample radon, surface soils, subsurface soils, vegetation, direct radiation, and sediment. The general locations of air monitoring stations are consistent with Regulatory Guide 4.14 (NRC 1980). Instrumentation is appropriate for the measurement task and is acceptable. All reporting and record keeping is done in accordance with the applicable requirements of 10 CFR Part 20, Subpart L.

4.4 Internal Radiation Control Program

4.4.1 Airborne Radioactivity Areas

HRI has committed to post any area, room, or enclosure as an "Airborne Radioactivity Areas" if it meets one of two definitions:

1) if at any time the uranium concentration exceeds one derived air concentration (DAC) for solubility class W, or;

2) if the potential exposure to an individual without respiratory protection could exceed an intake of 10 percent of the annual limit on intake (ALI) in one week.

While the first definition is consistent with the 10 CFR 20.1003 definition, the second definition is not. Therefore, HRI shall post "airborne radioactivity areas" consistent with the 10 CFR 20.1003 definition, and pursuant to the requirements of 10 CFR 20.1902(a-d).

4.4.2 Respiratory Protection Program

HRI has committed to using, to the extent practicable, process or other engineering controls to minimize the airborne concentrations of radionuclides. One example is the use of the vacuum dryer design, which will minimize yellowcake dusting in the workplace and the environment. When it is not practicable to use process or other engineering controls to maintain an area below the limits that define an airborne radioactivity area, HRI will, consistent with maintaining the total effective dose equivalent (TEDE) ALARA, employ one or more of the following means to limit intakes:

(a) control of access,
(b) limitation of exposure times,
(c) use of respiratory protection equipment, and/or
(d) other controls.

HRI will employ respiratory protection if workers may be potentially exposed to air concentrations that will result in exceedence of 10 DAC-hr/wk and/or 3.3 working level-hour/wk, for airborne uranium and radon progeny, respectively.

HRI's proposed respiratory protection program described in the COP Section 9.11 (HRI 1997b) meets the requirements of 10 CFR Part 20, Subpart H. The RSO or his or her designee will be responsible for the respirator maintenance, fitting, and training programs. Records of respirator training and maintenance shall be kept for inspection. Every respirator wearer must be properly fitted and have annual medical approval. HRI will perform random fit testing using irritant smoke in addition to an HRI requirement that each respirator wearer perform a negative, or positive, pressure fit tests. HRI has proposed performing a random alpha survey of respirators before reuse. As stated previously, NRC shall require that HRI shall implement Table 2 of Regulatory Guide 8.30 (NRC 1983c), which includes requiring surveys of all respirator face pieces and hoods prior to reuse.

4.4.3 Bioassay - Urinalysis

The purpose of the bioassay program is to confirm the effectiveness of the radiation protection programs and to verify the results of the calculated exposures. HRI is planning on implementing a bioassay program consistent with that described in Revision 1 of Regulatory Guide 8.22 (NRC 1988). Employees routinely exposed to airborne yellowcake or excessive levels of yellowcake will be bioassayed. Bioassays will be conducted at least once a month for routinely exposed workers and declared pregnant females. Workers that have been temporarily exposed shall have a bioassay performed within 48 to 72 hours after the exposure. The initial action level will be set at 15 μg/l, which will begin an investigation. The actions, including appropriate corrective measures, described in the COP (HRI 1997b), are consistent with those described in Revision 1 of Regulatory Guide 8.22 (NRC 1988). To ensure HRI establishes individual baselines, NRC will require by license condition that:

HRI shall implement a comprehensive bioassay sampling program that conforms to Regulatory Guide 8.22.

4.4.4 Conclusions

Based on the information provided in the application and the detailed review conducted of the internal radiation control and monitoring programs at the Crownpoint Project, as modified above by the stated license condition, the NRC staff has concluded that the internal radiation control and monitoring programs are acceptable and ensure compliance with 10 CFR 20.1204 (requirements for determining internal exposure), and the applicable requirements of 10 CFR Part 20, Subpart H (licensees to limit doses to individuals by controlling access, limiting exposure times, prescribing the use of respiratory equipment, or use of other controls).

HRI has described acceptable respiratory protection and bioassay programs for the Crownpoint Project. Individuals routinely exposed to yellowcake dust are part of the bioassay program. An acceptable action program to curtail uranium intake, including action levels and corrective measures, has been described. HRI's programs include record keeping protocols in conformance with the applicable requirements of 10 CFR Part 20, Subpart L.

4.5 Contamination Control

4.5.1 Personnel Contamination

HRI has committed to requiring all employees leaving the uranium work areas to change clothing and shower or monitor themselves for alpha contamination. Employees that shower and change clothes are considered to be free of significant contamination. In lieu of showering, employees will be required to survey their clothing, shoes, hands, face and hair with an alpha survey instrument. Records of survey results, or showering, will be documented and maintained on site. Employees who exceed the maximum allowed contamination level of 1,000 dpm per 100 cm^2 will be required to decontaminate and, then, resurvey. The RSO or his or her designee will perform unannounced spot check surveys on at least a quarterly basis.

4.5.2 Surface Contamination

HRI has committed to surveying the designated eating areas, change rooms, and office areas (i.e., building areas not designated as uranium work areas) for contamination on a monthly basis. In the uranium work areas, HRI has committed to a daily survey using a visual inspection for obvious signs of contamination and routine instrument surveys to determine total alpha contamination. If the total alpha survey indicates a total contamination greater than 1000 dpm/100 cm^2, a smear survey will be conducted to evaluate the amount of removable contamination. Results will be documented on the survey data sheet. In areas outside the uranium work area, if the smear results indicate removable contamination greater than 200 dpm/100 cm^2, the area will be decontaminated promptly, resurveyed, and the RSO will investigate the cause of the contamination. HRI commits to adhering to the limits for surface contamination in Regulatory Guide 8.30 (NRC 1983c), which are based on the values from Regulatory Guide 1.86 (AEC 1974). To minimize the chance that radioactive material will be inadvertently ingested, NRC will require by license condition that:

Within restricted areas, eating shall be allowed only in designated eating areas.

4.5.3 Release of Contaminated Equipment

All equipment being removed from the restricted areas for use outside of the restricted area, resale, or maintenance will be surveyed, consistent with the guidance in Regulatory Guide 8.30 (NRC 1983c) and Regulatory Guide 1.86 (AEC 1974). Equipment that fails to meet the release limits will be decontaminated, if possible, and resurveyed. Equipment that fails to achieve the unrestricted release criteria can still be used within the uranium work area, sold and transferred to another source material licensee, and will be disposed in an offsite NRC-licensed or Agreement State-licensed 11e.(2) byproduct material disposal cell at the end of the equipment's useful life.

