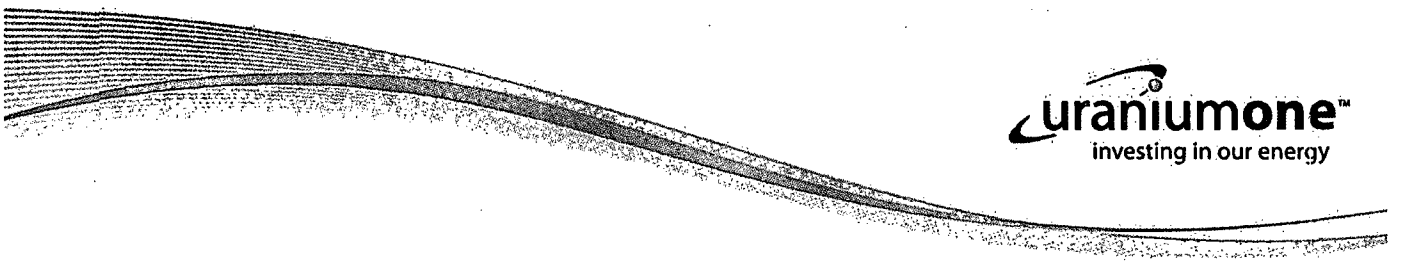


February 8, 2010

Attn: Document Control Desk
Mr. Charles L. Miller, Director
Office of Federal and State Materials and
Environmental Management Programs
U.S. Nuclear Regulatory Commission
Two White Flint North, Mailstop T8F5
11545 Rockville Pike
Rockville, MD 20852

RE: Submittal of Source Material License SUA-1341 Amendment Application
Ludeman Uranium Project
Docket No. 40-8502

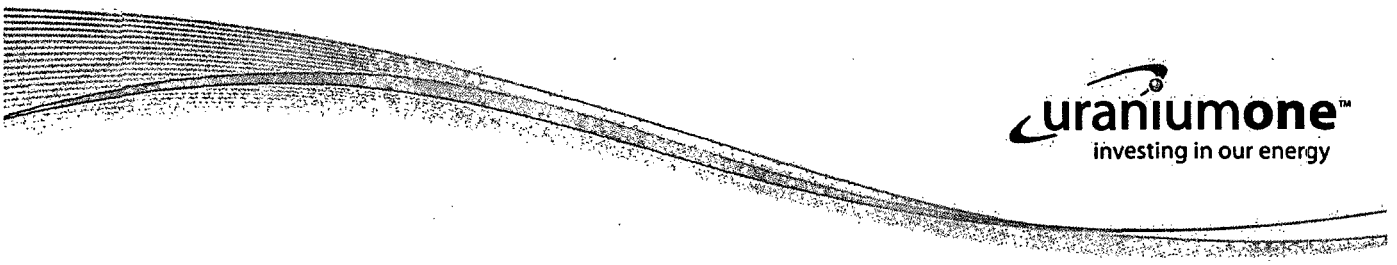
Dear Mr. Miller:

By letter dated January 15, 2010, Uranium One Americas submitted a Source Materials License Application to construct and operate the Ludeman Project in Converse County, Wyoming. Enclosed with that application was a Technical Report prepared in accordance with NUREG-1569 and an Environmental Report prepared in accordance with NUREG-1748.

On January 25, 2010, Uranium One completed the purchase of Cogema Mining, Inc., which included the change of control for SUA-1341, which authorizes the operation of the Irigaray and Christensen Ranch in situ recovery (ISR) facilities in Johnson and Campbell Counties, Wyoming. Uranium One hereby requests that NRC review the Ludeman Uranium Project application as an amendment to SUA-1341. The Ludeman project will include three satellite ISR facilities for the recovery of uranium with subsequent shipment to the Irigaray central processing plant for further processing. Accompanying this submittal is a Form 313 – Application for Materials License.

Uranium One Americas, Inc.
A Member of the Uranium One Inc. Group of Companies
tel +1 307-234-8235 • **fax** +1 307-237-8235
907 N. Poplar Street, Suite 260
Casper, Wyoming 82601
www.uranium1.com

NMSS01



Uranium One looks forward to working with your staff on the timely review and issuance of the Source Materials License for the Ludeman Project. If you or your staff should have any questions regarding this Application, please contact me at (307) 234-8235.

Sincerely,

Jon Winter
Manager, Wyoming Environmental and Regulatory Affairs

Enclosures:
NRC Form 313 and attachments

Uranium One Americas, Inc.
A Member of the Uranium One Inc. Group of Companies
tel +1 307-234-8235 • **fax** +1 307-237-8235
907 N. Poplar Street, Suite 260
Casper, Wyoming 82601
www.uranium1.com

NRC FORM 313 (3-2009) 10 CFR 30, 32, 33, 34, 35, 36, 39, and 40

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE

APPROVED BY OMB: NO. 3150-0120 **EXPIRES: 3/31/2012**

Estimated burden per response to comply with this mandatory collection request: 4.3 hours. Submittal of the application is necessary to determine that the applicant is qualified and that adequate procedures exist to protect the public health and safety. Send comments regarding burden estimate to the Records and FOIA/Privacy Services Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resource@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0120), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

OFFICE OF FEDERAL & STATE MATERIALS AND
ENVIRONMENTAL MANAGEMENT PROGRAMS
DIVISION OF MATERIALS SAFETY AND STATE AGREEMENTS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS:

IF YOU ARE LOCATED IN:

ALABAMA, CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, FLORIDA, GEORGIA, KENTUCKY, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, NORTH CAROLINA, PENNSYLVANIA, PUERTO RICO, RHODE ISLAND, SOUTH CAROLINA, TENNESSEE, VERMONT, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

LICENSING ASSISTANCE TEAM
DIVISION OF NUCLEAR MATERIALS SAFETY
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406-1415

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
2443 WARRENVILLE ROAD, SUITE 210
LISLE, IL 60532-4352

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MISSISSIPPI, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
612 E. LAMAR BOULEVARD, SUITE 400
ARLINGTON, TX 76011-4125

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S.NUCLEAR REGULATORY COMMISSION JURISDICTIONS.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- ☐ A. NEW LICENSE
- ☑ B. AMENDMENT TO LICENSE NUMBER **SUA-1341**
- ☐ C. RENEWAL OF LICENSE NUMBER

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include ZIP code)*

Uranium One USA, Inc.
907 N Poplar Street, Suite 260
Casper Wyoming 82601

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Ludeman Uranium Project
Converse County, Wyoming
13.5 miles North East of Glenrock, WY, Highway 95
Glenrock Wyoming 82637

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Donna Wichers

TELEPHONE NUMBER

(307) 234-8235

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 X 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number; b. chemical and/or physical form; and c. maiximum amount which will be possessed at any one time.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY **2.A.(2)(c)** AMOUNT ENCLOSED $ **0.00**

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, 36, 39, AND 40, AND THAT ALL INFORMATION CONTANED HEREIN IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

CERTIFYING OFFICER – TYPED/PRINTED NAME AND TITLE	SIGNATURE	DATE
Donna Wichers SR. Vice President of ISR Operations		**02/08/2010**

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			$		
APPROVED BY				DATE	

LUDEMAN URANIUM PROJECT
SOURCE MATERIALS LICENSE SUA-1341
AMENDMENT APPLICATION

NRC Form 313 Attachment
Items 5 Through 11

Applicant

Uranium One USA, Inc.
907 N Poplar Street, Suite 260
Casper, WY 82601

5. **Radioactive Material**:

a) Element and Mass Number:

Uranium- Unat (U_{238}, U_{234}, and U_{235})

b) Chemical and/or Physical Form:

Unat - Unspecified
In Solution and adsorbed on resin

c) Maximum Amount Which will be possessed at any one time:

Unlimited

6. PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED:

Fuel for electricity generation from nuclear power plants.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE:

No change from current license

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS:

No change from current license

9. FACLITIES AND EQUIPMENT:

This information is provided in detail in Section 3 of the Ludeman Uranium Project, Source Material License SUA-1341 Amendment Application, Technical Report.

10. RADIATION SAFETY PROGRAM:

This information is provided in detail in Section 5 of the Ludeman Uranium Project, Source Material License SUA-1341 Amendment Application, Technical Report.

11. WASTE MANAGEMENT:

This information is provided in detail in Section 4 of the Ludeman Uranium Project, Source Material License SUA-1341 Amendment Application, Technical Report.

REVISION INDEX
Uranium One USA., Inc.
NRC License SUA-1341 Amendment Application
Ludeman Project Environmental and Technical Reports
February 2010

VOLUME AND SECTION NUMBER	PAGE, MAP OR OTHER PERMIT ENTRY TO BE REMOVED	PAGE, MAP OR OTHER PERMIT ENTRY TO BE ADDED
ENVIRONMENTAL REPORT		
Volume. I, Section 1	Remove TOC, Remove pages 1-1 thru 1-3 Remove page 1-12 thru1-13	**Insert revised TOC** **Insert revised pages 1-1 thru 1-3** **Insert revised page 1-12 thru 1-13** ***February 2010 revision***
Volume. I, Section 2	Remove TOC Remove page 2-1 Remove page 2-7 Remove page 2-8 Remove page 2-28 Remove page 2-30 thru 2-31 Remove page 2-40 thru 2-41 Remove page 2-51	**Insert revised TOC** **Insert revised pages 2-1** **Insert revised page 2-7** **Insert revised page 2-8** **Insert revised page 2-28** **Insert revised page 2-30 thru 2-31** **Insert revised page 2-40 thru 2-41** **Insert revised page 2-51** ***February 2010 revision***
Volume. II, Section 3.4	Remove page 3.4-7 Remove page 3.4.-70	**Insert revised page 3.4-7** **Insert revised page 3.4-70** ***February 2010 revision***
Volume. II, Section 3.5	Remove page 3.5-21	**Insert revised page 3.5-21** ***February 2010 revision***
Volume. III, Section 5.0	Remove pages 5-51 thru 5-54	**Insert revised pages 5-51 thru 5-54** ***February 2010 revision***

VOLUME AND SECTION NUMBER	PAGE, MAP OR OTHER PERMIT ENTRY TO BE REMOVED	PAGE, MAP OR OTHER PERMIT ENTRY TO BE ADDED
ENVIRONMENTAL REPORT Cont.		
Volume I Binder (Cover and Spline)	Remove cover and spline Volume 1	**Replace cover and spline Volume 1** ***February 2010 revision***
Volume II Binder (Cover and Spline)	Remove cover and spline Volume II	**Replace cover and spline Volume II** ***February 2010 revision***
Volume III Binder (Cover and Spline)	Remove cover and spline Volume III	**Replace cover and spline Volume III** ***February 2010 revision***
Volume IV Binder (Cover and Spline)	Remove cover and spline Volume IV	**Replace cover and spline Volume IV** ***February 2010 revision***
TECHNICAL REPORT		
Volume I Section 1	Remove TOC page 1-i Remove pages 1-1 thru 1-4 Remove pages 1-7 thru 1-14	**Insert revised TOC, page 1-i** **Insert revised pages 1-1 thru 1-4** **Insert revised pages 1-7 thru 1-14** ***February 2010 revision***
Volume I Section 2.0	Remove page 2.2-23	**Insert revised page 2.2-23** ***February 2010 revision***
Volume III Section 2.7	Remove page 2.7-53	**Insert revised page 2.7-53** ***February 2010 revision***
Volume III Section 2.8	Remove page 2.8-21	**Insert revised page 2.8-21** ***February 2010 revision***
Volume IV Section 3.0	Remove page 3-23 Remove page 3-25	**Insert revised page 3-23** **Insert revised page 3-25** ***February 2010 revision***
Volume IV Section 5.0	Remove page 5-12 Remove page 5-15	**Insert revised page 5-12** **Insert revised page 5-15** ***February 2010 revision***
Volume IV Section 7.0	Remove pages 7-36 thru 7-38	**Insert revised pages 7-36 thru 7-38** ***February 2010 revision***
Volume IV Section 8.0	Remove page 8-1 Remove page 8-6	**Insert revised page 8-1** **Insert revised page 8-6** ***February 2010 revision***

VOLUME AND SECTION NUMBER	PAGE, MAP OR OTHER PERMIT ENTRY TO BE REMOVED	PAGE, MAP OR OTHER PERMIT ENTRY TO BE ADDED
TECHNICAL REPORT Cont.		
Volume IV Section 10.0	Remove page 10-1 thru 10-2	**Insert revised page 10-1 thru 10-2** ***February 2010 revision***
Volume I Binder (Cover and Spline)	Remove cover and spline Volume I	**Replace cover and spline Volume I** ***February 2010 revision***
Volume II Binder (Cover and Spline)	Remove cove and spline Volume II	**Replace cover and spline Volume II** ***February 2010 revision***
Volume III Binder (Cover and Spline)	Remove cover and spine Volume III	**Replace cover and spline Volume III** ***February 2010 revision***
Volume IV Binder (Cover and Spline)	Remove cover and spline Volume IV	**Replace cover and spline Volume IV** ***February 2010 revision***
Volume V Binder (Cover and Spline)	Remove cover and spline Volume V	**Replace cover and spline Volume V** ***February 2010 revision***

The original Application submittal contained four copies of the Technical Report (5 binders per copy) and four copies of the Environmental Report (4 binders per copy). Uranium One has provided replacement pages, binder covers and splines for all four copies of each the Technical Report and Environmental Report.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION OF THE ENVIRONMENTAL REPORT

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

This Environmental Report has been prepared in support of an application to the United States Nuclear Regulatory Commission (NRC) to amend Materials License SUA-1341 to develop and operate the Ludeman Project in Converse County, Wyoming. The project will consist of injection/production wellfields, lixiviant make-up circuit, three satellite plants with an ion exchange circuit, six deep injection disposal wells and six surge ponds. Uranium from ion exchange resins at the Ludeman satellite plants will be processed at the Irigaray Central Processing Plant located in Johnson County.

