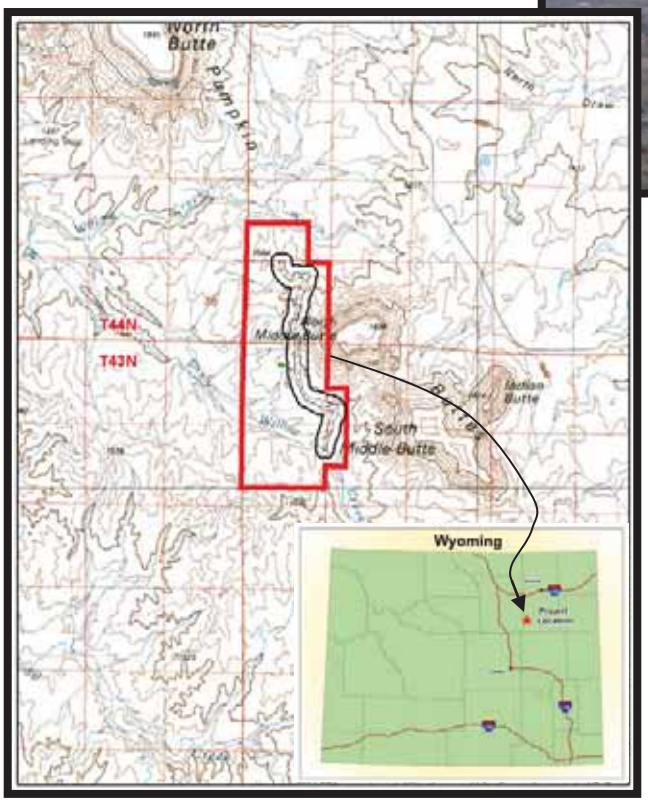
# Environmental Assessment for Uranerz Energy Corporation's Proposed Hank Unit Uranium In-Situ Recovery Project, Campbell County, Wyoming




June 2013

BLM

Wyoming High Plains District - Buffalo Field Office

The BLM manages more land – 256 million acres – than any other Federal agency. This land, known as the National System of Public Lands, is primarily located in 12 Western States, including Alaska. The Bureau, with a budget of about $1 billion, also administers 700 million acres of sub-surface mineral estate throughout the nation. The BLM's multiple-use mission is to sustain the health and productivity of the public lands for the use and enjoyment of present and future generations. The Bureau accomplishes this by managing such activities as outdoor recreation, livestock grazing, mineral development, and energy production, and by conserving natural, historical, cultural, and other resources on public lands.

**WY-070-EA13-226**

# ENVIRONMENTAL ASSESSMENT FOR URANERZ ENERGY CORPORATION'S PROPOSED HANK UNIT URANIUM IN-SITU RECOVERY PROJECT, CAMPBELL COUNTY, WYOMING

Prepared for

**Bureau of Land Management**
**Wyoming High Plains District**
**Buffalo Field Office**
**Buffalo, Wyoming**

**June 2013**

## TABLE OF CONTENTS

**Page**

1.0 INTRODUCTION ..... 1-1
1.1 BACKGROUND ..... 1-1
1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION ..... 1-5
1.3 DECISION TO BE MADE ..... 1-6
1.4 RELATIONSHIP TO STATUTES, REGULATIONS, PLANS, OR OTHER ENVIRONMENTAL ANALYSES ..... 1-7
1.4.1 Conformance with Applicable Land Use Plans ..... 1-7
1.4.2 Relationship to Other Plans or Environmental Analyses ..... 1-7
1.4.3 NEPA Compliance ..... 1-9
1.4.4 Supplemental Authorities - Statues and Regulations ..... 1-9
1.5 SCOPING, PUBLIC INVOLVEMENT, AND ISSUES ..... 1-13

2.0 PROPOSED ACTION AND ALTERNATIVES ..... 2-1
2.1 INTRODUCTION ..... 2-1
2.2 ALTERNATIVE 1 - PROPOSED ACTION ..... 2-2
2.2.1 Summary of the Proposed Action ..... 2-2
2.2.2 Preconstruction Activities ..... 2-7
2.2.2.1 NRC, WDEQ/LQD, and Other Non-BLM Permitting ..... 2-7
2.2.2.2 BLM Approval Process ..... 2-7
2.2.3 Summary of the Plan of Operations ..... 2-9
2.2.3.1 Overview ..... 2-9
2.2.3.2 Construction Phase ..... 2-10
2.2.3.3 Uranium Recovery Phase ..... 2-34
2.2.3.4 Groundwater Restoration Phase ..... 2-42
2.2.3.5 Decommissioning and Reclamation Phase ..... 2-47
2.2.3.6 Mitigation Measures ..... 2-51
2.2.3.7 Monitoring ..... 2-67
2.3 ALTERNATIVE 2 - NO ACTION ALTERNATIVE ..... 2-76
2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY ..... 2-77
2.4.1 Conventional Mining and Milling at the Hank Unit Project Site ..... 2-77
2.4.2 Use of Alternate Lixiviants ..... 2-79
2.4.3 Use Alternative Waste Disposal Methods ..... 2-79