The limits for surface contamination have been updated in a 1987 NRC staff position since publication of Regulatory Guide 8.30 (NRC 1983c). HRI has committed to follow the new guidance. NRC will require by license condition that:

Release of equipment, materials, or packages from the restricted area shall be in accordance with NRC staff position, *"Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials"* (NRC 1987a), or suitable alternative procedures approved by the NRC prior to any such release.

4.5.4 Yellowcake Drums

Yellowcake drums will be shipped as radioactive material of Low Specific Activity (LSA). Each drum will be labeled on two sides with the drum number, net yellowcake weight, and radioactivity stickers including LSA, and "Caution - Radioactive Materials." Packaged drums filled with dry yellowcake will be smear surveyed prior to shipment. The truck and trailer loaded with yellowcake drums will be surveyed for the external exposure rate. The surveys will be recorded and included as part of the yellowcake drum shipment. HRI has committed to meeting

the contamination limits imposed by 49 CFR 173.400 and 49 CFR 173.443 for shipping yellowcake drums, which specify the allowable external exposure rate at the exterior of the trailer and the removable contamination limits, respectively. Additionally, as previously noted in Section 4.5.3, the drums will be required to meet the limits imposed for the release of contaminated equipment from the restricted area. In general, NRC limits for release of contaminated equipment are lower than those promulgated by U.S. Department of Transportation (DOT) regulations. Therefore, drums meeting the NRC limits for surface contamination will meet the contamination release limits of DOT.

4.5.5 Slurry Transports

Yellowcake slurry will be transported in DOT approved slurry trailers which are placarded according to DOT specifications in accordance with 10 CFR 71.5. Slurry transports will be surveyed before, and after positioning on the processing pad. These transports will be surveyed for the external exposure rate and smear surveyed for alpha contamination. HRI is exempted from all other requirements of 10 CFR Part 71, pursuant to 10 CFR 71.10(b), except as noted above.

4.5.6 Conclusions

HRI has described an acceptable contamination control program for the Crownpoint Project. The program is consistent with Regulatory Guide 8.30 (NRC 1983c). Acceptable controls will be in place to prevent contaminated employees from entering clean areas or leaving the site. The SOPs will include provisions for contamination control such as maintaining changing areas and personal alpha radiation monitoring prior to leaving Uranium Work Areas. Acceptable action levels have been set in accordance with Regulatory Guide 8.30 (NRC 1983c) and plans for surveys are in place for skin and personal clothing contamination. HRI has established that all items removed from the restricted area are surveyed by the radiation safety staff and meet release limits. All reporting and record keeping is done consistent with protocols established in Regulatory Guide 8.7 (NRC 1992b). HRI has demonstrated that the range, sensitivity, and calibration of monitoring equipment will support protection of the health and safety of employees during the full range of facility operations. HRI has committed to establishing that contamination on material, equipment, or scrap will be within the limits specified in "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials" (NRC 1987a). Yellowcake drums and slurry transports will be surveyed and monitored for contamination prior to leaving the restricted area, and transported in accordance with applicable DOT regulations.

Based on the information provided in the application and the detailed review conducted of the contamination control program for the Crownpoint Project, modified as above by the stated license conditions, the NRC staff has concluded that the contamination control program is acceptable, and ensures compliance with the applicable requirements of (1) 10 CFR 20.1101; (2) 10 CFR 20.1501 (survey and monitoring provisions); (3) 10 CFR 20.1702 (methods for controlling concentrations of airborne radioactive material); and (4) 10 CFR 71.5 (requirements for transportation of licensed material).

4.6 Annual Dose Determinations

4.6.1 Worker Dose Determinations

HRI will monitor employees for external radiation using TLDs and base calculations of internal exposure on area monitoring, breathing zone samples, and bioassay results, as appropriate. HRI has committed to monitoring employees in accordance with Regulatory Guide 8.34 (NRC 1992c) and recording and reporting annual exposures in accordance with Regulatory Guide 8.7 (NRC 1992b).

Radiation exposures at the various worker stations are primarily a function of the time spent at the station and the concentration of uranium and radon or its daughters. HRI will base its calculations of internal doses on the area air monitoring or breathing zone air sampling. Occupancy factors will be determined from time card data. Annual personnel exposure will also include any calculations of exposure due to non-routine work performed under RWPs. HRI plans on using the derived air concentration (DAC) system from 10 CFR Part 20, Appendix B. HRI will calculate the number of DAC-hours of exposure for the appropriate workers. The DAC-hours will be totaled weekly and entered in the employee's Occupational Exposure Record. Under this system, in general, 2,000 DAC-hours are equal to 50 mSv (5 rem).

Results of the committed effective dose equivalent will be summed with the deep dose results from the individual's TLD badge, if appropriate, to compare with the annual worker protection dose limit of 50 mSv (5 rem). In addition, HRI will determine weekly the intake of soluble uranium to compare with the regulatory limit of 10 mg per week of soluble uranium. Workers will be informed of annual exposures via a tabulated posting on a bulletin board in the central office. Terminating employees can request an exposure history.

4.6.2 Embryo/Fetus Dose Determination

Declared pregnant female workers will have, in addition to their annual exposure, estimates of the dose equivalent to the embryo/fetus. To ensure proper calculation, HRI will calculate embryo/fetus doses in accordance with Regulatory Guide 8.36 (NRC 1992d).

4.6.3 Administrative Action Levels

HRI has committed to establishing the following administrative action levels:

(1) 3 mg intake per calendar week for soluble uranium.

(2) 130 DAC-hours per quarter for insoluble uranium and/or radon progeny.

(3) 3 mSv (300 mrem) per quarter for TLD badges.

If an action level is exceeded, the RSO will initiate an investigation into the cause of the occurrence, determine any corrective actions that will reduce future exposures, and document the corrective actions taken.

4.6.4 Conclusions

HRI has described acceptable techniques for performing exposure calculations at the Crownpoint Project. HRI's exposure calculations for natural uranium and airborne radon daughter exposure are acceptable and are consistent with the guidance in NRC Regulatory Guide 8.30 (NRC 1983b) and NRC Regulatory Guide 8.34 (NRC 1992c). HRI has committed to calculating prenatal and fetal radiation exposures consistent with NRC Regulatory Guides 8.13 (NRC 1987b) and 8.36 (NRC 1992d). HRI's commitments regarding record keeping and reporting ensure compliance with the applicable requirements of 10 CFR Part 20, Subparts L and M. Based on the information provided in the application, the NRC staff has also concluded that the applicable occupational dose limits of 10 CFR Part 20, Subpart C, will be met at the Crownpoint Project.