This amendment application and Environmental Report have been prepared using guidelines and standard formats from both state and federal agencies. The Environmental Report is presented primarily in the NRC format found in Regulatory Guide 3.46, *"Standard Format and Content of License Applications, Including Environmental Reports, For In Situ Uranium Solution Mining"* (June 1982) and NUREG-1748, *Envrionmental Review Guidance for Licensing Actions Associated with NMSS Programs* (August 2003). The guidance in NUREG-1748 was used to ensure that all necessary information is provided to allow NRC Staff to complete their review and approval of this license amendment application.

In 2008, total domestic U.S. uranium production was approximately 7.7 million pounds U_3O_8, or 14 percent of domestic U.S. uranium consumption of approximately 53 million pounds U_3O_8 (EIA website). The Ludeman Project represents an important new source of domestic uranium supplies that are essential to provide a continuing source of fuel to power generation facilities.

1.2 THE PROPOSED ACTION

1.2.1 Background

The Ludeman Project area was initially identified as a significant uranium prospect in the late 1970s. Multiple parties investigated and evaluated prospects in the vicinity of the Ludeman Project. Teton Exploration Drilling Company, Inc. (TETON) and Nuclear Exploration and Development Company (NEDCO) conducted extensive exploratory drilling and prepared a Mine Permit Application that was dated for start of ISR operation on September 1, 1981 for the Leuenberger Project. The Leuenberger Project was located in the northwest portion of the proposed Ludeman Project. An extensive exploration and aquifer testing program was conducted by TETON and NEDCO. A pilot production plant was built at the Leuenberger site and production began in January of 1980. The plant operated for approximately one year and was technically successful. However, the

economic conditions of the uranium market forced commercial mining plans to be postponed. The pilot plant was decommissioned and groundwater was restored under NRC and Wyoming Department of Environmental Quality (DEQ) guidance.

Uranium Resources, Inc. (URI) completed exploratory drilling and conducted an extensive pumping test of the production zone aquifer systems in the northeast portion of the proposed Ludeman Project during November 1980. URI subsequently prepared a Mine Permit Application for the proposed site. The URI project was permitted but was never operated as a result of the declining economics for uranium production.

Additionally, Envirosphere was retained by Nuclear Assurance Corporation (NAC) to conduct hydrologic testing and analyses of an ore zone in the southeast portion of the proposed Ludeman Project. Hydrologic testing occurred September 19 through December 5, 1979 at the Peterson Property. No uranium extraction or processing was completed at the Peterson property.

1.2.2 Site Location and Description

The Ludeman Project is located in the southern portion of the Powder River Uranium District of Wyoming, within Converse County (Figure 1.1). The proposed Ludeman Project covers approximately 31 sections (19,888 acres) and its location is described as follows:

- T34N R74W – All of Sections 12, 13, 14, 23, 24 and the east half of Section 22.
- T34N R73W – All of sections 3, 4, 5, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 34, 35, the west half of the west half of Section 2, the south half of Section 6, the west half of the west half of Section 11, the south half of Section 24, the west half of Section 25, the west half of the east half of Section 25, the northeast quarter of the northeast quarter of Section 25, the east half of Section 28, the west half of Section 36, and the west half of the east half of Section 36.
- T34N R72W – The southwest quarter of Section 19 and the north half of the northwest quarter of Section 30.
- T33N R73W – The northwest quarter of the northeast quarter of Section 1, the north half of the northwest quarter of Section 1, the north half of the north half of Section 2, and the north half of the north half of Section 3.

The North Platte Satellite Plant coordinates are Latitude 42° 56' 2.43" and Longitude -105° 36' 39.30". The Leuenberger satellite plant coordinates are Latitude 42° 55' 6.95" and Longitude -105° 41' 41.26". The Peterson satellite plant coordinates are Latitude 42° 53' 4.22" and Longitude -105° 35' 18.60".

State Highway 95 provides access to the Ludeman Project from the Towns of Glenrock and Rolling Hills to the west and State Highway 93 provides access from Douglas to the southeast. Interstate 25 provides access to both of these state highways from the south of the Ludeman Project. The main access to the North Platte and Peterson plant facilities and wellfields will be from State Highways 93, via a paved road running east through section 9, and 95, via a paved road running through sections 14 and 15. A paved road will be used to access the Peterson site which will head from section 15. The Leuenberger plant facilities will be accessed from Highway 95 by a paved road heading south in sections 13 and 14.

ESRI® ArcMap™ 9.3 software was used with Wyoming DRG-E (Enhanced Digital Raster Graphic) image data from the Wyoming GIS Coordination Structure (WGCS) to create a base map. The base map was then used for each of the figures prepared for this document with the addition of pertinent geospatial data from the Wyoming Geographic Information Science Center (WyGISC) for that figure.

The project will consist of wellfields, three satellite facilities and all appropriate appurtenances.

Figure 1-2 shows the general topography, project site layout, and restricted areas for the project including the satellite facilities and wellfields. Other site right-of-ways such as roads, electrical transmission lines and pipelines are also shown on Figure 1-2. Drainage, surface water features, and waterways are shown on Figure 3.4-6 in Section 3.4. Further development within the Project may be possible according to sand trends, see Section 3 Figure 3-1.

The minerals leased in the Ludeman Project area are primarily on private land with some areas of Federal or State lands. Figure 1-3 shows the surface land ownership and Figure 1-4 shows mineral ownership for the Ludeman Project.

1.4.1 Environmental Consultation

During the course of the preparation of this license amendment application, consultations were conducted with several agencies:

Ecological Resources

Preparation of the ecological resources discussion (Section 2) required consultations with the following individuals and agencies:

Wetlands

Mathew A. Bilodeau
Paige Wolken
United States Army Corps of Engineers
2232 Dell Range Blvd, Suite 210
Cheyenne, WY 82009-4942

Soils

Tim Schroeder, District Conservationist
Douglas NRCS
1954 E. Richards, #10
Douglas, WY 82633

Lowell Spackman and Anna Waitkus
Wyoming Department of Environmental Quality-Land Quality Division
Herschler Building
122 W 25th St.
Cheyenne, WY 82002

Wildlife

Shane Gray
Wildlife Biologist
Bureau of Land Management
2987 Prospector Dr.
Casper, WY 82604

Socioeconomics

Mark Antrim
Associate Director of Buildings
Natrona County School District

970 N. Glenn Rd.,
Casper, WY 82601,

Glendene Stillwell
Converse School District #2
120 Boxelder Trail
Glenrock, WY 82637

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

2 ALTERNATIVES

2.1 NO-ACTION ALTERNATIVE

Under the provisions of the National Environmental Policy Act (NEPA), one alternative that must be considered in each environmental review is the no-action alternative. In this case, the no-action alternative would mean that the NRC would not approve the Ludeman Project application and would not amend Materials License. SUA-1341. ISR uranium mining would not occur at the Ludeman Project and the associated environmental impacts would not occur.

2.1.1 Impacts of the No-Action Alternative

The no-action alternative would result in significant financial impacts to Uranium One and to Converse County, Wyoming and the surrounding area. Uranium One has invested significant resources to develop the Ludeman Project that would be irretrievably lost under the no-action alternative. In addition, the no action alternative would adversely affect the economic growth of Converse, Natrona and Campbell Counties. As discussed in further detail in Section 7, the Ludeman Project is expected to provide a significant economic impact to the local economy.

A decision to not amend Materials License SUA-1341 would leave a large resource unavailable for energy production supplies. Uranium One is continuing to develop estimates of the reserves at the Ludeman Project satellite site, but the current estimated resource is 6.3 million pounds U_3O_8.

In 2008, total domestic U.S. uranium production was approximately 7.7 million pounds U_3O_8 (Energy Information Administration). During the same year, domestic U.S. uranium consumption was approximately 53 million pounds U_3O_8 (Energy Information Administration). The Ludeman Project represents an important new source of domestic uranium supplies that are essential to provide a continuing source of fuel to power generation facilities.

In addition to leaving a large deposit of valuable mineral resources untapped, a denial of this license amendment would result in adverse economic affects on the individuals that have surface leases with Uranium One and own the mineral rights in the Ludeman Project.

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In addition to leaving a large deposit of valuable mineral resources untapped, a denial of this license amendment would result in adverse economic affects on the individuals that have surface leases with Uranium One and own the mineral rights in the Ludeman Project.

2.2.1 Licensing Action Requested

This Environmental Report has been prepared in support of an amendment application to the NRC for a Materials License SUA-1341 to authorize development and operation of the Ludeman Project in Converse County, Wyoming. The project will consist of injection/production wellfields, lixiviant make-up circuit, three satellite plants with an ion exchange circuit, six deep injection disposal wells and six surge ponds. Uranium from ion exchange resins at the Ludeman satellite plants will be processed at the Irigaray Central Processing Plant located in Johnson County.

2.2.2 Ludeman Project Background

The Ludeman Project area was initially identified as a significant uranium prospect in the late 1970s. Multiple parties investigated and evaluated prospects in the vicinity of the Ludeman Project. Teton Exploration Drilling Company, Inc. (TETON) and Nuclear Exploration and Development Company (NEDCO) conducted extensive exploratory drilling and prepared a Mine Permit Application that was dated for start of ISR operation on September 1, 1981 for the Leuenberger Project. The Leuenberger Project was located in the northwest portion of the proposed Ludeman Project. An extensive exploration and aquifer testing program was conducted by TETON and NEDCO. A pilot production plant was built at the Leuenberger site and production began in January of 1980. The plant operated for approximately one year and was technically successful. However, the economic conditions of the uranium market forced commercial mining plans to be postponed. The pilot plant was decommissioned and groundwater was restored under NRC and Wyoming Department of Environmental Quality (DEQ) guidance.

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Additionally, Envirosphere was retained by Nuclear Assurance Corporation (NAC) to conduct hydrologic testing and analyses of an ore zone in the southeast portion of the proposed Ludeman Project. Hydrologic testing occurred September 19 through December 5, 1979 at the Peterson Property. No uranium extraction or processing was completed at the Peterson property.

2.2.3 Corporate Entities Involved

This license amendment application and environmental report are prepared and submitted by Uranium One USA, Inc., a Delaware corporation. Uranium One USA, Inc. is licensed under materials license SUA-1341 for uranium recovery activities at the Irigaray and Christensen Ranch Uranium Project. The immediate parent company of Uranium One USA, Inc. is Uranium One Americas Inc., a Delaware corporation. The immediate parent company of Uranium One USA, Inc. is Uranium One Inc., a British Columbia, Canada uranium production company with a primary listing on the Toronto Stock Exchange (TSX) and a secondary listing on the Johannesburg Stock Exchange (JSE Limited). Throughout this amendment application and environmental report Uranium One USA, Inc. will be referred to as Uranium One.

2.2.4 Site Location and Description

The site location and general description of the proposed Ludeman Project was provided in Section 1.2. The total surface area to be affected by the proposed operation is included completely within the project area and is estimated to total 815 acres. Seven wellfields, three satellite ion exchange facilities, six deep disposal wells and six surge ponds are the significant surface features to be associated with the uranium *in situ* recovery mining operations. Construction of the three satellite plants will encompass approximately 15 acres. The satellite plants are anticipated to consist of an 80- x 140-foot processing building, a 70- x 90-foot shop, associated parking, and other infrastructure within an approximate 1.5 acre area enclosed with security fencing. In addition, two surge ponds (each approximately 1.2 acres) will be separately enclosed in a 3.5 acre area with security fencing. The road disturbance acreage is approximately 37 acres and is calculated assuming approximately seven miles of 25-foot-wide main road and approximately 18 miles of eight-foot-wide, field roads.

Other mineralized trends exist within the current proposed project area, but have not been extensively explored. If future exploration shows potential for development of these other existing trends, then appropriate baseline evaluations will be made at that time.

2.2.5 Orebody

Uranium ore within the Ludeman Project area occurs in typical roll-front deposits. The production zone aquifers in the Ludeman Project area are the 70, 80 and 90 Sands of the Lebo member of the Paleocene Fort Union formation. Uranium One exploration nomenclature designates the sands in the project area by decreasing numbers with depth. The 70 Sand is continuous across the planned wellfields as is the 90 Sand. The 80 Sand is

2.2.8.4 Resin Transfer and Elution

Once the ion exchange resin in an ion exchange column is loaded to capacity with uranium complexes, the column will be taken out of service. The resin loaded with uranium will be transferred from one of the Ludeman satellite facilities to the Irigaray Central Processing Plant via tanker truck. Once the resin has been stripped of the uranium by the process of elution, the resin will be returned to the Ludeman satellite for reuse in the ion exchange circuit. In the elution circuit the loaded resin will be stripped of uranium by a process based on the following chemical reaction:

$$R_2UO_2(CO_3)_2 + 2Cl^- + CO_3^{-2} \longrightarrow 2\,RCl + UO_2(CO_3)_3^{-2}$$

After the uranium has been stripped from the resin, the resin may be rinsed with a sodium bicarbonate solution. This rinse removes the high chloride eluant physically entrained in the resin and partially converts the resin to bicarbonate form. In this way, chloride ion buildup in the lixiviant can be controlled.