3.0 AFFECTED ENVIRONMENT ..... 3-1
3.1 INTRODUCTION ..... 3-1
3.2 AIR QUALITY ..... 3-2
3.3 CULTURAL RESOURCES AND NATIVE AMERICAN CONSULTATION ..... 3-5
3.3.1 Introduction ..... 3-5

**TABLE OF CONTENTS (Continued)**

**Page**

3.3.2 Cultural History ..... 3-6
3.3.2.1 Prehistoric Era ..... 3-6
3.3.2.2 Protohistoric/Historic Era ..... 3-8
3.3.2.3 Cultural Resources Identified and Places of Cultural Significance ..... 3-12
3.3.2.4 Places of Cultural Significance ..... 3-12
3.3.2.5 Traditional Cultural Properties ..... 3-14
3.3.2.6 Native American Consultation ..... 3-15
3.4 GEOLOGY, ENERGY, MINERALS, AND GEOLOGIC HAZARDS ..... 3-17
3.4.1 Geology ..... 3-17
3.4.1.1 Geology of Powder River Basin ..... 3-17
3.4.1.2 Geology of Hank Unit ..... 3-21
3.4.2 Energy and Mineral Development ..... 3-23
3.4.2.1 Introduction ..... 3-23
3.4.2.2 Locatable Minerals ..... 3-24
3.4.2.3 Leasable Minerals ..... 3-24
3.4.2.4 Salable Minerals ..... 3-26
3.4.3 Geologic Hazards ..... 3-26
3.4.3.1 Introduction ..... 3-26
3.4.3.2 Earthquakes ..... 3-26
3.4.3.3 Subsidence ..... 3-27
3.4.3.4 Mass Movement ..... 3-27
3.5 LAND USE ..... 3-28
3.5.1 Introduction ..... 3-28
3.5.2 Grazing ..... 3-29
3.5.3 Recreation ..... 3-29
3.5.4 Energy and Mineral Development ..... 3-29
3.6 SOCIOECONOMICS ..... 3-30
3.6.1 Demographics ..... 3-30
3.6.2 Employment Structure ..... 3-31
3.6.3 Income ..... 3-31
3.6.4 Housing ..... 3-32
3.6.5 Local Finance ..... 3-33
3.6.6 Education ..... 3-34
3.6.7 Health and Social Services ..... 3-34
3.7 SOIL RESOURCES ..... 3-35
3.8 VEGETATION INCLUDING SPECIAL STATUS SPECIES, NOXIOUS WEEDS, AND WETLANDS ..... 3-35
3.8.1 Vegetation ..... 3-35
3.8.2 Special Status Plant Species ..... 3-42
3.8.2.1 Introduction ..... 3-42
3.8.2.2 Federally-designated Plant Species ..... 3-45

**TABLE OF CONTENTS (Continued)**

**Page**

3.8.2.3 BLM-sensitive Plant Species ..... 3-46
3.8.2.4 WYNDD Species of Concern ..... 3-46
3.8.2.5 Noxious Weeds and Other Invasive Species ..... 3-47
3.8.3 Wetlands and WUS ..... 3-47
3.9 VISUAL RESOURCES ..... 3-48
3.10 WATER RESOURCES ..... 3-51
3.10.1 Surface Water Resources ..... 3-51
3.10.1.1 Introduction ..... 3-51
3.10.1.2 Drainage Basins ..... 3-51
3.10.1.3 Surface Water Features ..... 3-51
3.10.1.4 Surface Water Flow ..... 3-53
3.10.1.5 Surface Water Quality ..... 3-53
3.10.2 Groundwater Resource ..... 3-56
3.10.2.1 Introduction ..... 3-56
3.10.2.2 Uranium-bearing Aquifer ..... 3-57
3.10.2.3 Hydrogeologic Characteristics ..... 3-59
3.10.2.4 Level of Vertical Confinement ..... 3-59
3.10.2.5 Groundwater Quality ..... 3-60
3.10.2.6 Current Groundwater Uses ..... 3-63
3.10.2.7 Surrounding Aquifers ..... 3-64
3.11 WILDLIFE INCLUDING SPECIAL STATUS ANIMAL SPECIES ..... 3-65
3.11.1 Wildlife and Fisheries ..... 3-65
3.11.1.1 Introduction ..... 3-65
3.11.1.2 Big Game ..... 3-65
3.11.1.3 Upland Game Birds ..... 3-67
3.11.1.4 Waterfowl and Shorebirds ..... 3-68
3.11.1.5 Nongame/Migratory Birds (Including non-sensitive raptors) 3-68
3.11.1.6 Other Mammals ..... 3-70
3.11.1.7 Amphibians and Reptiles ..... 3-71
3.11.1.8 Fisheries ..... 3-71
3.11.2 Special Status Animal Species ..... 3-71
3.11.2.1 Introduction ..... 3-71
3.11.2.2 Federally-designated Animal Species ..... 3-76
3.11.2.3 BLM-sensitive Species and Wyoming Species of Greatest Conservation Need ..... 3-81