4.7 Quality Assurance and Calibration

HRI has committed in the COP (HRI 1997b) to implementing a quality assurance program for all radiological and non-radiological effluent and environmental monitoring, and bioassay programs at the Crownpoint Project. The COP (HRI 1997b) describes a program that addresses the elements discussed in Regulatory Guide 4.15 (NRC 1979). Elements of the quality assurance program will include standard operating procedures for radiological and water quality sampling, training of individuals in quality control, inter-laboratory comparisons using split samples, and the use of blanks and spiked samples. Annually, an audit of the water quality sampling and analysis program, radiological monitoring sampling programs, and quality assurance/quality control program will be conducted in conjunction with the annual ALARA audit.

HRI has committed that all radiation monitoring, sampling, and detection equipment shall be recalibrated at least annually, as well as after each repair. Prior to each usage, a documented constancy check will be made of the survey instrument to ensure proper response. To ensure survey instrumentation is performing appropriately, NRC will require that:

All radiation survey instruments shall be operationally checked in conformance with Regulatory Guide 8.30 (NRC 1983c).

HRI has described an acceptable QA program for the Crownpoint Project. The QA program will be applied to all radiological, effluent, and environmental programs consistent with NRC Regulatory Guides 4.14 (NRC 1980) and 4.15 (NRC 1979).

Based on the information provided in the application and the detailed review conducted of the QA program for the Crownpoint Project, modified as above by the stated license condition, the NRC staff has concluded that the QA program is acceptable, and will ensure compliance with 10 CFR 20.1101(c), which requires periodic licensee reviews of its radiation protection programs.

5.0 SECURITY

The Crownpoint Project is located on three separate multi-acre sites which HRI has committed to surrounding with fences. The restricted area at the Crownpoint Project will be defined by the fenced areas which will encompass all buildings, wellfield patterns, and associated equipment. Signs reading "CAUTION - RADIOACTIVE MATERIALS" or "ANY AREA WITHIN THE FACILITY MAY CONTAIN RADIOACTIVE MATERIAL" will be posted around the restricted area fences. This posting is in accordance with the requirements stated in 10 CFR 20.1902. Section 20.1902(e) requires that cautionary signs be posted within a facility at each area or room where licensed material above a specified quantity is used or stored. Due to the access controls described below, and the HRI commitment to surround the Project sites with fencing, NRC has considered granting HRI an exemption to the Section 20.1902(e) posting requirements, pursuant to 10 CFR 20.2301.

Access to the restricted areas will be through the main gate of the appropriate site (Crownpoint, Churchrock or Unit 1) which will be electronically controlled and can be opened by entering a combination or by contacting an HRI employee inside the property. The applicant has proposed daily and weekly facility maintenance inspections throughout the plant site and well fields. These inspections can be used as an active access control, in support of the passive controls of fencing and posting. All individuals entering the restricted area will be required to register at the appropriate site offices.

Due to these access controls, NRC finds that posting of individual areas or rooms is not necessary, and would impose a redundant requirement since cautionary signs will be posted on or along the perimeter fencing. Posting of individual areas or rooms would lead to over-posting, and the risk that the cautionary signs might eventually be ignored. Accordingly, NRC finds, pursuant to 10 CFR 20.2301, that granting HRI an exemption from the requirements of Section 20.1902(e) is authorized by law and would not result in undue hazard to life and property.

NRC will grant by license condition the following exemption:

HRI is hereby exempted from the requirements of 10 CFR 20.1902(e) for areas within the process facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.1902(e), and with the words, "ANY AREA WITHIN THE FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

The security measures planned for the Crownpoint Project are acceptable active and passive constraints on ingress to the licensed and restricted areas. HRI has identified acceptable reasonable passive controls including fencing, locked gates, and warning signage for site control.

Based on the information provided in the application and the detailed review conducted of the security measures for the Crownpoint Project, the NRC staff has concluded that the security measures are acceptable, and ensure compliance with the requirements of 10 CFR Part 20, Subpart I (security of stored material and control of material not in storage).

6.0 EMERGENCY PROCEDURES AND PREVENTIVE MEASURES

6.1 Transportation Accident Response

As part of the COP (HRI 1997b), HRI has submitted emergency procedures for responding to a transportation accident involving either yellowcake or ion exchange resin. The contingency procedure for uranium transportation accidents specifies appropriate individuals to contact, health and decontamination procedures to follow, and area clean up methods. HRI's contingency procedure is based on three phases of action: (1) immediate containment, (2) accurate and proper notification, and (3) decontamination using trained, dedicated personnel and equipment. Accompanying the shipping papers for every uranium shipment, a short letter detailing the hazards, preliminary containment procedures, and persons to contact immediately, will be present, in case the driver is unable to communicate the information to first responders. Each transporter will be equipped with proper equipment to quickly contain a spill, while any other equipment necessary for decontamination will be brought by the response team. After initial notification of VPT, VPHSE, and Plant Superintendent, these individuals will in turn notify the proper individuals to handle the situation, including the response team, proper authorities (State Police or Navajo Police), and NRC. The response team will decontaminate the area to current standards for unrestricted areas and survey all individuals who came in contact with the spill. Proper implementation of the contingency procedure will ensure an adequate level of safety to individuals and the environment.

In addition, HRI has committed to coordinate with local emergency services and develop an action plan for equipping and training local emergency officials in the event an accident occurs involving source, or byproduct material. HRI has proposed that a Memorandum of Agreement (MOA) be developed with local emergency services that delineates responsibilities and requirements. NRC will require by license condition that:

Prior to injection of lixiviant, HRI shall have all applicable MOAs between HRI and local authorities, the fire department, medical facilities, and other emergency services, ratified and in effect. At a minimum, the MOAs shall identify individual party responsibilities, coordination requirements, and reporting procedures for all emergency incident responses.

6.2 Wellfield Pipe Breaks

As an integral part of operations, HRI will monitor the current pressure in the wellfield piping. Extraction rates from the mine zone must exceed the injection rates. To monitor the flow, HRI will use flow meters at either the wellheads, or in the meter house, in addition to flow meters in the facility. Alarm set points for the flow meters will be established by HRI such that false positive alarms due to natural variability and/or wellfield pressure balancing will be minimized. In case of a significant pressure drop, such as might occur if a pipe were to break and begin releasing lixiviant to the surface, an alarm will sound in the applicable processing facility (CPF or satellite facility) which will cause an immediate investigation of the appropriate area of the wellfield or facility by a member of the operations staff to discover the cause. Additionally, operational staff will perform at least weekly inspections of the well fields to evaluate maintenance needs.

If a spill or pipe break were discovered, personnel would immediately discontinue the flow of lixiviant through that pipe. Radiological staff would survey the spill area, and decontaminate areas above release limits. In the case of a significant spill, HRI would be required to report the incident to NRC. To ensure proper documentation at the time of decommissioning, NRC will require by license condition that:

Until license termination, HRI shall maintain documentation on all spills of source or 11e.(2) byproduct materials, and all spills of process chemicals. Documented information shall include the date, volume of spill, total activity, survey results, corrective actions, results of remediation surveys, and a map showing spill location and impacted area. After any spill, HRI shall also determine whether the NRC must be notified.