2.2.9 Proposed Operating Schedule

The proposed Ludeman Project mine schedule is shown in Figure 2-9. The mine schedule is preliminary based on Uranium One's current knowledge of the area and potential for future wellfield development. The schedule shows potential development of seven wellfields, the three satellite ion exchange facilities in the eastern, central and western portions of the site. The three satellite ion exchange facilities will be constructed and operated in a staggered fashion starting in approximately 2012, as shown on Figure 2-10. As shown on Figure 2-1, the northern portion of the project area contains significant areas of potential mineralization which will be further delineated with the potential for definition of additional wellfield areas. As development of these potential wellfield areas progress, the mine schedule, and schedule for use of the individual satellite ion exchange facilities will be updated accordingly.

2.3 LUDEMAN PROJECT CHEMICAL STORAGE FACILITIES; EQUIPMENT USED AND MATERIAL PROCESSED

The uranium recovery process described in the preceding section will be accomplished in several steps. Uranium recovery from the solution by ion exchange will be performed at the Ludeman satellite. Processing of the loaded ion exchange resin to remove the uranium (elution), the precipitation of uranium, and the dewatering and packaging of solid uranium (yellowcake) will be performed at the Irigaray or Central Processing Plant.

2.3.1.1 Flow and Material Balance – Ion Exchange

The uranium-bearing solution or pregnant lixiviant pumped from the wellfield is piped to one of the Ludeman Project satellite plants for extraction of the uranium by use of ion exchange units. The ion exchange system consists of six fixed-bed ion exchange vessels. The ion exchange vessels will be operated as three sets of two vessels in series. The ion exchange system is designed to process recovered solution at a rate of 3,000 gpm with each vessel sized for 500 cubic feet of resin operated in a pressurized downflow mode. As the solution passes through the ion exchange resin in the vessels the uranyl dicarbonate and uranyl tricarbonate are preferentially removed from the solution. The barren solutions leaving the ion exchange units normally contain less than two mg/l of uranium.

After the barren lixiviant leaves the ion exchange vessels, carbon dioxide and/or carbonate/bicarbonate is added, if necessary, to return the lixiviant concentration to the desired operating level. The solution is then pumped to the wellfield, with the oxidant (O_2 gas) added at the wellfield header houses before the solution is re-injected into the production zone.

Loaded resin from the satellite plants will be transported to the Irigaray Central Processing Plant via tanker truck. A pressurized transfer system will be used to transfer resin from the truck to the plant.

2.3.1.2 Facility Areas Where Fumes or Gases May Be Generated

A description of the areas in the proposed satellite facility where radiological gases or air particulate could be generated is presented in Section 5.1.6. Those areas are shown in Section 5, Figure 5-1 as monitoring locations.

The potential sources of non-radiological fumes or gases are minimal within each satellite facility since the mining solutions contained in the process equipment are maintained under a positive pressure.

2.4 LUDEMAN SATELLITE PLANT, CHEMICAL STORAGE FACILITIES, EQUIPMENT USED AND MATERIAL PROCESSED

The Ludeman satellite ion exchange plants are shown on Figure 2-3 and 2-4 including associated structures and wellfields. Each of the Ludeman satellite facilities will be designed to operate at a throughput of 3,000 gpm. The North Platte, Leuenberger and Peterson satellite ion exchange processing plants will each be located within an approximate 5-acre fenced area in the SW¼NW¼, Section 10, T34N, R73W, SE¼NE¼ of Section 14, T34N, R74W, and SW¼SW¼, Section 26, T34N, R73W, respectively. The processing plants will include the ion exchange, resin loading, and transfer areas. These areas will also contain chemical storage, storage yard, temporary byproduct storage area, and employee parking. The main satellite buildings will each be approximately 80 feet in width by 140 feet in length and will be entirely contained within a concrete curb designed to contain the volume of the largest tank in the facility. Figure 2-10 shows the general layout of the process equipment in the satellite plant.

As the pregnant lixiviant enters the satellite ion exchange facility from the wellfield, a booster pump upstream of the ion exchange columns will pressurize the fluid to approximately 100 psig to move the fluid through the ion exchange system.

Any sand or silt contained in the pregnant lixiviant will be trapped by a series of bag filters before and after the ion exchange train. The barren lixiviant exiting the second stage ion exchange vessel will normally contain less than two mg/L of uranium. This fluid will be pressurized by booster pumps prior to return to the wellfield for re-injection.

When resin in a first stage ion exchange vessel is loaded and removing very little additional uranium, the vessel is isolated from the normal process flow, which is shunted to another vessel in the train. The loaded resin will be transferred in 500 cubic foot lots to a trailer for transport to the Irigaray Central Plant. After processing, the resin is returned to the satellite facility via truck and placed back into an ion exchange vessel for continued uranium recovery.

reducing conditions include those of arsenic, molybdenum, selenium, uranium and vanadium. Groundwater quality mitigation measures are discussed in detail in Section 5.4.2 of this ER.

2.5.6.3 Financial Assurance

Uranium One typically maintain financial surety instruments in the form of an Irrevocable Letter of Credit to cover the costs of reclamation including the costs of groundwater restoration, the decommissioning, dismantling and disposal of all buildings and other facilities, and the reclamation and revegetation of affected areas. Other approved forms of surety may be considered. Additionally, in accordance with NRC and WDEQ requirements, an updated Annual Surety Estimate Revision will be submitted to the NRC and WDEQ each year to adjust the surety instrument amount to reflect existing operations and those planned for construction or operation in the following year. After review and approval of the Annual Surety Estimate Revision by the NRC and WDEQ, Uranium One will revise the surety instrument to reflect the revised amount. Uranium One will:

1) Automatically extend the existing surety amount if the NRC has not approved the extension at least 30 days prior to the expiration date;

2) Revise the surety arrangement (with WDEQ approval) within three months of NRC approval of a revised closure (decommissioning) plan, if estimated costs exceed the amount of the existing financial surety;

3) Provide NRC a copy of the final surety arrangement.

Groundwater restoration costs are based on treatment of one pore volume for groundwater sweep and six pore volumes for reverse osmosis and reductant. Wellfield pore volumes are determined using the following equation:

Wellfield Pore Volume = (Affected Ore Zone Area) x (Average Completed Thickness) x (Flare Factor) x (Porosity)

Flare factor has been determined for PRI's Smith Ranch wellfields to be approximately 1.5 to 1.7. This flare factor was estimated using a three-dimensional groundwater flow model (MODFLOW) in conjunction with an advective particle tracking technique (MODPATH). Horizontal and vertical flare factors of 1.5 and 1.3, respectively, have been approved by the US Nuclear Regulatory Commission for the Hydro Resources, Inc., Churchrock licensing action in New Mexico. Uranium One USA, Inc., at the Irigaray/Christensen Ranch sitesunder Materialss License SUA-1341, uses an overall flare factor of 1.44. Accordingly, Uranium One is using a flare factor of 1.44 for the surety estimate. All critical ground water restoration factors (pore volume, flare factors,

porosity and completed thickness) are identified in the surety estimate presented in Appendix E. However, the surety estimate presented in Appendix E was developed for the first year of the project. There will be no wellfield or satellite operations during the first year therefore no wellfield groundwater restoration or building or soil decontamination costs were carried through the cost summary. These costs will be rolled into the surety estimate during the annual update.

2.5.7 Monitoring

2.5.7.1 Radiological Monitoring

Uranium One has completed a detailed characterization of the background radiological characteristics of the Ludeman Project area. The preoperational monitoring was designed to meet the requirements of NRC Regulatory Guide 4.14, *Radiological Effluent and Environmental Monitoring at Uranium Mills* and involved the following environmental sampling:

- Intensive (75 to 90 percent coverage) preoperational global positioning satellite (GPS) -based gamma survey of the areas proposed for the processing facility and wellfields;
- GPS-based gamma survey of the remainder of the proposed project area at a density of approximately 15 percent coverage.
- Surface and subsurface soil sampling;
- Sediment sampling;
- Ambient gamma and radon monitoring;
- Air particulate monitoring;
- Groundwater sampling;
- Surface water sampling; and
- Vegetation sampling.

Based on the radiological effluents and exposure pathways, Uranium One has designed an operational radiological monitoring program that meets the guidance contained in Regulatory Guide 4.14. Radiological monitoring is discussed in detail in Section 6.1 of this ER.

2.5.7.1.1 Wellfield Operational Monitoring

During operation, the primary purpose of the wellfield monitoring program will be to detect and correct conditions that could lead to an excursion of lixiviant or detect such an

exposed to the radionuclides present in and emanating from the ore and tailings and the potential for radiation exposure is significantly less than that associated with conventional mining and milling.

5. By removing the solid wastes from the site to a licensed waste disposal site and otherwise restricting them from contaminating the surface and subsurface environment, the entire mine site can be returned to unrestricted use within a relatively short time.

6. ISR mining results in significantly less water consumption than conventional mining and milling.

7. The socioeconomic advantages of ISR include:

   - The ability to mine a lower grade ore;
   - A lower capital investment;
   - Less risk to the miner;
   - Shorter lead time before production begins; and
   - Lower manpower requirements.

2.8 CUMULATIVE EFFECTS

2.8.1 Future Development

Uranium One has other potential resource areas identified in the Powder River Basin that may be developed as satellite facilities to the Ludeman project area. Development of these facilities is dependent upon further site investigations by Uranium One and the future of the uranium market. If conditions warrant, Uranium One may submit license amendment requests and WDEQ-LQD Mine Permit Applications for development of these additional resources. Uranium One currently projects that development of these areas would be primarily intended to maintain production at Irigaray allowed under materials license as reserves SUA-1341at the Ludeman Project site are depleted.

2.9 COMPARISON OF THE PREDICTED ENVIRONMENTAL IMPACTS

Table 2-3 provides a summary of the environmental impacts for the no-action alternative (Section 2.1), the proposed alternative (Section 2.1), and the reasonable alternatives

3.4.1.2.1 Groundwater Quantity

According to the Wyoming State Engineers Office, there are 415 well permits located within two miles of the Ludeman Project boundary as of November, 2008. Most of the groundwater pumped from active wells surveyed within two miles of the Ludeman Project boundary is used either for stock or monitoring. Groundwater rights within the Ludeman Project are presented in Addendum 3.4-B.

Figure 3.4-2 shows the locations of all water wells in the Ludeman Project and within two miles of project boundary. The WSEO has history of more wells than are shown on the map. List of wells on the map are identified in Addendum 3.4-A, Tables 3.4-2, 3.4-3 and 3.4-4. Table 3.4-4 has the WSEO-listed wells which are shown on Figure 3.4-2 at the estimated positions from legal descriptions describing quarter-quarter-quarter sections. Within two miles of the Ludeman Project, 67 domestic and 52 domestic/stock water wells exist, ranging from five to 360 feet in depth. Although the one residence within the Ludeman Project is known to have a domestic well, and that well was sampled as part of baseline environmental evaluations for this License amendment application, no information was found regarding the well, from the WSEO or other sources.

- On a regional scale, the 70, 80 and 90 Sands have been adequately characterized with respect to hydrogeologic conditions within the test area at Ludeman Project;

- Adequate confinement exists between the 70, 80 and 90 Sands Production Zones and the overlying and underlying Sands throughout the Ludeman Project area;

- Adequate hydrostratigraphic confinement exists between the 70, 80 and 90 Sand Production Zones and the underlying 60 Sand throughout the proposed Wellfields. Mine-unit scale testing will demonstrate the validity of the recommended approach(s) for mining and monitoring; and,

- Sufficient testing has been conducted to date at the Ludeman Project to proceed with a WDEQ-LQD Permit to Mine application and a NRC license amendment application.

Possible Effect of ISR Mining on North Platte River

Due to the distance of the Ludeman Project area from the North Platte River (greater than one mile to the closest mineable ore body in Section 35, T34N, R73W), a regional north-northeast structural dip away from the river, a general low-angle stratigraphic dip of the production zone sands toward the north away from the river, and general groundwater flow of the production zone sands toward the east and southeast, there does not appear to be potential mining impacts on the North Platte. Additionally, the ISR mining procedures that will result in removal of approximately one percent more groundwater than is reinjected to control groundwater flows in the wellfield will further limit the potential for mining impacts to the river. Details of the groundwater impact analysis are found in Appendix A-1.

Table 3.5-19 Vegetation Cover Sampling Data Summary of Species by Lifeform for the Crested Wheatgrass Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	2.48	4.74
Native Cool Season Grasses	2.16	4.13
Introduced Cool Season Grasses	33.60	64.12
Warm Season Grasses	2.16	4.13
Annual Forbs	6.08	11.60
Perennial Forbs	4.24	8.10
Perennial Shrubs	0.80	1.53
Perennial Sub-Shrubs	0.08	0.15
Succulents	0.24	0.46

Shrub Density

The Crested Wheatgrass community supported an average of 806.48 shrubs per acre or 0.20 shrubs/m^2. The following full and half/sub-shrub species were found: big sagebrush, sticky-leaved rabbitbrush, *Ericameria nauseosa* (rubber rabbitbrush), fringed sagewort, birdsfoot sagewort, winterfat, and granite prickly gilia. Refer to Addendum 3.5-C for a complete Crested Wheatgrass Field density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weeds *Grindelia squarrosa* (curlycup gumweed) and cheatgrass were encountered in the area during sampling.