4.0 ENVIRONMENTAL CONSEQUENCES ..... 4-1
4.1 INTRODUCTION ..... 4-1
4.2 AIR QUALITY ..... 4-2
4.2.1 Proposed Action ..... 4-2
4.2.2 No Action Alternative ..... 4-5
4.2.3 Applicant Committed Mitigation Measures ..... 4-5
4.2.4 Residual Impacts ..... 4-5

**TABLE OF CONTENTS (Continued)**

**Page**

4.2.5 Cumulative Impacts ..... 4-6
4.3 CULTURAL RESOURCES AND NATIVE AMERICAN CONCERNS ..... 4-8
4.3.1 Proposed Action ..... 4-8
4.3.1.1 Cultural Resources ..... 4-8
4.3.1.2 Native American Concerns ..... 4-10
4.3.2 No Action Alternative ..... 4-11
4.3.3 Applicant Committed Mitigation Measures ..... 4-11
4.3.4 Residual Impacts ..... 4-11
4.3.5 Cumulative Impacts ..... 4-12
4.4 GEOLOGY (INCLUDING ENERGY, MINERALS, AND GEOLOGIC HAZARDS) ..... 4-13
4.4.1 Proposed Action ..... 4-13
4.4.1.1 Geology ..... 4-13
4.4.1.2 Energy and Minerals ..... 4-13
4.4.1.3 Geologic Hazards ..... 4-15
4.4.2 No Action Alternative ..... 4-16
4.4.3 Applicant Committed Mitigation Measures ..... 4-17
4.4.4 Residual Impacts ..... 4-17
4.4.5 Cumulative Impacts ..... 4-17
4.5 LANDUSE (GRAZING, RECREATION, AND ENERGY AND MINERAL DEVELOPMENT) ..... 4-19
4.5.1 Proposed Action ..... 4-19
4.5.1.1 Livestock Grazing ..... 4-19
4.5.1.2 Recreation ..... 4-20
4.5.1.3 Energy and Mineral Development ..... 4-20
4.5.2 No Action Alternative ..... 4-20
4.5.3 Applicant Committed Mitigation Measures ..... 4-20
4.5.4 Residual Impacts ..... 4-21
4.5.5 Cumulative Impacts ..... 4-21
4.6 VEGETATION INCLUDING SPECIAL STATUS SPECIES, NOXIOUS WEEDS, AND WETLANDS ..... 4-23
4.6.1 Proposed Action ..... 4-23
4.6.1.1 Vegetation ..... 4-23
4.6.1.2 Special Status Plant Species ..... 4-24
4.6.1.3 Wetlands ..... 4-24
4.6.2 No Action Alternative ..... 4-25
4.6.3 Applicant Committed Mitigation Measures ..... 4-25
4.6.4 Residual Impacts ..... 4-25
4.6.5 Cumulative Impacts ..... 4-26
4.7 SOCIOECONOMICS ..... 4-27
4.7.1 Proposed Action ..... 4-27
4.7.1.1 Construction Impacts ..... 4-28