6.3 Conclusions

HRI has acceptably described the anticipated significant effects of accidents from facility operations involving radioactivity, including transportation accidents. The planned response programs are acceptable and include the appropriate mitigation and remediation measures. The response program, modified as above by the stated license conditions, will comply with the notification requirements of 10 CFR 20.2202 and 10 CFR 20.2203.

7.0 WASTE MANAGEMENT

Waste management strategies are discussed in FEIS Section 2.1.2 (NRC 1997). HRI has committed to pre-treating waste water as part of its general waste management strategy. Prior to performing any waste disposal option, HRI will add barium chloride to effectively remove radium, resulting in radionuclide concentrations that are consistent with ALARA principles. HRI is currently considering up to five different final disposal options for waste waters (both process-generated and restoration waters): (1) surface discharge, (2) land application, (3) brine concentration, (4) waste retention ponds, and (5) deep well disposal. HRI has not provided all of the detailed information necessary for approval of any of these methods for NRC-licensed material. Currently, HRI would be limited to using either surface discharge (with appropriate State or Federal permits/licenses), brine concentration, waste retention ponds, or a combination of the three options to dispose of process waste water. Although waste retention ponds remain a viable option for disposal of process waste water, HRI must comply with the following guidance discussed in Section 7.1. Pursuant to 10 CFR 20.2007, NRC approval of a disposal method does not relieve the licensee from complying with other applicable Federal, State, and local regulations governing other toxic or hazardous properties of materials that may be disposed of under 10 CFR Part 20.

7.1 Waste Retention Ponds

HRI's proposed waste retention ponds must be designed to meet the applicable requirements of 10 CFR Part 40, Appendix A. To meet these requirements with respect to flooding and erosion, the licensee will be required to provide a design that ensures that contaminated materials will not be released during operations. The waste retention ponds will need to be adequately protected against rainfall and runoff from severe precipitation events. To provide

such protection, the staff concludes that it will be necessary for the licensee to construct certain design features that will safely store or discharge run-off from large storm events.

The staff developed several documents that provide hydrologic design guidance and acceptable design methods for meeting the requirements of 10 CFR Part 40 by safely storing or discharging large storm events. WM-8201, "Hydrologic Design Criteria for Tailings Retention Systems," provides general criteria for the design and operation of design features needed to accommodate large storm events. In addition, Final Staff Technical Position (FSTP), "Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites," provides detailed guidance for the design of specific features associated with waste retention ponds, such as diversion channels, riprap erosion protection, and flood analyses. Further, Standard Review Plans (SRPs) have been developed for staff analysis of flooding and erosion at uranium recovery facilities, and these SRPs provide detailed staff review procedures that will be used in the analysis of hydraulic designs.

HRI provided preliminary engineering analyses for the proposed sites (Espey, Huston & Associates, Inc. 1993, 1996a-c). In those analyses, HRI concluded that flooding and erosion will not pose significant problems at any of the sites. However, HRI also indicated that the final locations and design details of the waste retention ponds, berms, diversion channels, and other features had not yet been determined due to unresolved operational considerations (e.g., obtaining appropriate groundwater permits, determining groundwater restoration approach, etc.). HRI further concluded that routine hydraulic design features, such as diversion channels and riprap protection, could be designed to provide adequate flood protection.

Using the criteria provided in WM-8201, the FSTP, and the SRPs, the staff independently reviewed the information provided by HRI, and conducted site visits to each of the three sites. During its site visits, the staff confirmed there were no anomalous site conditions requiring unique design features as a result of potential flooding and erosion, and that any such problems could be adequately addressed by routine hydraulic design features. The staff's review and conclusions for each of the sites are discussed in detail as follows:

Crownpoint:

Based on the staff's review of the aforementioned hydrologic information provided by HRI, and a site visit conducted on February 6, 1996, the most significant flooding issue at the Crownpoint site involves the presence of an ephemeral stream that flows immediately in the site vicinity adjacent to the existing ponds. The stream has a relatively large drainage area, and the Probable Maximum Flood (PMF) could potentially erode the side slopes of above-grade waste retention ponds, if proper design precautions are not taken.

The staff's review indicates that HRI has adequately defined the scope of the flooding problem that could exist at the site. HRI provided PMF analyses using run-off models recommended by the staff in the FSTP, including peak flow rates, times of concentration, drainage areas, rainfall distributions, and infiltration losses. In accordance with review procedures recommended in the SRP, the staff reviewed these calculations and analyses and compared the results with historic flood data. Based on this review, the flood estimates are considered to be acceptable for design purposes.

It will be necessary for HRI to provide engineered design features to prevent erosion of the side slopes of the waste retention ponds. The staff's review indicates there may be several design options available to HRI. HRI could construct a new diversion channel located well away from the waste retention pond side slopes, provide riprap erosion protection for the existing channel, modify the slopes and grades of the existing channel to eliminate the need for riprap, or provide a design that incorporates a combination of these options. Regardless of the design option selected, the staff notes there are no anomalous site conditions requiring unique design and construction of diversion channels or riprap erosion protection features.

Unit 1:

Based on the staff's review of the hydrologic information provided by HRI, and a site visit conducted on February 6, 1996, there are no significant flooding issues at the Unit 1 site. The site is located on a high ridge between two shallow arroyos and the local drainage areas affecting any site features are likely to be minimal. The staff concludes that a waste retention pond could be constructed in several locations where the drainage area is minimal, thus eliminating the need for a large, heavily-protected diversion channel.

HRI provided flooding analyses to document that the flows in the arroyos would not affect the design of retention ponds located on, or near the top of, the ridge. HRI used NRC-recommended methods to estimate peak flow rates and indicated that waste retention ponds and other structures would be located well away from arroyos or areas of flood flows. HRI also indicated that one drainage area may need to be rerouted by a diversion channel, depending on the final location and size of the waste retention ponds and structures. HRI proposed that this rerouting could be accommodated by a 3-foot deep trapezoidal channel, thus demonstrating that such drainage modifications would be minor.

As discussed above in the Crownpoint Site analysis, the staff has concluded there are no anomalous site conditions at Unit 1 requiring unique design and construction of diversion channels or riprap erosion protection features.

Church Rock:

Based on the staff's review of the hydrologic information provided by HRI, and a site visit conducted on July 16, 1997, there are two potential hydrologically-significant issues affecting the design of the waste retention ponds. First, an ephemeral stream with a relatively large drainage area flows through the site area. Therefore, the waste retention ponds will need to be located far enough from this stream, or protected by engineered design features from erosion associated with this stream. Second, most of the potential pond locations will have some upgradient drainage area, making it likely that a diversion channel will be required to divert flood flows around the waste retention ponds.