3.5.5.1.9 Vegetation Survey Discussion

The proposed 19,888.10 acre project area consists of six vegetation communities: Upland Grassland, Big Sagebrush Shrubland, Upland Grassland Rough Breaks Complex, Lowland Grassland, Silver Sagebrush Shrubland and Crested Wheatgrass. Each community was investigated for baseline vegetation information in support of an NRC Materials License amendment application and a Wyoming Non-Coal Mine Permit Application.

No threatened or endangered species were encountered within the project area. Refer to Addendum 3.5-E for a complete report on the Ute Ladies' Tresses' orchid (*Spiranthes diluvialis*) reconnaissance survey. There was the presence of three Converse County

5.12 MITIGATION MEASURES FOR PUBLIC AND OCCUPATIONAL HEALTH IMPACTS

5.12.1 Non-Radiological Impacts

NUREG-1569 requires that applicants provide estimates of concentrations of nonradioactive constituents in effluents at the points of discharge and provide a comparison with natural ambient concentrations and applicable discharge standards. There are two effluents expected from the Ludeman Project.

- A gaseous and airborne effluent will consist of air ventilated from the plant building ventilation system and vented from process vessels and tanks. This gaseous effluent will contain radon gas as previously discussed in Sections 2.4 and 4.6. The gaseous and airborne effluent will not contain any non-radiological effluents. Nonradioactive airborne effluents at the Ludeman Project will be limited to fugitive dust from access roads and wellfield activities. Fugitive dust emissions will be minimal and dust suppressants will be used if conditions warrant their use. Air quality impacts of construction and operation of the Ludeman Project were discussed in detail in Sections 4.1.1 and 4.2.1, respectively.

- The liquid effluent will be managed in the deep disposal wells. The deep disposal wells will permanently dispose of liquid wastes and will be permitted under a Class I UIC Permit issued by the WDEQ. No routine liquid environmental discharges, other than waste disposal via deep well injection, are planned and as such, no definable water related pathways for routine operations exist. There are no non-radiological impacts to public health expected due to the liquid effluents from the Ludeman Project.

Uranium One will develop emergency management procedures to implement the nonradiological risk control recommendations contained in NUREG/CR-6733 analyses. Training programs will be developed to ensure that Uranium One personnel are adequately trained to respond to all potential emergencies. These training programs were discussed in detail in Section 5 of the Technical Report for this License Amendment Application.

5.12.2 Radiological Impacts

5.12.2.1 Radiological Impacts from Routine Operations

As discussed in Section 4.12.2, the maximum Total Effective Dose Equivalent (TEDE) estimated by MILDOS-AREA is 0.8 mrem/yr. to a receptor located at the northwest property boundary. This dose is 0.8 percent of the public annual dose limit from licensed operations of 100 mrem.

The dose estimates developed by MILDOS-AREA are based on the central plant system design, which includes pressurized downflow ion exchange columns to reduce the release of radon-222 to a minimum and the use of vacuum dryers, which have no airborne radioactive emissions. The Uranium One design applies state-of-the-art ISR technology to reduce radiological doses to the public and employees to a minimum.

A separate ventilation system will be installed for the ion exchange vessels or other vessels where radon-222 or process fumes would be expected. The system will consist of an air duct or piping system connected to the top of each of the vessel. The venting system from all tanks and sumps consists of four- to six-inch polyvinyl chloride (PVC) piping and function to vent radon gas to the outside atmosphere. The design of the ventilation system will ensure that the system will be capable of limiting employee exposures with the failure of any single fan. Discharge stacks will be located away from building ventilation intakes to prevent introducing exhausted radon into the facility as recommended in Regulatory Guide 8.31 (USNRC, 2002). Airflow through any openings in the vessels will be from the process area into the vessel and into the ventilation system, controlling any releases that occur inside the vessel. Separate ventilation systems may be used as needed for the functional areas within the plant. Tank ventilation systems of this type have been successfully utilized at other ISR facilities and have proven to be an effective method for minimizing employee exposure.

The work area ventilation systems will be designed to force air to circulate within the Ludeman Project satellite plant facilities. The ventilation system exhausts will be located on the leeward side of the buildings and will exhaust outside the building, drawing fresh air in from the upwind side of the building. During favorable weather conditions, open doorways and convection vents in the roof will provide satisfactory work area ventilation. The design of the ventilation system will be adequate to ensure that radon daughter concentrations in the facility are maintained below 25 percent of the derived air concentration (DAC) from 10 CFR Part 20 as follows:

- For the Ludeman satellite plants, a minimum of two exhaust fans will operate at a minimum rate of 10,000 cubic feet per minute (cfm), at zero inches of water, each. Increased operation of these systems will provide adequate ventilation during unfavorable weather conditions. The system will have a design rate of three air exchanges per hour with a redundant system as a backup of three air exchanges per hour.

Radon effluent monitoring will be conducted in the Satellite Plants as described in Section 6

Other emissions to the air are limited to exhaust and dust from limited vehicular traffic. Impacts from potential emissions from process chemicals that will be used at the plant are described in Section 4.12.1. There are no significant combustion-related emissions from the satellite facility, as commercial electrical power is available at the site.

5.12.3 Air Particulate Effluents

the Ludeman project consists of only ion exchange operations and no yellowcake processing occurs where airborne particles could be present. There is no potential hazard for air particulate effluents at the Ludeman Project site.

No other mitigation measures to control radiological impacts from routine operations have been identified.

5.12.3.1 Radiological Impacts from Accidents

The Ludeman Satellite Plants will be designed in accordance with standard industry building codes and will incorporate containment adequate to contain the contents of the largest tank in the facility at a minimum. The Satellite Plants building structure and concrete curb will contain the liquid spills from the leakage or rupture of a process vessel and will direct any spilled solution to a floor sump. The floor sump system will direct any spilled solutions back into the plant process circuit or to the waste disposal system. Bermed areas, tank containments, and/or double-walled tanks will perform a similar function for any process chemical vessels located outside the central plant building.

All piping from the plant, to and within the wellfield will be buried for frost protection. Pipelines will be constructed of high density polyethylene (HDPE) with butt welded joints, or equivalent. All pipelines will be pressure tested at operating pressures prior to final burial and production flow and following maintenance activities that may affect the integrity of the system.

Each wellfield will have a number of headerhouses where injection and production wells will be continuously monitored for pressure and flow. Individual wells may have high and low flow alarm limits set. All monitored parameters and alarms will be observed in the control room via the computer system. In addition, each wellfield building will have a "wet building" alarm to detect the presence of any liquids in the building sump. High and low flow alarms have been proven effective in detection of significant piping failures (e.g., failed fusion weld). Uranium One will implement a program of continuous wellfield

monitoring by roving wellfield operators and will require periodic inspections of each well that is in service.

Uranium One will prepare spill response procedures, provide spill response equipment and materials, require the use of protective equipment, and will train employees in proper spill response methods.

5.13 MITIGATION MEASURES FOR WASTE MANAGEMENT IMPACTS

This section describes mitigation measures for the waste management impacts from the Ludeman Project. The estimated waste streams and management programs were described in Section 4.13.

5.13.1 Gaseous Effluents-Tank and Process Vessel, and Work Area Ventilation Systems

The radiological effluents of concern at ISR operations include the release or potential release of radon gas (radon-222), radionuclides in liquid process streams, and dried yellowcake.

Section 5.12.2.1 discussed the mitigation measures included in the Uranium One design to control gaseous and airborne impacts.

5.13.2 Air Particulate Effluents

Section 5.12.3 discussed the mitigation measures included in the Uranium One design to control gaseous and airborne impacts.

5.13.3 Liquid Waste

5.13.3.1 Aquifer Restoration

Following mining operations, restoration of the affected aquifer commences which results in the production of wastewater. The current groundwater restoration plan, discussed in detail in Section 6, consists of two activities:

1. Groundwater Sweep; and
2. Groundwater Treatment.

TABLE OF CONTENTS

LIST OF FIGURES

TR replacement pages Copy # 1

1 PROPOSED ACTIVITIES

1.1 LICENSING ACTION REQUESTED

This Technical Report has been prepared in support of an application to the United States Nuclear Regulatory Commission (NRC) for an amendment to Materials License SUA-1341 to develop and operate the Ludeman Project in Converse County, Wyoming. The project will consist of injection/production wellfields, lixiviant make-up circuit, three satellite plants with an ion exchange circuit, six deep injection disposal wells and six surge ponds. Uranium from ion exchange resins at the Ludeman satellite plants will be processed at the Irigaray Central Processing Plant, located in Johnson County.

This application and Technical Report have been prepared using guidelines and standard formats from both state and federal agencies. The Technical Report is presented primarily in the NRC format found in Regulatory Guide 3.46, *"Standard Format and Content of License Applications, Including Environmental Reports, For In Situ Uranium Solution Mining"* (June 1982) and NUREG-1569, *Standard Review Plan for In Situ Leach Uranium Extraction License Applications* (June 2003). The guidance in NUREG-1569 was used to ensure that all necessary information is provided to allow NRC Staff to complete their review and approval of this license application.

1.2 LUDEMAN PROJECT BACKGROUND

The Ludeman Project area was initially identified as a significant uranium prospect in the late 1970s. Multiple parties investigated and evaluated prospects in the vicinity of the Ludeman Project. Teton Exploration Drilling Company, Inc. (TETON) and Nuclear Exploration and Development Company (NEDCO) conducted extensive exploratory drilling and prepared a Mine License Application that was dated for start of ISR operation on September 1, 1981 for the Leuenberger Project. The Leuenberger Project was located in the northwest portion of the proposed Ludeman Project. An extensive exploration and aquifer testing program was conducted by TETON and NEDCO. A pilot production plant was built at the Leuenberger site and production began in January of 1980. The plant operated for approximately one year and was technically successful. However, the economic conditions of the uranium market forced commercial mining plans to be postponed. The pilot plant was decommissioned and groundwater was restored under NRC and Wyoming Department of Environmental Quality (DEQ) guidance.

Uranium Resources, Inc. (URI) completed exploratory drilling and conducted an extensive pumping test of the production zone aquifer systems in the northeast portion of

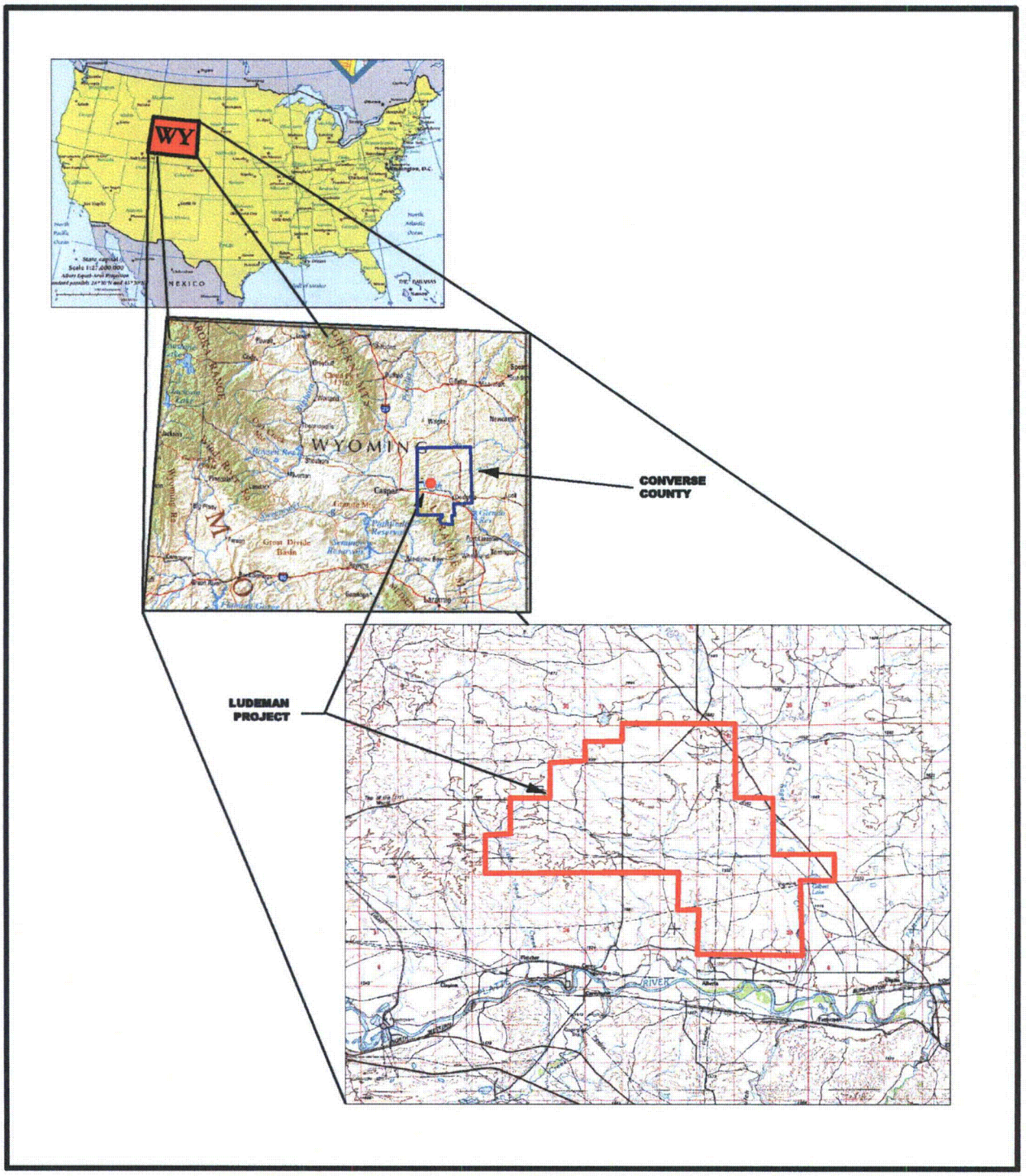
the proposed Ludeman Project during November 1980. URI subsequently prepared a Mine License Application for the proposed site. The URI project was permitted but was never operated as a result of the declining economics for uranium production.