**TABLE OF CONTENTS (Continued)**

**Page**


4.7.1.2 Operational Impacts ..... 4-30
4.7.2 No Action Alternative ..... 4-33
4.7.3 Applicant Committed Mitigation Measures ..... 4-33
4.7.4 Residual Impacts ..... 4-33
4.7.5 Cumulative Impacts ..... 4-34
4.8 SOIL RESOURCES ..... 4-36
4.8.1 Proposed Action ..... 4-36
4.8.2 No Action Alternative ..... 4-38
4.8.3 Applicant Committed Mitigation Measures ..... 4-38
4.8.4 Residual Impacts ..... 4-39
4.8.5 Cumulative Impacts ..... 4-39
4.9 VISUAL RESOURCES ..... 4-40
4.9.1 Proposed Action ..... 4-40
4.9.2 No Action Alternative ..... 4-42
4.9.3 Applicant Committed Mitigation Measures ..... 4-42
4.9.4 Residual Impacts ..... 4-44
4.9.5 Cumulative Impacts ..... 4-44
4.10 WATER RESOURCES ..... 4-45
4.10.1 Proposed Action ..... 4-45
4.10.1.1 Surface Water Resources ..... 4-45
4.10.1.2 Groundwater Resources ..... 4-48
4.10.2 No Action Alternative ..... 4-51
4.10.3 Applicant Committed Mitigation Measures ..... 4-51
4.10.4 Residual Impacts ..... 4-54
4.10.4.1 Surface Water ..... 4-54
4.10.4.2 Groundwater ..... 4-54
4.10.5 Cumulative Impacts ..... 4-56
4.10.5.1 Surface Water ..... 4-56
4.10.5.2 Groundwater ..... 4-58
4.11 WILDLIFE INCLUDING SPECIAL STATUS ANIMAL SPECIES ..... 4-63
4.11.1 Proposed Action ..... 4-63
4.11.1.1 Big Game ..... 4-63
4.11.1.2 Upland Game Birds ..... 4-66
4.11.1.3 Waterfowl and Shorebirds ..... 4-67
4.11.1.4 Nongame/Migratory Birds (including non-sensitive raptor species) ..... 4-67
4.11.1.5 Other Mammals ..... 4-69
4.11.1.6 Amphibians and Reptiles ..... 4-70
4.11.1.7 Special Status Animal Species ..... 4-70
4.11.2 No Action Alternative ..... 4-75
4.11.3 Applicant Committed Mitigation Measure ..... 4-76
4.11.4 Residual Impacts ..... 4-80

## TABLE OF CONTENTS (Continued)

**Page**

4.11.5 Cumulative Impacts ..... 4-81
4.11.5.1 Wildlife ..... 4-81
4.11.5.2 Special Status Animal Species ..... 4-82

5.0 CONTRIBUTORS, REVIEWERS, AND PREPARERS ..... 5-1

6.0 REFERENCES ..... 6-1

## LIST OF FIGURES

**Page**

Figure 1.1 Hank Unit Location Map ..... 1-2

Figure 1.2 Nichols Ranch ISR Project Location ..... 1-4

Figure 2.1 Project Schedule ..... 2-4

Figure 2.2 General Location of Wellfield Access Road and Adjacent Pipeline, Utility, and Communication Corridors ..... 2-5

Figure 2.3 Layout of the Proposed SPF ..... 2-13

Figure 2.4 Plan View of Typical Wellfield Layout and Flow Pattern ..... 2-21

Figure 2.5 Typical Injection/Production Well Design ..... 2-23

Figure 2.6 Hank Unit Groundwater Sampling Locations ..... 2-24

Figure 2.7 Typical Monitoring Well Design ..... 2-25

Figure 2.8 View of Typical Operating ISR Wellfield ..... 2-26

Figure 2.9 Deep Disposal Well ..... 2-28

Figure 2.10 Idealized Schematic Cross Section to Illustrate Ore Zone Geology and Lixiviant Migration from an Injection Well to a Production/Recovery Well ..... 2-36

Figure 2.11 Flow Diagram of Typical ISR Uranium Recovery Process ..... 2-38

Figure 2.12 Location of Hank Unit Air Particulate and Radon Samplers ..... 2-69

## LIST OF FIGURES (Continued)

**Page**

Figure 2.13 Hank Unit Sediment Sample Locations ..... 2-70

Figure 3.1 Formations of Interest at the Hank Unit Project ..... 3-19

Figure 3.2 Relevant Geologic Strata Within the Hank Unit ..... 3-22

Figure 3.3 BLM Visual Resources Areas Within and near the Hank Unit Project Area ..... 3-50

Figure 3.4 Hank Unit Surface Water Drainage Basins ..... 3-52

Figure 3.5 Location of Existing Wells in and near the Hank Unit ..... 3-58

Figure 3.6 Location of Known Raptor Nests in and near the Hank Unit ..... 3-69

Figure 3.7 Location of Greater Sage-grouse Leks Within 2.0 mi of the Hank Unit Project Area ..... 3-83

Figure 3.8 Location of Designated Bald Eagle Winter Roost Sites Within and near the Hank Unit Project Area ..... 3-87

## LIST OF TABLES

**Page**

Table 1.1 Major Federal, State, and Local Permits, Approvals, and Authorizing Actions Applicable to Hank Unit Uranium Development and Operation in Campbell County, Wyoming ..... 1-10