Using models recommended by the staff in the FSTP, HRI provided PMF analyses, including peak flow rates, times of concentration, drainage areas, rainfall distributions, and infiltration losses. In accordance with review procedures recommended in the SRP, the staff reviewed these calculations and analyses and compared the results with historic flood data. Based on this review, the flood estimates are considered to be acceptable for design purposes.

To protect any above-grade waste retention pond side slopes from the large ephemeral stream that flows through the site, HRI would need to locate the ponds and facility structures in an area not subject to flooding from this stream. Alternately, HRI could provide riprap to protect the waste retention pond side slopes from erosion.

The staff concluded that some small upland drainage area will probably exist regardless of the waste retention pond location. Therefore, HRI will need to provide a diversion channel and/or erosion protection to prevent erosion due to run-off from these small drainages. The staff's review indicates there may be several design options available to HRI. To protect the side slopes of the waste retention pond from run-off due to the localized drainage areas, HRI could construct diversion channels with the necessary riprap erosion protection features. The channel could be designed with a relatively flat slope across the site to minimize the need for riprap, or a design could be provided that incorporates a combination of these options. Regardless of the design selected, the staff concludes there are no anomalous site conditions requiring unique design and construction of diversion channels or riprap erosion protection features.

HRI states in the COP Revision 2.0 (HRI 1997b) that it plans to build only below-ground level retention ponds, if possible. This would eliminate the potential for embankment failure that could result in any release of waste water. Should HRI have to construct an above-ground retention pond(s) that: (1) has an embankment that is greater than or equal to 25 feet in height and a storage capacity greater than 15 acre-feet; or (2) has a storage capacity greater than or equal to 50 acre-feet and an embankment greater than 6 feet in height; or (3) poses a potentially significant downstream hazard, then the NRC staff would use Regulatory Guide 3.11 (NRC 1977) to review the design, construction, inspection, and maintenance features of the proposed above-grade embankment. In addition, any above-ground retention ponds meeting the aforementioned criteria would be included in the NRC Dam Safety Program, and would be subject to Section 215, "National Dam Safety Program," of the Water Resources Development Act of 1996.

Regardless of whether below-ground or above-ground retention ponds are used, HRI would still need to satisfy the design requirements of 10 CFR Part 40, Appendix A, Criterion 5A, regarding the hydrogeologic setting, the structural integrity of the liner, and the overall stability of surface impoundments.

If HRI decides to construct above-ground waste retention ponds, the staff has concluded that there are no site conditions which would require a unique design feature. Based on its review of the seismic slope stability for the United Nuclear Corporation Church Rock tailings site (located adjacent to the Crownpoint Project site), the NRC staff concluded that embankment slopes can be designed to remain stable for 1,000 years, to the extent reasonably achievable. Therefore, the NRC staff has further concluded that an equal or greater level of stability can be achieved for the proposed 20 year lifetime of any conventionally designed waste retention pond(s) constructed by HRI for the Crownpoint Project.

HRI has committed to using a double-lined, impermeable synthetic membrane for its waste retention ponds in accordance with 10 CFR Part 40, Appendix A requirements. The liners will be separated by 4-5 inches of sand or equivalent medium, and a drainage network of open

piping which forms an underdrain leak detection system. The inner liner will provide secondary containment for any leakage that may occur. HRI states that it will conduct daily inspections for leakage, and that fluid found in the leak detection system will be cause for immediate corrective action, including notification of the NRC.

Based on further discussions with HRI since the FEIS (NRC 1997) was published, NRC will impose the following conditions with respect to waste retention ponds, rather than those stated in FEIS Section 4.2.3 (NRC 1997):

Prior to injecting lixiviant at a site, or processing licensed material at the Crownpoint site, HRI shall provide and receive NRC acceptance - for that site - information, calculations, and analyses to document the adequacy of the design of waste retention ponds and their associated embankments (if applicable), liners, and hydrologic site characteristics. HRI shall demonstrate that the criteria described in the following documents have been met: 10 CFR Part 40, Appendix A, Criterion 5A regarding surface impoundment design; Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills"; WM-8201, "Hydrologic Design Criteria for Tailings Retention Systems,"; and Final Staff Technical Position, "Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites." As applicable, based on the designs selected, HRI shall provide information in the following areas:

a) **maps and detailed drawings outlining drainage areas of principal water courses and drainage features at the site;**

b) **drainage basin characteristics, including soil types and characteristics, vegetative cover, local topography, flood plains, geomorphic characteristics, and surficial and bedrock geology;**

c) **maps and detailed drawings showing the location of site features, particularly the location of the retention ponds and diversion channels;**

d) **analyses and calculations for peak flood flows, including the PMF, and documenting the methods and assumptions used to compute the floods;**

e) **analyses and calculations for water surface profiles and velocities associated with the ability of the retention ponds or diversion channels to resist or limit erosion and flooding;**

f) **analyses and computations of riprap or erosion protection needed to protect the retention ponds;**

g) **specific details on the design, construction, maintenance, and operation of the waste retention ponds and embankments (where applicable);**

h) **specific details on the design, construction, maintenance, and operation of the liners and leak detection system.**

i) **any other analyses and computations which demonstrate that applicable design criteria have been met.**

7.2 Solid Radioactive Waste Disposal

All solid 11e.(2) byproduct material will be shipped to an NRC- or Agreement State-licensed 11e.(2) byproduct material disposal cell. HRI has a contract with International Uranium Corporation (IUC) to ship 11e.(2) byproduct material for disposal in the tailings cells at IUC's White Mesa Uranium Mill in Blanding, Utah (HRI 1996a). Contaminated materials would be stored adjacent to the waste retention ponds prior to shipment for disposal. To ensure HRI maintains access to disposal capacity, NRC will require by license condition that:

HRI shall dispose of 11e.(2) byproduct material from the Crownpoint Project at a waste disposal site licensed by the NRC or an Agreement State to receive 11e.(2) byproduct material. At each Project site, HRI shall maintain an area within the restricted area boundary for storing contaminated materials prior to their disposal. HRI's approved waste disposal agreement must be maintained on site. Should this agreement expire or be terminated, HRI shall notify the NRC in writing within seven (7) working days after the agreement expires or is terminated. A new agreement shall be ratified within 90 days of expiration or termination of the previous agreement, or HRI will be prohibited from further lixiviant injection.

Pursuant to 10 CFR 20.2108, HRI will maintain records of all transfers of byproduct material for disposal until license termination.