Additionally, Envirosphere was retained by Nuclear Assurance Corporation (NAC) to conduct hydrologic testing and analyses of an ore zone in the southeast portion of the proposed Ludeman Project. Hydrologic testing occurred September 19 through December 5, 1979 at the Peterson Property. No uranium extraction or processing was completed at the Peterson property.

1.3 CORPORATE ENTITIES INVOLVED

This license application and technical report are prepared and submitted by Uranium One USA, Inc., a Delaware corporation. Uranium One USA, Inc. is licensed under materials license SUA-1341 for uranium recovery activities at the Irigaray and Christensen Ranch Uranium Project. The immediate parent company of Uranium One USA, Inc. is Uranium One Americas Inc., a Nevada corporation. The ultimate parent company of Uranium One USA Inc. is Uranium One Inc., a British Columbia, Canada uranium production company with a primary listing on the Toronto Stock Exchange (TSX) and a secondary listing on the Johannesburg Stock Exchange (JSE Limited). Throughout this application and technical report Uranium One USA, Inc. will be referred to as Uranium One.

Figure 1-1 Ludeman Project General Location



1.4 SITE LOCATION AND DESCRIPTION

The Ludeman Project is located in the southern portion of the Powder River Uranium District of Wyoming, within Converse County (Figure 1-1). The proposed Ludeman Project covers approximately 31 sections (19,888 acres) and its location is described as follows:

- T34N R74W – All of Sections 12, 13, 14, 23, 24 and the east half of Section 22.
- T34N R73W – All of sections 3, 4, 5, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 34, 35, the west half of the west half of Section 2, the south half of Section 6, the west half of the west half of Section 11, the south half of Section 24, the west half of Section 25, the west half of the east half of Section 25, the northeast quarter of the northeast quarter of Section 25, the east half of Section 28, the west half of Section 36, and the west half of the east half of Section 36.
- T34N R72W – The southwest quarter of Section 19 and the north half of the northwest quarter of Section 30.
- T33N R73W – The northwest quarter of the northeast quarter of Section 1, the north half of the northwest quarter of Section 1, the north half of the north half of Section 2, and the north half of the north half of Section 3.

The Ludeman Project is located approximately ten miles northeast of Glenrock, Wyoming. State Highway 95 provides access to the Ludeman Project from the Towns of Glenrock and Rolling Hills to the west and State Highway 93 provides access from Douglas to the southeast. Interstate 25 provides access to both of these state highways from the south of the Ludeman Project. The project will consist of wellfields, three satellite facilities and all appropriate appurtenances. Detailed information related to the site location is presented in Section 2.1.

The minerals leased in the Ludeman Project area are primarily on private land with some areas of Federal or State lands. Figure 1-2 shows the surface land ownership and Figure 1-3 shows mineral ownership for the Ludeman Project.

Figure 1-2 Ludeman Surface Land Ownership

Replace this page with Figure 1-2 from original 1/15/2010 application submittal

Figure 1-3 Ludeman Mineral Ownership

Replace this page with Figure 1-3 from original 1/15/2010 application submittal

1.5 OREBODY DESCRIPTION

Uranium ore within the Ludeman Project occurs in typical roll-front deposits. The production zone sands in the Ludeman Project area are the 70, 80 and 90 Sands of the Lebo member of the Paleocene Fort Union formation. Uranium One exploration nomenclature designates the sands in the project area by decreasing numbers with depth. The production sands are classified as arkosic sandstones with calcite and clays as the dominant cementing material. The 70 and 90 Sands are continuous across the planned wellfields. The 80 Sand is not continuous throughout the site due to a pinch out in the middle of the Project. Baseline characterization efforts identified excellent confinement between the 70, 80 and 90 Sands production zones and the overlying and underlying sands throughout the Ludeman Project. The sand thickness is variable and ranges from ten to 125 feet in the 70 Sand, zero to 125 feet in the 80 Sand and 20 to 120 feet in the 90 Sand. However, the ore intercept(s) at any location is a fraction of the total thickness of the host sand and rarely exceeds 20 feet. Though total mineable resources for the Ludeman Project are not fully developed at this time, Uranium One estimates, for the purposes of this License Application and Technical Report, mineable ore resources of on the order of 6.3 million pounds of uranium at an average grade of approximately 0.097 percent are located on the Ludeman Project.

1.6 SOLUTION MINING METHOD AND RECOVERY

The ISR process for uranium recovery consists of an oxidation step and a dissolution step. Water with gaseous oxygen or hydrogen peroxide will be used to oxidize the uranium within the host sandstones. Carbon dioxide and/or bicarbonate will be used for dissolution of the uranium such that it is mobile in water. The lixiviant (carbonate/bicarbonate recovery solution and oxidant) will be injected into the ore bearing sandstone formation through a series of wells that have been drilled, cased, cemented, and tested for mechanical integrity. As the recovery solution and oxidant move through the formation and contact the ore, the uranium will be first oxidized, and then complexed with the carbonate to form a soluble salt that will aid in the dissolution of the uranium. The pregnant lixiviant (uranium-bearing solution) will be drawn to a production well where it will be pumped to the surface and transferred to the ion exchange facilities at the Ludeman site. Following ion exchange, the loaded resin from the satellite plants will be processed at the Irigaray Central Processing Plant. The process will use the following steps to extract uranium from the recovered solutions:

- Loading of uranium complexes onto ion exchange resins (Satellite facilities);
- Reconstitution of the leaching solution by the addition of carbon dioxide and/or carbonate/bicarbonate and oxidant (gaseous oxygen or hydrogen peroxide), which

will be sent back to the wellfields for continued operations (Ludeman Satellite facilities);

- Elution of the uranium complexes from the resin (Irigaray Central Processing Plant);
- Precipitation of uranium complexes from the eluate (Irigaray Central Processing Plant);
- Drying and packaging of the uranium (Irigaray Central Processing Plant).

During the mining process, slightly more water will be produced from the ore-bearing formation than will be injected. This net withdrawal, or "bleed," will produce a cone of depression in the mining area, controlling fluid flow and confining it to the production zone. The mined aquifer will be surrounded both laterally and above and below, as necessary, by monitor wells that are frequently sampled to ensure that all mining fluids are retained within the production zone.

The ISR mining process removes uranium from the ore body. No tailings are generated by the process, thus eliminating a major concern associated with conventional uranium mining. When installing an ISR wellfield, only limited surface disturbance occurs. During the operating life of the wellfield, vegetation will be re-established over the wellfields and pipeline corridors to prevent erosion and buildup of undesirable weeds.

1.6.1 Advantages of ISR Uranium Mining

ISR uranium mining is a proven technology that has been successfully demonstrated commercially in Wyoming, Texas, and Nebraska and in other countries throughout the world. Where feasible, based on site conditions, ISR mining of uranium is environmentally superior to conventional open pit and underground uranium mining as evidenced by the following:

1. ISR mining results in significantly less surface disturbance than conventional mines as mine pits, waste dumps, haul roads, and tailings ponds are not needed;
2. ISR mining requires much less water demand than conventional mining and milling, avoiding the water usage associated with pit dewatering, conventional milling, and tailings transport;
3. The lack of heavy equipment, haul roads, waste dumps, etc. results in very little air quality degradation at ISR mines;

4. Fewer employees are needed at ISR mines, thereby reducing transportation and socioeconomic concerns;

5. Aquifers are not excavated, but remain intact during and after ISR mining;

6. Tailings ponds are not used, thereby eliminating a major groundwater pollution concern. State of the art deep injection wells and/or lined evaporation ponds may be used to manage liquid waste streams; and

7. ISR uranium mining results in leaving the majority of other contaminants (e.g., heavy metals) where they naturally occur instead of moving them to waste dumps and tailings ponds where their presence is of more environmental concern.

1.6.2 Ore Amenability to the ISR Mining Method

Amenability of the uranium deposits at the Ludeman Project area to ISR mining has been demonstrated through both the Leuenberger and North Platte Pilot Projects performed on the site of the Ludeman Project and by nearby existing commercial projects in Wyoming's Powder River Basin (Smith Ranch/Highland Project and Christensen Ranch/Irigaray Projects) that are similar in geology and chemistry to the conditions at the Ludeman site. These projects demonstrate that *in situ* recovery methods can efficiently mine and restore roll front uranium deposits in a cost effective manner with minimal environmental impacts and with no significant risk to the public health or safety.

1.7 OPERATING PLANS, DESIGN THROUGHPUT, AND PRODUCTION

The uranium extracted from the Ludeman Project will be loaded onto ion exchange resin at the three Ludeman satellite facilities. Loaded ion exchange resin from the satellite facilities will then be transported to the Irigaray Central Processing Plant for elution, precipitation, drying and packaging of uranium. Barren resin will be returned back to the appropriate portion of the ion exchange circuit in the Ludeman satellite facilities.

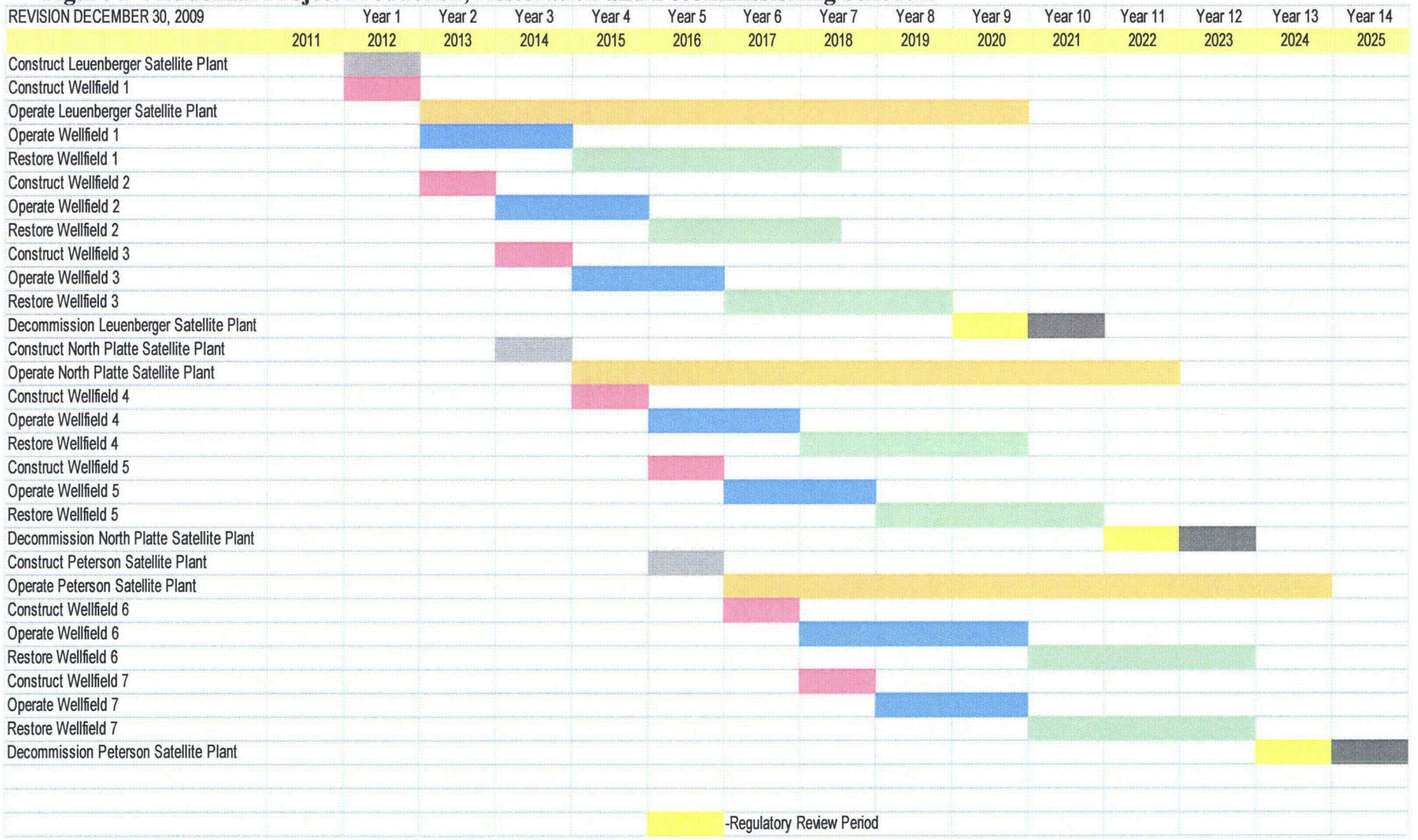
1.8 OPERATING SCHEDULES

1.8.1 Ludeman Construction, Operation, and Restoration Schedule

Following NRC approval of the amendment of Materials License SUA-1341, construction of the first wellfield and ancillary satellite are planned to begin in the first quarter of 2012. Completion of the first satellite plant, wellfield and deep disposal well is expected to be completed in the first quarter of 2013 and startup of operations will commence. Construction of subsequent wellfields will follow, approximately one every year. It is anticipated that there will be a seamless transition from production to restoration of wellfields and that depleted wellfields will be inactive for less than 30 days, unless immediately adjacent to another wellfield in which case restoration could pull mining solutions into the area of restoration. Development of the three satellite facilities and associated wellfields will begin in sequential order.