7.3 Conclusions

HRI has acceptably described the common liquid effluents to be generated at the Crownpoint Project. While HRI has discussed a wide range of acceptable control methods, HRI would be limited to using either surface discharge (with appropriate State or Federal permits/licenses), brine concentration, waste retention ponds, or a combination of the three to dispose of process waste water. In addition, HRI has provided preliminary hydrologic engineering analyses for the Crownpoint Project site. Based on its review of this data and the information gathered during its site visits, the NRC staff concludes there are no anomalous site conditions at any of the three sites that would require unique designs for constructing waste retention ponds, diversion channels, or riprap erosion protection features. Similar type waste retention ponds, diversion channels, and riprap erosion protection are common design features at numerous other uranium mill sites, and the staff has considerable expertise in evaluating the performance of these engineered features. Furthermore, HRI has committed to following design criteria enumerated in Regulatory Guide 3.11 (if applicable), WM-8201, and the FSTP when constructing its waste retention ponds. Therefore, the staff concludes that an acceptable detailed design can be readily provided by HRI to meet 10 CFR Part 40, Appendix A, Criterion 5A requirements, once the project's operational issues have been resolved.

HRI has committed that sump capacity for each process building will be sufficient to contain the volume of the largest vessel. Each site facility will have acceptable alarms to notify the operator of loss of or excess pressure within the production circuits. HRI has an acceptable plan for the

disposal of contaminated solid wastes that are generated by the Crownpoint Project, including storage of contaminated material that either cannot, or will not, be decontaminated and released for unrestricted use, prior to disposal. HRI will dispose of contaminated solid waste periodically at a licensed waste disposal site, and will maintain an agreement/contract for future disposal capacity.

Based on the information provided in the application, site visits conducted by the staff, and the detailed review conducted of the effluent control systems for liquids and solids for the Crownpoint Project, as modified above by the stated license conditions, the NRC staff has concluded that HRI's waste management plans ensure compliance with the applicable requirements of (1) 10 CFR Part 20, Subpart K (waste disposal); (2) 10 CFR Part 40, Appendix A, Criterion 2 (disposal of byproduct material); and (3) 10 CFR Part 40, Appendix A, Criteria 5A (surface impoundment requirements).

Because the waste retention ponds are operational features used for waste water management, the monitoring requirements listed in 10 CFR Part 40, Appendix A, Criterion 7 are not applicable to this project. Specifically, the monitoring requirements in Criterion 7 apply to disposal cells which are used for the long-term stabilization of uranium mill tailings.

8.0 DECOMMISSIONING AND RECLAMATION

HRI included a preliminary schedule for mining related activities in the COP (HRI 1997b). Decommissioning and reclamation of the CPF and satellites will take place after all mining and groundwater restoration at the site is complete. Groundwater restoration and wellfield decommissioning will be accomplished as wellfields are mined out.

HRI has committed to submitting a detailed reclamation plan to NRC for review and approval at least 12 months prior to the planned final shutdown of mining operations. As part of the COP (HRI 1997b), HRI has submitted a conceptual reclamation plan. The main goal of the plan is to return areas affected by mining activities to a condition which supports the premining land use of sheep and cattle grazing, and associated wildlife habitats. The conceptual reclamation plan provides reasonable assurance that the goal can be reached for surface reclamation activities. Information on the groundwater restoration activities can be found in the FEIS Section 4.3 (NRC 1997).

HRI has committed to decontaminating to unrestricted release standards, or disposing of, all radiologically contaminated buildings, process vessels, and other structures, and affected areas prior to final reclamation. Decontamination will include using acid and water wash downs of structures and concrete. The resulting wastewater will be disposed by disposal well, brine concentration, and/or evaporation. Equipment which cannot be decontaminated will be dismantled and disposed as 11e.(2) byproduct material or utilized at another NRC licensed uranium site. Retention ponds will have the liners and pond sludge removed and disposed as 11e.(2) byproduct material, if the pond had been used for process waste water.

HRI has committed to providing information to NRC, prior to release of an area for unrestricted use, verifying that radionuclide concentrations meet the applicable radiation standards in 10 CFR Part 40, Appendix A, Criterion 6(6), for allowable radium concentrations.

Areas unaffected by process wastes but contaminated by restoration waste waters will need to meet the appropriate standards of the State of New Mexico or the Navajo Nation.

Based on the information provided in the application, the NRC staff has concluded that the proposed reclamation program is acceptable, and that the applicable decommissioning requirements of 10 CFR 40.42 can be met.

9.0 SURETY REQUIREMENTS

10 CFR Part 40, Appendix A, Criterion 9, requires the licensee to establish a financial surety arrangement to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the site. The surety is based on an estimate which must account for the total costs that would be incurred if an independent contractor were contracted to perform the work. The surety estimate must be approved by NRC and based on a NRC-approved decommissioning and reclamation plan. HRI must also provide the surety arrangement through a financial instrument acceptable to NRC. The licensee's surety mechanism will be reviewed by NRC annually to ensure that sufficient funds are available to complete reclamation. Additionally, the amount of the surety should be adjusted to recognize any increases or decreases in liability resulting from inflation, changes in engineering plans, or other conditions affecting cost. NRC will require by license condition that:

As a prerequisite to operating under its license, HRI shall submit an NRC-approved surety arrangement to cover the estimated costs of decommissioning, reclamation, and groundwater restoration. Generally, these surety amounts shall be determined by the NRC based on cost estimates for a third party completing the work in case HRI defaults. Surety for groundwater restoration of the initial well fields shall be based on 9 pore-volumes. Surety shall be maintained at this level until the number of pore volumes required to restore the groundwater quality of a production-scale well field has been established by the restoration demonstration. If at any time it is found that well field restoration requires greater pore-volumes or higher restoration costs, the value of the surety will be adjusted upwards. Upon NRC approval, HRI shall maintain the NRC-approved financial surety arrangement consistent with 10 CFR Part 40, Appendix A, Criterion 9.

Annual updates to the surety amount, required by 10 CFR Part 40, Appendix A, Criterion 9, shall be provided each year to the NRC at least 3 months prior to the anniversary date of the license issuance. If the NRC has not approved a proposed revision 30 days prior to the expiration date of the existing surety arrangement, HRI shall extend the existing arrangement, prior to expiration, for 1 year. Along with each proposed revision or annual update of the surety, HRI shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation (ie., using the approved Urban Consumer Price Index), maintenance of a minimum 15 percent contingency, changes in engineering plans, activities performed, and any other conditions affecting estimated costs for site closure.

HRI shall provide an NRC-approved updated surety before undertaking any planned expansion or operational change which has not been included in the annual surety

update. This surety update shall be provided to the NRC at least 90 days prior to the commencement of the planned expansion or operational change.

HRI shall also provide the NRC with copies of surety-related correspondence submitted to the State of New Mexico, a copy of the State's surety review, and the final approved surety arrangement. HRI must also ensure that the surety, where authorized to be held by the State, identifies the NRC-related portion of the surety and covers the above-ground decommissioning and decontamination, the cost of off-site disposal, soil and water sample analyses, and groundwater restoration associated with the site. The basis for the cost estimate is the NRC-approved site closure plan or the NRC-approved revisions to the plan.

10.0 CONCLUSION AND SAFETY LICENSE CONDITIONS

Upon completion of the safety review of HRI's license application for a source material license, the staff concludes that the requirements of 10 CFR 40.32 have been satisfied, and that issuance of a license to HRI containing the following conditions will not be inimical to the common defense and security or to the public's health and safety. The staff further concludes that there is adequate assurance that the applicable requirements of 10 CFR Parts 19, 20, 40, and 71, and the AEA, have been or will be met.

Additional license conditions (not included in this SER) regarding environmental protection are stated in the FEIS, and will be included in the 10 CFR Part 40 license to be issued to HRI. Therefore, the staff recommends granting a source material license to HRI 30 days after the issuance of this SER, subject to the following conditions:

- The licensee shall conduct operations in accordance with all commitments, representations, and statements made in its license application submitted by cover letter dated April 25, 1988, as supplemented, and the Crownpoint Uranium Project COP, Rev. 2.0, dated August 15, 1997, except where superseded by license conditions contained in this license. Whenever the words "will" or "shall" are used in the aforementioned licensee documents, it denotes an enforceable license requirement.

- The processing plant flow rate at each site (Church Rock, Unit 1, or Crownpoint) shall not exceed 15,142 L/min (4000 gal/min), exclusive of restoration flow. Total yellowcake production from all three sites shall not exceed 1.36 million kg (3 million lbs) annually.

- Any corporate organization changes affecting the assignments or reporting responsibilities of the radiation safety staff as described in the COP (HRI 1997b) shall conform to Regulatory Guide 8.31 (NRC 1983b).

- The Radiation Safety Officer (RSO) shall have the education, training, and experience as specified in Regulatory Guide 8.31 (NRC 1983b).

- The Radiation Safety Technician (RST) shall have the qualifications specified in Regulatory Guide 8.31 (NRC 1983b). Any person newly hired as an RST shall have all work reviewed and approved by the RSO as part of a comprehensive training program

until appropriate course training is completed, and at least for 6 months from the date of appointment.

- The licensee may, without prior NRC review or approval: (a) make changes in the Crownpoint Project's facilities or processes as described in Revision 2.0 of the COP; (b) make changes in its standard operating procedures; and © conduct tests or experiments, if the licensee ensures that the following conditions are met:

  (1) the change, test, or experiment does not conflict with any requirement specifically stated in the license, or impair the licensee's ability to meet all applicable NRC regulations;

  (2) there is no degradation in the safety or environmental commitments made in COP Revision 2.0 (HRI 1997b), or in the approved reclamation plan for the Crownpoint Project; and

  (3) the change, test, or experiment is consistent with NRC's findings in the FEIS (NRC 1997) and SER dated November , 1997, for the Crownpoint Project.

  If any of these conditions are not met for the change, test, or experiment under consideration, the licensee is required to submit a license amendment application for NRC review and approval. The licensee's determinations as to whether the above conditions are met will be made by a Safety and Environmental Review Panel (SERP). All such determinations shall be documented, and the records kept until license termination. All such determinations shall be reported annually to the NRC. The retained records shall include written safety and environmental evaluations, made by the SERP, that provide the basis for determining whether or not the conditions are met.

  The licensee shall provide an annual report to NRC that describes the changes, tests, or experiments, including a summary of the safety and environmental evaluation of each such action. As part of this annual report, the licensee shall include any COP pages revised in accordance with the performance-based license condition.

- The SERP shall consist of a minimum of three individuals employed by the licensee, whereby one shall be designated the SERP Chairperson. 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 be the Environmental Manager, with the responsibility of ensuring that changes conform to radiological safety and environmental requirements. Additional members may be included in the SERP as appropriate, to address technical aspects such as health physics, ground-water hydrology, surface water hydrology, earth sciences, and other technical disciplines. Temporary members, or permanent members other than the three identified above, may be consultants.

- The results of the following activities, operations, or actions shall be documented: sampling; analyses; surveys or monitoring; survey/monitoring equipment calibrations;

reports on audits and inspections; emergency generator use and maintenance records; all meetings and training courses required by the license; and any subsequent reviews, investigations, or corrective actions. Unless specified otherwise in NRC regulations or the license, all documentation required by the license shall be maintained for a period of at least five (5) years by the licensee at its facility, and is subject to NRC review and inspection.

- Written SOPs shall be established and followed for: (1) all operational activities involving radioactive materials that are handled, processed, stored, or transported by employees; (2) all non-operational activities involving radioactive materials including in-plant radiation protection and environmental monitoring, and (3) emergency procedures for potential accident/unusual occurrences including significant equipment or facility damage, pipe breaks and spills, loss or theft of yellowcake or sealed sources, and significant fires. The SOPs shall include appropriate radiation safety practices to be followed in accordance with 10 CFR Part 20. SOPs for operational activities shall enumerate pertinent radiation safety practices to be followed. A copy of the current written procedures shall be kept in the area(s) of the production facility where they are utilized. All SOPs for activities described in the COP shall be reviewed and approved as described in the COP.

- Radiation Work Permits shall include, at a minimum, the information described in Section 2.2 of Regulatory Guide 8.31 (NRC 1983b).

- Site inspections and reviews shall be completed and documented, as described in Section 2.3.1 and 2.3.2 of Regulatory Guide 8.31 (NRC 1983b).

- The licensee shall implement and maintain a training program for all site employees as described in Regulatory Guide 8.31 (NRC 1983b), and as detailed in the COP. All training materials shall incorporate the information from current versions of 10 CFR Part 19 and 10 CFR Part 20. Additionally, classroom training shall include the subjects described in Section 2.5 of Regulatory Guide 8.31 (NRC 1983b). All personnel shall attend annual refresher training, and HRI shall conduct regular safety meetings on at least a bi-monthly basis, as described in Section 2.5 of Regulatory Guide 8.31 (NRC 1983b).

- The licensee shall ensure that the manufacturer-recommended vacuum pressure is maintained in the drying chamber during all periods of yellowcake drying operations. This shall be accomplished by continuously monitoring differential pressure and installing instrumentation which will signal an audible alarm if the air pressure differential falls below the manufacturer's recommended levels. The alarm's operability shall be checked and documented daily. Additionally, yellowcake drying operations shall be immediately suspended if any emission control equipment for the yellowcake drying or packaging areas is not operating within specifications for design performance.