Additional wellfield plans will be developed approximately one year prior to the planned commencement of new mining operations in that wellfield. The layout of the planned wellfields and satellite is shown in Figure 2.1-1 in Section 2.1. It is currently anticipated that ISR operations and wellfield restoration will continue for approximately twelve years. At this point, decommissioning of wellfields including well abandonment, piping and equipment removal, wellfield building removal, surface scanning and reclamation will commence. Projected production and restoration schedules for the Ludeman Project are shown in Figure 1-4.

Figure 1-4 Ludeman Project Production, Restoration and Decommissioning Schedule



1.9 WASTE MANAGEMENT AND DISPOSAL

1.9.1 Liquid Waste

Wastewater disposal for the Ludeman Project will be done through deep well injection. Deep injection is utilized by ISR operations as the primary tool for waste disposal and has been utilized by ISR facilities throughout the Powder River Basin. The deep injection well(s) will be permitted in accordance the WDEQ-WQD Class I or Class V UIC rules and regulations. Surge ponds will be designed and constructed for use as an alternate storage option for cases when the deep injection well(s) is temporarily unavailable, work over, or annual testing.

The operation of the process facility results in three sources of water that are collected on the site. They include the following:

- **Liquid process waste** - The operation of the ion exchange facilities results in liquid waste from the production bleed (ion exchange cycles). This water will be injected into the deep disposal well(s).

- **Aquifer restoration** - Following mining operations, restoration of the affected aquifer commences which results in the production of wastewater. The restoration waste is primarily from the first phase of aquifer restoration, groundwater sweep. The second source is brine from the reverse osmosis units. The permeate is either re-injected into the wellfields or used in the process. Wastewater from both groundwater sweep and the reverse osmosis phases of restoration are injected into the deep disposal well(s).

- **Water collected from wellfield releases** - This water is injection lixiviant or recovery fluids recovered from areas where a liquid release has occurred from a well or pipeline. These occurrences are very infrequent and typically contain small volumes for disposal. The water will be placed into the wastewater disposal systems for deep well injection.

Domestic liquid waste will be disposed of in on-site wastewater treatment (i.e. septic) systems properly permitted by Converse County.

Sources and methods of handling liquid wastes are discussed in more detail in Section 4.0.

1.9.2 Non Contaminated Solid Waste

Solid wastes generated consist of spent resin, resin fines, filters, miscellaneous pipe and fittings, and domestic waste. These wastes will be classified as either contaminated or non-contaminated waste according to radiological survey results.

Non-contaminated solid waste will be collected on site on a regular basis and disposed of in a sanitary landfill permitted by the WDEQ.

1.9.3 Contaminated Solid Waste and Equipment

Contaminated 11e.(2) byproduct waste that cannot be decontaminated will be packaged and stored until it can be shipped to a licensed waste disposal site or licensed mill tailings facility.

Materials and equipment that become contaminated as a result of normal operations are decontaminated if possible and disposed of by conventional methods. Equipment and materials that cannot be decontaminated are treated in the same manner as other contaminated 11e.(2) byproduct material.

1.10 GROUNDWATER RESTORATION

Groundwater restoration activities will be carried out at the Ludeman Project upon completion of mining in a given wellfield and concurrent with mining activities in other wellfields. The restoration process may consist of the following activities:

- **Groundwater sweep**- water is pumped from the wellfields with no reinjection, which results in an influx of native groundwater from outside the wellfields.
- **Groundwater treatment**- water from wells is pumped to the restoration plant where ion exchange, reverse osmosis, filtration or other treatment methods take place.
- **Reductant**- Chemical or biological agents may be added to the injection stream to increase microbial activity to promote reduced conditions.

As described in more detail in Section 6.1, it may not be necessary to use all of the phases described above to meet restoration goals. Following restoration, a groundwater stabilization monitoring program will be initiated. Once the restoration target values are reached and maintained, restoration will be deemed complete. Results will be

documented in a restoration report and submitted to the WDEQ and the NRC for approval. Groundwater restoration is described in more detail in Section 6.

1.11 DECOMMISSIONING AND RECLAMATION

Surface and subsurface facilities in individual wellfields will be decommissioned following the completion and agency acceptance of groundwater restoration. Individual wellfield decommissioning will include the plugging and abandonment of all injection and production wells and the removal of wellfield piping and structures that are no longer required for operation of the mine.

At the completion of mine life and after groundwater restoration has been completed, the entire site will be fully decommissioned. Decommissioning will include the removal of remaining wellfield piping and equipment, demolition and disposal of contaminated buildings and structures, and reclamation of all disturbed areas. Appropriate NRC and WDEQ guidance will be followed during decommissioning as required. Decommissioning and reclamation are discussed in more detail in Section 6.

1.12 SURETY ARRANGEMENTS

Uranium One will have in place a financial surety arrangement consistent with 10 CFR 40, Appendix A, Criterion 9 prior to the construction and startup of operations to cover the estimated costs of reclamation activities during the first year of operations. The surety amount will be revised annually to reflect the estimated costs of reclamation activities for the Ludeman Project as development activities proceed. The state of Wyoming will hold the surety for the Ludeman Project. The estimated reclamation costs and surety arrangements are discussed in more detail in Section 6.

2.2.3.2.1 Ground Water Quantity

According to the Wyoming State Engineers Office, there are 415 well permits located within two miles of the Ludeman Project boundary as of November, 2008. Most of the groundwater pumped from active wells buffered within two miles of the Ludeman Project boundary is used either for stock or monitoring. Groundwater rights within the Ludeman Project are presented in Section 2.7 Addendum A.

Figure 2.2-9 shows the locations of the water wells in the Ludeman Project and within two miles of Project boundary. The WSEO has record of more wells than are shown on the map, as the well data is provided on a quarter-quarter basis and several wells may occur within a given quarter-quarter of a section. The list of wells on the map are identified in Addendum 2.2-A, Tables 2.2-8, 2.2-9 and 2.2-10. Table 2.2-10 has the WSEO-listed wells which are shown on Figure 2.2-9 at the estimated positions from legal descriptions describing quarter-quarter sections. Within two miles of the Ludeman Project, 67 domestic and 52 domestic/stock water wells exist, ranging from five to 360 feet in depth. Although the one residence within the Ludeman Project is known to have a domestic well, and that well was sampled as part of baseline environmental evaluations for this License Amendment Application, no information was found regarding the well, from the WSEO or other sources.

- On a regional scale, the 70, 80 and 90 Sands have been adequately characterized with respect to hydrogeologic conditions within the test area at the Ludeman Project;

- Adequate confinement exists between the 70, 80 and 90 Sands production zones and the overlying and underlying sands throughout the Ludeman Project area;

- Adequate hydrostratigraphic confinement exists between the 70, 80 and 90 Sand production zones and the underlying 60 Sand throughout the proposed wellfields. Mine-unit scale testing will demonstrate the validity of the recommended approach(s) for mining and monitoring; and,

- Sufficient testing has been conducted to date at the Ludeman Project to proceed with a WDEQ-LQD Permit to Mine application and a NRC license amendment application.

Possible Effect of ISR Mining on North Platte River

Due to the distance of the Ludeman Project area from the North Platte River (greater than one mile to the closest mineable ore body in Section 35, T34N, R73W), a regional north-northeast structural dip away from the river, a general low-angle stratigraphic dip of the production zone sands toward the north away from the river, and general groundwater flow of the production zone sands toward the east and southeast, there does not appear to be potential mining impacts on the North Platte. Additionally, the ISR mining procedures that will result in removal of approximately one percent more groundwater than is reinjected to control groundwater flows in the wellfield will further limit the potential for mining impacts to the river. Details of the groundwater impact analysis are found in Appendix A-1.

Table 2.8-19 Vegetation Cover Sampling Data Summary of Species by Lifeform for the Crested Wheatgrass Community

	Vegetation Cover	
	Absolute (percent)	Relative (percent)
Annual Grasses	2.48	4.74
Native Cool Season Grasses	2.16	4.13
Introduced Cool Season Grasses	33.60	64.12
Warm Season Grasses	2.16	4.13
Annual Forbs	6.08	11.60
Perennial Forbs	4.24	8.10
Perennial Shrubs	0.80	1.53
Perennial Sub-Shrubs	0.08	0.15
Succulents	0.24	0.46

Shrub Density

The Crested Wheatgrass community supported an average of 806.48 shrubs per acre or 0.20 shrubs/m^2. The following full and half/sub-shrub species were found: big sagebrush, sticky-leaved rabbitbrush, *Ericameria nauseosa* (rubber rabbitbrush), fringed sagewort, birdsfoot sagewort, winterfat, and granite prickly gilia. Refer to Addendum 2.8-C for a complete Crested Wheatgrass density summary.

Other Data

There were no federally listed threatened or endangered species found during sampling. The Converse County designated noxious weeds *Grindelia squarrosa* (curlycup gumweed) and cheatgrass were encountered in the area during sampling.

2.8.5.1.9 Vegetation Survey Discussion

The proposed 19,888.10 acre project area consists of six vegetation communities: Upland Grassland, Big Sagebrush Shrubland, Upland Grassland Rough Breaks Complex, Lowland Grassland, Silver Sagebrush Shrubland and Crested Wheatgrass. Each community was investigated for baseline vegetation information in support of an NRC License Amendment Application and a Wyoming Non-Coal Mine Permit Application.

No threatened or endangered species were encountered within the project area. Refer to Addendum 2.8-E for a complete report on the Ute Ladies' Tresses' orchid (*Spiranthes diluvialis*) reconnaissance survey. There was the presence of three Converse County

3.1.5.4 Resin Transfer and Elution

Once the ion exchange resin in an ion exchange column is loaded to capacity with uranium complexes, the column will be taken out of service. The resin loaded with uranium will be transferred from one of the Ludeman satellite facilities to the Irigaray Central Processing Plant via tanker truck. Once the resin has been stripped of the uranium by the process of elution, the resin will be returned to the Ludeman satellite for reuse in the ion exchange circuit. In the elution circuit the loaded resin will be stripped of uranium by a process based on the following chemical reaction:

$$R_2UO_2(CO_3)_2 + 2Cl^- + CO_3^{-2} \longrightarrow 2\,RCl + UO_2(CO_3)_3^{-2}$$

After the uranium has been stripped from the resin, the resin may be rinsed with a sodium bicarbonate solution. This rinse removes the high chloride eluant physically entrained in the resin and partially converts the resin to bicarbonate form. In this way, chloride ion buildup in the lixiviant can be controlled.

3.1.6 Proposed Operating Schedule

The proposed Ludeman Project mine schedule is shown in Figure 3-9. The mine schedule is preliminary based on Uranium One's current knowledge of the area and potential for future wellfield development. The schedule shows potential development of seven wellfields, with three satellite ion exchange facilities in the eastern, central and western portions of the site. The three satellite facilities will be constructed and operated in a staggered fashion starting in approximately 2012, as shown on Figure 3-9. As shown on Figure 3-1, the northern portion of the project area contains significant areas of potential mineralization which will be further delineated with the potential for definition of additional wellfield areas. As development of these potential wellfield areas progress, the mine schedule, and schedule for use of the individual satellite facilities will be updated accordingly.

3.2 LUDEMAN PROJECT CHEMICAL STORAGE FACILITIES; EQUIPMENT USED AND MATERIAL PROCESSED

The uranium recovery process described in the preceding section will be accomplished in several steps. Uranium recovery from the solution by ion exchange will be performed at the Ludeman satellite. Processing of the loaded ion exchange resin to remove the uranium (elution), the precipitation of uranium, and the dewatering and packaging of solid uranium (yellowcake) will be performed at the Irigaray Central Processing Plant.

3.2.1 Flow and Material Balance – Ion Exchange

The uranium-bearing solution or pregnant lixiviant pumped from the wellfield is piped to one of the Ludeman Project satellite plants for extraction of the uranium by use of ion exchange units. The ion exchange system consists of six fixed-bed ion exchange vessels. The ion exchange vessels will be operated as three sets of two vessels in series. The ion exchange system is designed to process recovered solution at a rate of 3,000 gpm with each vessel sized for 500 cubic feet of resin operated in a pressurized downflow mode. As the solution passes through the ion exchange resin in the vessels the uranyl dicarbonate and uranyl tricarbonate are preferentially removed from the solution. The barren solutions leaving the ion exchange units normally contain less than two mg/l of uranium.

After the barren lixiviant leaves the ion exchange vessels, carbon dioxide and/or carbonate/bicarbonate is added, if necessary, to return the lixiviant concentration to the desired operating level. The solution is then pumped to the wellfield, with the oxidant (O_2 gas) added at the wellfield header houses before the solution is re-injected into the production zone.

Loaded resin from the satellite plants will be transported to the Irigaray Central Processing Plant via tanker truck. A pressurized transfer system will be used to transfer resin from the truck to the plant.

3.2.1.1 Facility Areas Where Fumes or Gases May Be Generated

A description of the areas in the proposed satellite facility where radiological gases or air particulate could be generated is presented in Section 5.7. Those areas are shown on Figure 5-2 (Section 5) as monitoring locations.

The potential sources of non-radiological fumes or gases are minimal within each satellite facility since the mining solutions contained in the process equipment are maintained under a positive pressure.

5.2.4 Performance-Based License Condition

NRC Materials License SUA-1341 is a Performance-Based License (PBL). Under the PBL Condition, Uranium One is allowed, without prior NRC approval or the need to obtain a License Amendment, to:

1. Make changes to the facility or process, as presented in the license application (as updated);

2. Make changes in the procedures presented in the license application (as updated); and

3. Conduct tests or experiments not presented in the license application (as updated).

A License Amendment and/or NRC approval will be necessary prior to implementing a proposed change, test or experiment, if the change, test or experiment would:

1. Result in any appreciable increase in the frequency of occurrence of an accident previously evaluated in the license application (as updated);

2. Result in any appreciable increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the license application (as updated);

3. Result in any appreciable increase in the consequences of an accident previously evaluated in the license application (as updated);

4. Result in any appreciable increase in the consequences of a malfunction of an SSC previously evaluated in the license application (as updated);

5. Create a possibility for an accident of a different type than any previously evaluated in the license application (as updated);

6. Create a possibility for a malfunction of an SSC with a different result than previously evaluated in the license application (as updated);

7. Result in a departure from the method of evaluation described in the license application (as updated) used in establishing the final safety evaluation report (SER) or the environmental assessment (EA) or technical evaluation reports (TERs) or other analysis and evaluations for license amendments; and

- The technical evaluation of the proposed action including all aspects of the SERP review procedures listed above;
- Conclusions and recommendations;
- Signatory approvals of the SERP members; and
- Any attachments such as all applicable technical, environmental, or safety evaluations, reports, or other relevant information including consultant reports.

All SERP reports and associated records of any changes made pursuant to the PBL will be maintained through termination of the NRC license.

On an annual basis, Uranium One will submit a report to the NRC that describes all changes, tests, or experiments made pursuant to the PBL. The report will include a summary of the SERP evaluation of each change. In addition, Uranium One will annually submit replacement pages of the License Amendment Application or supplementary information. Each replacement page will include both a change indicator for the area of change, (e.g., bold marking vertically in the margin adjacent to the portion actually change), and a page change identification, (date of change or change number, or both).

5.3 MANAGEMENT AUDIT AND INSPECTION PROGRAM

The following internal inspections, audits and reports will be performed for Ludeman Project operations.

5.3.1 Radiation Safety Inspections

5.3.1.1 Daily Inspections

The RSO, RST, or a qualified designee, will conduct a daily walkthrough inspection of the plant areas. Generally, the RST will perform the daily walkthrough inspection when they are on shift. A qualified designee (e.g., the plant operator) may be trained to perform the daily walkthrough inspections on the weekends. Qualified designees will receive specific training for conducting daily inspections from the RSO. This training will include specific procedural requirements contained in Standard Operating Procedures and related documentation of inspections. Any significant radiological hazards noted during these inspections will be reported immediately to the RSO. Training will be documented in the individual's training records and available for inspection by NRC. The inspection will entail a visual examination of compliance or other problems, which will reviewed with the Satellite Operations Manager.

machinery at the plant site is 85dB at 50 feet, the sound pressure level attained at the property boundary will be below the level identified by the USEPA as suitable for outdoor areas where human activity takes place (approximately 55 dB[1]). A level of 85 dB is the OSHA threshold at which a hearing conservation program at the plant would be required. Experience at operating ISR facilities verifies that this assumption is conservative and that the average sound pressure levels during construction will be less than 85 dB. After appropriate engineered controls (i.e. the protective enclosure for the equipment) are installed, noise levels will not impact the residences, and are unlikely to approach the levels attained by State Highway 95. Therefore, impact to noise or congestion above ambient background noise within the Project area or in the surrounding two-mile area is not anticipated. Additionally, given the maximum increase in population due to migrant workers is insignificant, noise and congestion impacts are not anticipated in Glenrock or other neighboring counties.

As a result of the remote location of the project and the low population density of the surrounding area, impact to noise or congestion within the project area or in the surrounding two-mile area are not anticipated. Additionally, given the maximum increase in population due to migrant workers is insignificant, noise and congestion impacts are not anticipated in Campbell or other neighboring counties.

7.2.9 Cumulative Impacts of Other Uranium Development Projects

The Powder River Basin has been historically developed for the recovery of uranium using ISR and conventional (underground and pit) mining. The only existing licensed uranium projects currently located in the Powder River Basin are the Smith Ranch/Highland Uranium Project (operated by Power Resources, Inc.) and the Irigaray/Christensen Ranch Project operated by Uranium One USA.. These ISR projects are located approximately ten miles north-northeast and 70 miles north-northwest of the Ludeman Project, respectively. Considering the distance between the existing projects and the proposed Ludeman Project, cumulative environmental impacts are not expected.

Uranium One is aware that several companies are actively investigating the potential for ISR mining in areas near the Ludeman Project. These projects are in various stages of development. Licensing and permitting applications have not been submitted to the regulatory agencies at the time of this application. As such, it is not possible for Uranium One to accurately predict the cumulative environmental impacts should these uranium projects seek and ultimately gain regulatory approval and be developed.

7.3 RADIOLOGICAL EFFECTS

Uranium One is proposing to develop a uranium in-situ recovery facility (facility) with a production and restoration flow of approximately 9,000 and 3,000 gallons per minute

(gpm) respectively (ie, 3,000 and 1,000 per satellite.) An assessment of the radiological effects from the facility must consider the types of emissions, the potential pathways present, and an evaluation of potential consequences of radiological emissions.

The facility will use fixed bed pressurized down flow ion exchange columns to separate uranium from the pregnant production fluid and to treat restoration solutions. The uranium contained in the loaded resin from the ion exchange columns will be precipitated and subsequently vacuum dried off site.

In addition to ion exchange treatment, the groundwater restoration process will also use reverse osmosis to remove the dissolved solids. Liquid waste disposal will be via a direct deep well injection. Each satellite facility will be accompanied by surge ponds to be utilized during maintenance or when disposal wells are temporarily inoperable.

The Ludeman project will consist of three satellite facilities with processing flow rates of 3,000 gpm each and 1,000 gpm each restoration capacity. Each satellite facility will generate uranium loaded ion exchange resin. An average of 1 resin transfer per day at each satellite facility is anticipated.

Since the drying and packaging operation will be conducted off-site, the only expected routine emission at the facility will be radon-222 gas. Radon-222, a decay product of radium-226, is dissolved in the lixiviant as it travels through the ore to a production well where it is brought to the surface. The concentration of radon-222 in the production solution and estimated releases are calculated using the methods found in USNRC Regulatory Guide 3.59, "Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Milling Operations" (NRC, 1987). The details of and assumptions used in these calculations are found in Section 7.3.3.

MILDOS-AREA is used to model radiological impacts on human and environmental receptors (e.g. air and soil) using site-specific radon-222 release estimates, meteorological and population data, and other parameters. The estimated radiological impacts resulting from routine site activities will be compared to applicable public dose limits as well as naturally occurring background levels.

7.3.1 Exposure Pathways

Figure 7.3-1 presents exposure pathways from all potential sources at the facility. The predominant pathways for planned and unplanned releases are identified. As mentioned earlier, atmospheric radon-222 is expected to be the predominant pathway for impacts on human and environmental media. Impacts of radon-222 releases can be expected in all quadrants surrounding the facility, the magnitude of which is driven predominantly by wind direction and atmospheric stability. As a noble gas, radon-222 itself has very little

radiological impact on human health or the environment. Radon-222 has a relatively short half-life (3.2 days) and its decay products are short lived, alpha emitting, nongaseous radionuclides. These decay products have the potential for radiological impacts to human health and the environment. As Figure 7.3-1 shows, all exposure pathways, with the possible exception of absorption, can be important depending on the environmental media impacted. All of the pathways related to air emissions of radon-222 are evaluated by MILDOS-AREA. MILDOS-AREA modeling output is in contained in Appendix C.

8 ALTERNATIVES TO PROPOSED ACTION

8.1 NO-ACTION ALTERNATIVE

Under the provisions of the National Environmental Policy Act (NEPA), one alternative that must be considered in each environmental review is the no-action alternative. In this case, the no-action alternative would mean that the NRC would not approve the Ludeman Project amendment application and would not amend SUA-1341. ISR uranium mining would not occur at the Ludeman Project and the associated environmental impacts would not occur.

8.1.1 Impacts of the No-Action Alternative

The no-action alternative would result in significant financial impacts to Uranium One and to Converse County, Wyoming and the surrounding area. Uranium One has invested significant resources to develop the Ludeman Project that would be irretrievably lost under the no-action alternative. In addition, the no action alternative would adversely affect the economic growth of Converse, Natrona and Campbell Counties. As discussed in further detail in Section 9, the Ludeman Project is expected to provide a significant economic impact to the local economy.

A decision to not amend Materials License SUA-1341or issue a WDEQ-LQD Mine Permit to Uranium One would leave a large resource unavailable for energy production supplies. Uranium One is continuing to develop estimates of the reserves at the Ludeman Project satellite site. The current estimated resource is 6.3 million pounds U_3O_8.

In 2008, total domestic U.S. uranium production was approximately 7.7 million pounds U_3O_8 (Energy Information Administration). During the same year, domestic U.S. uranium consumption was approximately 53 million pounds U_3O_8 (Energy Information Administration). The Ludeman Project represents an important new source of domestic uranium supplies that are essential to provide a continuing source of fuel to power generation facilities.

In addition to leaving a large deposit of valuable mineral resources untapped, a denial of this license amendment application would result in adverse economic affects on the individuals that have surface leases with Uranium One and own the mineral rights in the Ludeman Project.

based lixiviant has not been developed in the United States and EMC determined an acid-based lixiviant was not a suitable alternative for the Ludeman project.

Ammonia-based Lixiviants

Ammonia-based lixiviants have been used in the United States, including in Texas and Wyoming. The ammonia tended to adsorb onto clay minerals in the subsurface. The ammonia desorbs slowly from the clay during restoration, and therefore the aquifer requires that a much larger amount of groundwater be removed and processed during aquifer restoration (Mudd, 2000). In addition, concerns arose in the early 1980s over the potential post mining oxidation of ammonia in the groundwater to form nitrate and nitrite species. This potential difficulty in addition to the slow desorbtion of ammonia from clays resulted in a movement away from ammonia based lixiviants and an outright ban on their use in Texas. Due to this additional consumptive use of groundwater to meet groundwater restoration requirements, Uranium One determined that an ammonia-based lixiviant was not a suitable alternative for the Ludeman Project.

Other Lixiviants

Other lixiviants which have been evaluated in laboratory scale and limited field tests include potassium based lixiviants, a range of oxidants including air, iodine, potassium permanganate, and a variety of trace additives such as clay stabilizing agents to increase the selective oxidation and mobilization of uranium minerals. To date, these alternatives have consistently proven to be far less economical than the planned oxygen – sodium bicarbonate system.

8.3.1.2 Groundwater Restoration

The success of the groundwater restoration techniques proposed by Uranium One has been shown at other ISR mining operations in Wyoming. Groundwater sweep, permeate/reductant injection and groundwater treatment have successful restored the groundwater to pre-mining quality. No feasible alternative to the groundwater restoration method is currently available. The NRC and the WDEQ consider the method currently employed as the Best Practicable Technology (BPT) available.

8.3.1.3 Waste Management

Liquid wastes generated from production and restoration activities are generally managed at ISR facilities by solar evaporation ponds, deep well injection, and/or land application. The use of deep waste disposal well(s) is considered by Uranium One to be the best alternative to dispose of these types of wastes. The Ludeman Project deep injection well(s) will isolate liquid wastes generated by the project from any underground source

10 ENVIRONMENTAL APPROVALS AND CONSULTATIONS

Various permits and approvals from numerous Federal and State agencies will be required for the Ludeman Project to operate. Section 10.1 identifies the issuing agencies, a description of the type of permit(s), license or approvals needed, and the current status of securing these approvals.

10.1 APPLICABLE REGULATORY REQUIREMENTS, PERMITS, AND REQUIRED CONSULTATIONS

As stated above, Table 10-1 lists the necessary environmental approvals from Federal and State Agencies required for the Ludeman Project. The NRC licensing process for amendment of a source materials license represents the longest lead-time approval; therefore, the majority of the remaining approvals are in progress or will be initiated with in the next year. All necessary approvals must be secured prior to commencement of commercial production at the site.

Table 10-1: Environmental Approvals for the Ludeman Project

Issuing Agency	Description	Status
Wyoming Department of Environmental Quality 122 West 25th St Herschler Building Cheyenne, Wyoming 82001	Underground Injection Control Class III Permit (WDEQ Title 35-11)	Permit to mine application under preparation; expected submittal to WDEQ in the first quarter 2010
	Aquifer Exemption (WDEQ Title 35-11)	Aquifer exemption application under preparation; expected submittal to WDEQ in first quarter of 2011
	Underground Injection Control Permit (Deep Disposal Well) (WDEQ Title 35-11)	Class I UIC Permit application under preparation; expected submittal to WDEQ in third quarter 2010
	Industrial Stormwater NPDES Permit (WDEQ Title 35-11)	An Industrial Stormwater NPDES will be required for the satellite facilities. Expected submittal third quarter 2010
	Construction Stormwater NPDES Permit (WDEQ Title 35-11)	Construction Stormwater NPDES authorizations are applied for and issued annually under a general permit based on projected construction activities. The Notice of Intent will be filed at least 30 days before construction activities begin in accordance with WDEQ requirements.