- For all required types of surveys, the licensee shall, at a minimum, use the survey locations, frequencies, and lower limits of detection established in Table 2 of Regulatory Guide 8.30 (NRC 1983c).

- Prior to injecting lixiviant at any of the sites, the licensee shall submit an NRC-accepted, procedure-level, detailed environmental monitoring program.

- The licensee shall develop and administer its radiological effluent and environmental monitoring program consistent with Regulatory Guide 4.14 (NRC 1980). The licensee shall maintain, at a minimum, three airborne effluent environmental monitoring stations, as described in COP Section 9.7.3 and Table 9.5-1 (HRI 1997b).

- The licensee shall submit the required effluent reports in accordance with 10 CFR 40.65. The licensee shall submit information specified in Section 7 of Regulatory Guide 4.14 (NRC 1980), in addition to the reports required by 10 CFR 40.65.

- The licensee shall implement a comprehensive bioassay sampling program that conforms to Regulatory Guide 8.22.

- Within restricted areas, eating shall be allowed only in designated eating areas.

- Release of equipment, materials, or packages from the restricted area shall be in accordance with NRC Staff Position, *Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct or Source Materials* (NRC 1987a), or suitable alternative procedures approved by the NRC prior to any such release.

- All radiation survey instruments shall be operationally checked in conformance with Regulatory Guide 8.30 (NRC 1983c).

- The licensee is hereby exempted from the requirements of 10 CFR 20.1902(e) for areas within the process facility, provided that all entrances to the facility are conspicuously posted in accordance with Section 20.1902(e), and with the words, "ANY AREA WITHIN THE FACILITY MAY CONTAIN RADIOACTIVE MATERIAL."

- Prior to injection of lixiviant, the licensee shall have all applicable MOAs between the licensee and local authorities, the fire department, medical facilities, and other emergency services, ratified and in effect. At a minimum, the MOAs shall identify individual party responsibilities, coordination requirements, and reporting procedures for all emergency incident responses.

- Until license termination, the licensee shall maintain documentation on all spills of source or 11e.(2) byproduct materials, and all spills of process chemicals. Documented information shall include the date, volume of spill, total activity, survey results, corrective actions, results of remediation surveys, and a map showing spill location and impacted area. After any spill, the licensee shall also determine whether the NRC must be notified.

- Prior to injecting lixiviant at a site, or processing licensed material at the Crownpoint site, HRI shall provide and receive NRC acceptance - for that site - information, calculations,

and analyses to document the adequacy of the design of waste retention ponds and their associated embankments (if applicable), liners, and hydrologic site characteristics. HRI shall demonstrate that the criteria described in the following documents have been met: 10 CFR Part 40, Appendix A, Criterion 5A regarding surface impoundment design; Regulatory Guide 3.11, "Design, Construction, and Inspection of Embankment Retention Systems for Uranium Mills"; WM-8201, "Hydrologic Design Criteria for Tailings Retention Systems,"; and Final Staff Technical Position, "Design of Erosion Protection Covers for Stabilization of Uranium Mill Tailings Sites." As applicable, based on the designs selected, HRI shall provide information in the following areas:

a) maps and detailed drawings outlining drainage areas of principal water courses and drainage features at the site;

b) drainage basin characteristics, including soil types and characteristics, vegetative cover, local topography, flood plains, geomorphic characteristics, and surficial and bedrock geology;

c) maps and detailed drawings showing the location of site features, particularly the location of the retention ponds and diversion channels;

d) analyses and calculations for peak flood flows, including the PMF, and documenting the methods and assumptions used to compute the floods;

e) analyses and calculations for water surface profiles and velocities associated with the ability of the retention ponds or diversion channels to resist or limit erosion and flooding;

f) analyses and computations of riprap or erosion protection needed to protect the retention ponds;

g) specific details on the design, construction, maintenance, and operation of the waste retention ponds and embankments (where applicable);

h) specific details on the design, construction, maintenance, and operation of the liners and leak detection system.

i) any other analyses and computations which demonstrate that applicable design criteria have been met.

- The licensee shall dispose of 11e.(2) byproduct material from the Crownpoint Project at a waste disposal site licensed by the NRC or an Agreement State to receive 11e.(2) byproduct material. At each Project site, the licensee shall maintain an area within the restricted area boundary for storing contaminated materials prior to their disposal. The licensee's approved waste disposal agreement must be maintained on site. Should this agreement expire or be terminated, the licensee shall notify the NRC in writing within seven (7) working days after the agreement expires or is terminated. A new agreement

shall be ratified within 90 days of expiration or termination of the previous agreement, or the licensee will be prohibited from further lixiviant injection.

- As a prerequisite to operating under its license, the licensee shall submit an NRC-approved surety arrangement to cover the estimated costs of decommissioning, reclamation, and groundwater restoration. Generally, these surety amounts shall be determined by the NRC based on cost estimates for a third party completing the work in case the licensee defaults. Surety for groundwater restoration of the initial well fields shall be based on 9 pore- volumes. Surety shall be maintained at this level until the number of pore volumes required to restore the groundwater quality of a production-scale well field has been established by the restoration demonstration. If at any time it is found that well field restoration requires greater pore-volumes or higher restoration costs, the value of the surety will be adjusted upwards. Upon NRC approval, the licensee shall maintain the NRC-approved financial surety arrangement consistent with 10 CFR Part 40, Appendix A, Criterion 9.

  Annual updates to the surety amount, required by 10 CFR Part 40, Appendix A, Criterion 9, shall be provided each year to the NRC at least 3 months prior to the anniversary date of the license issuance. If the NRC has not approved a proposed revision 30 days prior to by the expiration date of the existing surety arrangement, the licensee shall extend the existing arrangement, prior to expiration, for 1 year. Along with each proposed revision or annual update of the surety, the licensee shall submit supporting documentation showing a breakdown of the costs and the basis for the cost estimates with adjustments for inflation (ie., using the approved Urban Consumer Price Index), maintenance of a minimum 15 percent contingency, changes in engineering plans, activities performed, and any other conditions affecting estimated costs for site closure.

  The licensee shall provide an NRC-approved updated surety before undertaking any planned expansion or operational change which has not been included in the annual surety update. This surety update shall be provided to the NRC at least 90 days prior to the commencement of the planned expansion or operational change.

  The licensee shall also provide the NRC with copies of surety-related correspondence submitted to the State of New Mexico, a copy of the State's surety review, and the final approved surety arrangement. The licensee must also ensure that the surety, where authorized to be held by the State, identifies the NRC-related portion of the surety and covers the above-ground decommissioning and decontamination, the cost of off-site disposal, soil and water sample analyses, and groundwater restoration associated with the site. The basis for the cost estimate is the NRC-approved site closure plan or the NRC-approved revisions to the plan.

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