Issuing Agency	Description	Status
	Mineral Exploration Permit (WDEQ Title 35-11)	Approved Mineral Exploration Permit 353DN is currently in place for the Ludeman areas.
	Underground Injection Control Class V (WDEQ Title 35-11)	The Class V UIC permit will be applied for following installation of an approved site septic system during facility construction.
U.S. Nuclear Regulatory Commission Washington, DC 20555	Amendment of Materials License SUA-1341 (10 CFR 40)	Application Submitted herein
U.S. Environmental Protection Agency 1200 Pennsylvania Ave, NW, Washington, DC 20460	Aquifer Exemption (40 CFR 144, 146)	Aquifer exemption application forwarded to EPA following WDEQ action.
U.S. Department of Interior, Bureau of Land Management 2987 Prospector Drive Casper, WY 826040	Notice of Intent to Explore (43 CFR 3809)	Notice of Intent to Explore will be submitted as needed for exploration drilling activities on BLM surface

10.2 ENVIRONMENTAL CONSULTATION

During the course of the preparation of this license application, consultations were conducted with several agencies:

Ecological Resources

Preparation of the ecological resources discussion (Section 2) required consultations with the following individuals and agencies:

Wetlands

Mathew A. Bilodeau
Paige Wolken
United States Army Corps of Engineers
2232 Dell Range Blvd, Suite 210
Cheyenne, WY 82009-4942

Soils

Tim Schroeder, District Conservationist
Douglas NRCS
1954 E. Richards, #10
Douglas, WY 82633

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Ludeman Project
Converse County, Wyoming

Environmental Report
Volume I Section 1 Through Section 3.3

February 2010

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Environmental Report
Volume II Section 3.4 Through Section 3.12

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Volume III Section 4 Through Section 10 February 2010

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Environmental Report
Volume IV Appendix A through Appendix E February 2010

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Technical Report
Volume I Section 1 Through Section 2.5

February 2010

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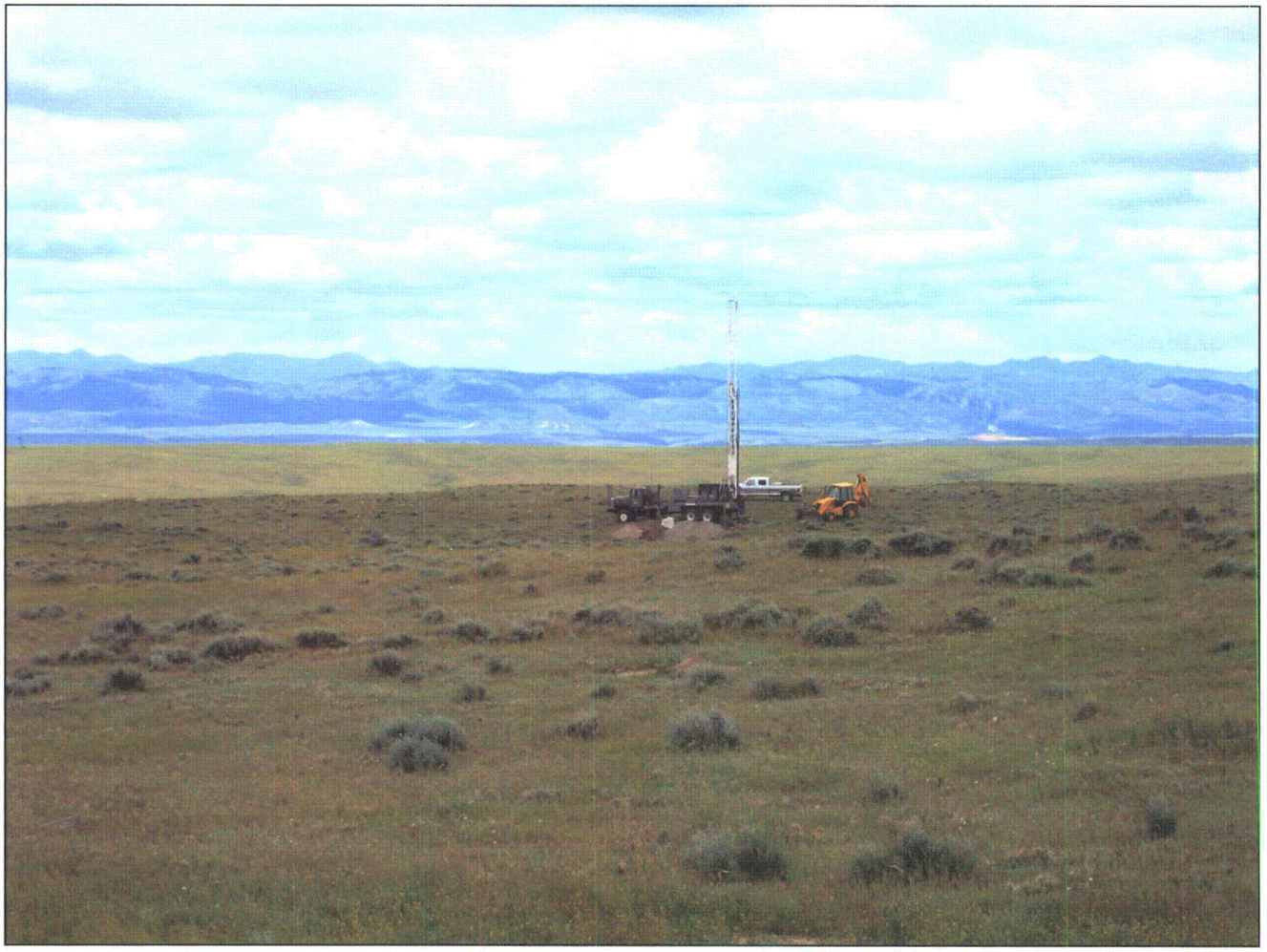
Technical Report
Volume II Section 2.6

February 2010



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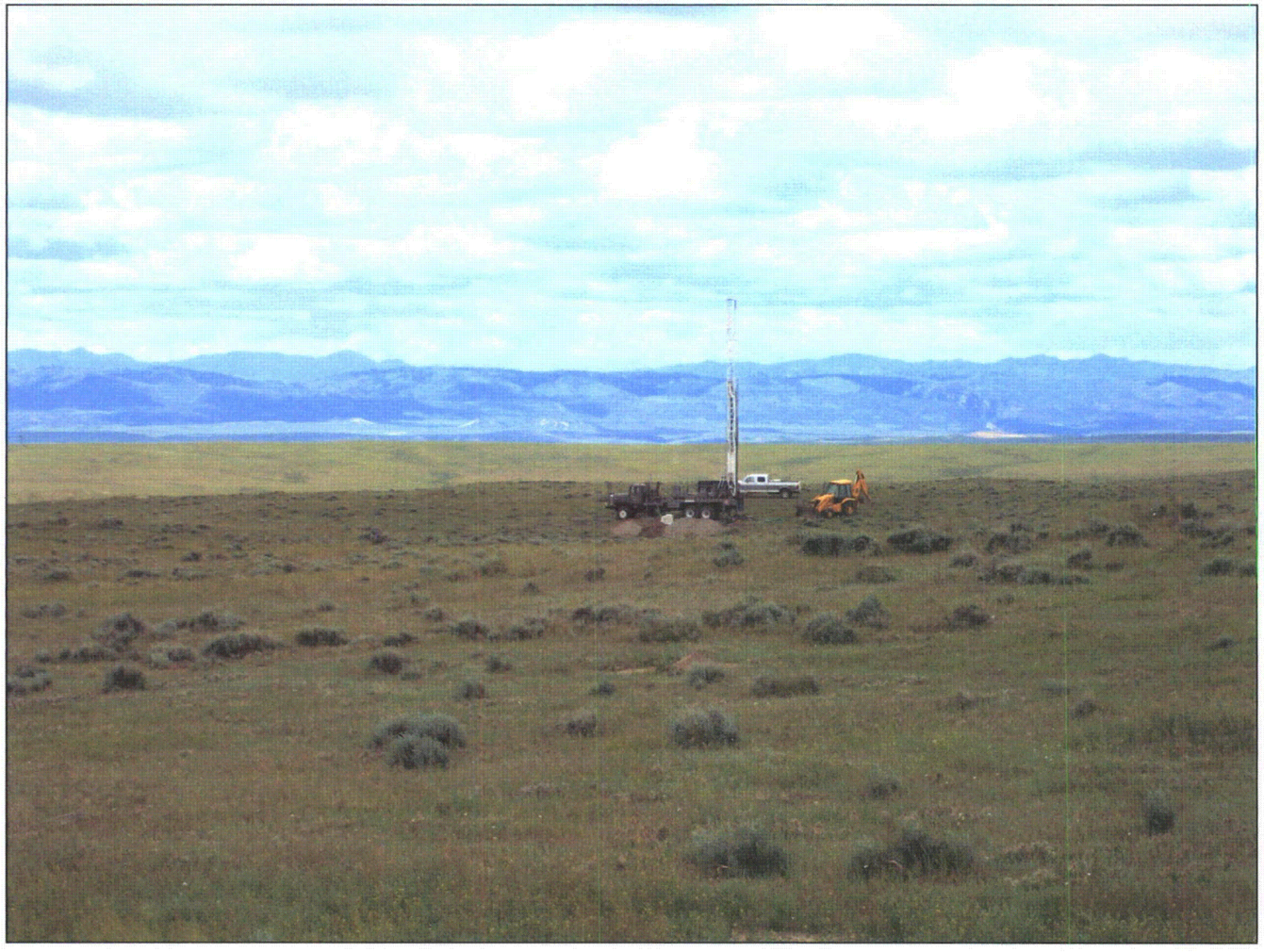
Technical Report
Volume III Section 2.7 Through Section 2.9 February 2010



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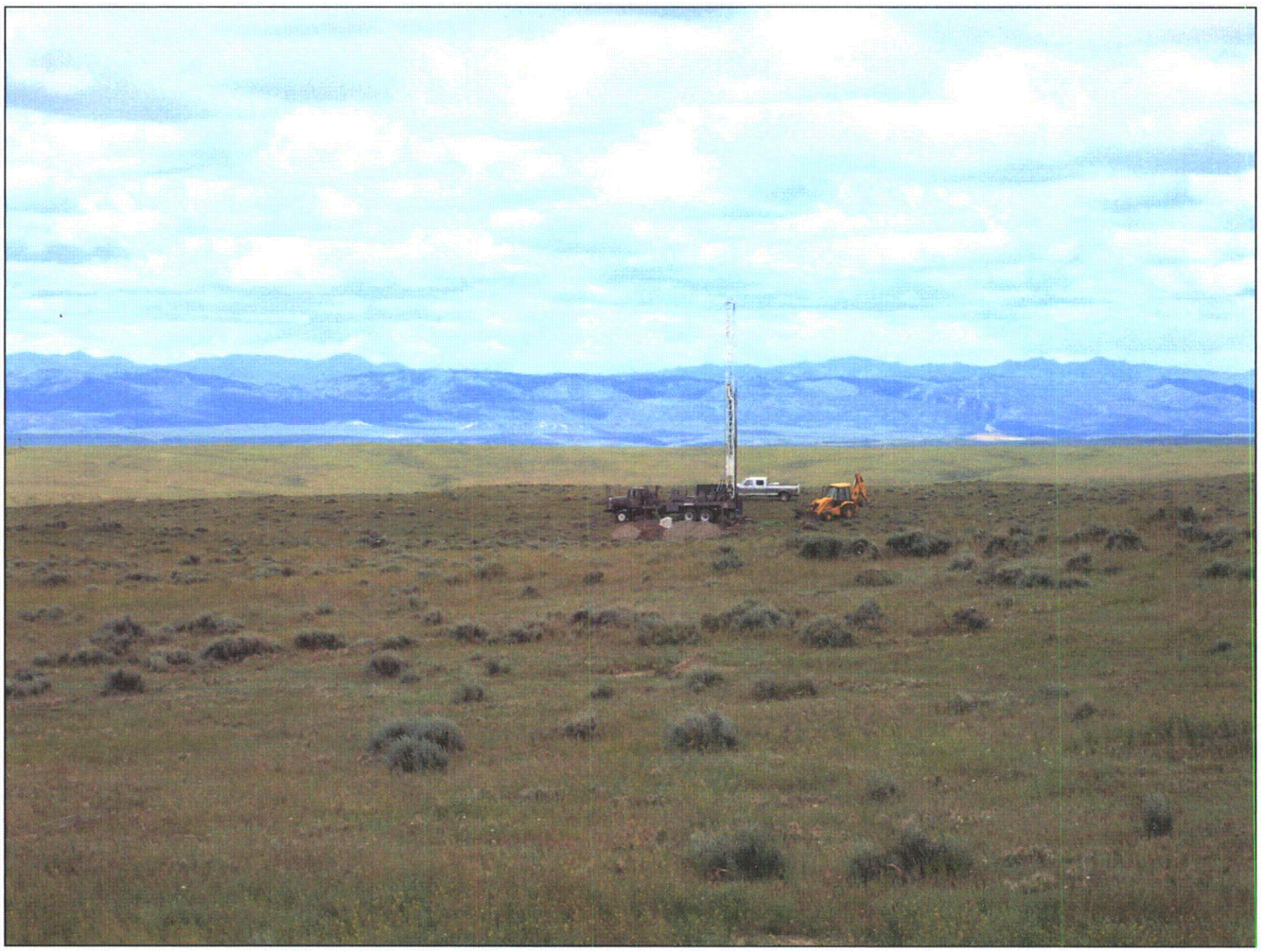
Technical Report
Volume IV Section 3.0 Through Section 10.0 February 2010



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Technical Report
Volume V Appendix A through Appendix E February 2010

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