Table 2.1 Surface Ownership Within Hank Unit Project Area ..... 2-3

Table 2.2 Estimated Acres of Surface Disturbance Within the Hank Unit (Proposed Action) ..... 2-6

Table 2.3 Sampling Parameters for the Recovery Wells During Aquifer Restoration ..... 2-46

Table 2.4 Reclamation Seed Mixture for Use on Privately-owned Surface Lands ..... 2-49

Table 2.5 Reclamation Seed Mixture for Use on BLM-administered Surface Lands ..... 2-49

## LIST OF TABLES (Continued)


| | | Page |
|---|---|---|
| Table 3.1 | Selected National and Wyoming Air Quality Standards (μg/m$^3$) | 3-4 |
| Table 3.2 | Ambient Air Quality Monitoring Data | 3-5 |
| Table 3.3 | Recorded Sites Within the Hank Unit Project Permit Area | 3-13 |
| Table 3.4 | 2011 Demographics of Campbell County | 3-30 |
| Table 3.5 | Soil Map Units Within the Hank Unit | 3-36 |
| Table 3.6 | Vegetation/Habitat Types and Occurrence Within the Hank Unit Project | 3-37 |
| Table 3.7 | Plant Species by Habitat Occurrence at the Hank Unit Project | 3-38 |
| Table 3.8 | Special Status Plant Species with the Potential to Occur Within or near the Hank Unit Project Area | 3-43 |
| Table 3.9 | BLM Visual Resource Management Class Objectives | 3-49 |
| Table 3.10 | Surface Water Quality of Specific Aquifers in the Hank Unit | 3-54 |
| Table 3.11 | Water Quality of Specific Aquifers in the Hank Unit | 3-62 |
| Table 3.12 | Special Status Animal Species with the Potential to Occur Within or near the Hank Unit Project Area | 3-72 |
| Table 3.13 | Occupied Greater Sage-grouse Lek Attendance Data for the Past Decade Located Within 2.0 mi of the Hank Unit Project Area | 3-84 |
| Table 4.1 | Total Estimated Non-radiological Air Emissions from the Proposed Action (tons) | 4-4 |
| Table 4.2 | Total Estimated Radon Emissions from the Proposed Action (curies/year) | 4-4 |
| Table 4.3 | NRHP-eligible or Unevaluated Sites Within the Hank Unit | 4-9 |
| Table 4.4 | Expected Disturbance from ISR Projects Within 15 mi of the Hank Unit | 4-22 |
| Table 5.1 | Record of Persons, Groups, and Governmental Agencies Contacted | 5-1 |
| Table 5.2 | List of Preparers | 5-1 |
| Table 5.3 | List of Contributors and Reviewers | 5-1 |

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ACHP | Advisory Council on Historic Preservation |
| ACL | Alternate concentration limit |
| AMSL | Above mean sea level |
| AO | Authorized officer |
| APE | Area of Potential Affect |
| AQD | Air Quality Division |
| AUM | Animal unit month |
| bgs | below ground surface |
| BLM | Bureau of Land Management |
| BFO | Buffalo Field Office |
| BMP | Best management practice |
| BO | Biological opinion |
| B.P. | Before present |
| CO | Carbon monoxide |
| $CO_2$ | Carbon dioxide |
| CBNG | Coal bed natural gas |
| CCESC | Campbell County Educational Services Center |
| CEQ | Council on Environmental Quality |
| CESQG | Conditionally Exempt Small Quantity Generator |
| CFR | *Code of Federal Regulations* |
| CPA | Core population area |
| CPP | Central processing plant |
| CWA | *Clean Water Act* |
| DL | Delisted |
| DOE | Department of Energy |
| DR | Decision Record |
| EA | Environmental Assessment |
| EHS | Extremely hazardous substances |
| EIA | Energy Information Administration |
| EIS | Environmental impact statement |
| EPA | Environmental Protection Agency |
| EPACT | *Energy Policy Act of 2005* |
| ERP | Emergency response plan |
| ESA | *Endangered Species Act of 1973* |
| FLPMA | *Federal Land Policy and Management Act of 1976* |
| FONSI | Finding of No Significant Impacts |
| ft | feet |
| FY | Fiscal year |
| GEIS | Generic Environmental Impact Statement |
| gpm | gallons per minute |
| HAP | Hazardous air pollutant |
| HDPE | High-density polyethylene |
| IM | Instruction Memorandum |
| ISR | In-situ recovery |
| kg | kilogram |
| KOP | Key Observation Point |
| LOP | life-of-project |
| LQD | Land Quality Division |
| lb | pound |
| mi | mile |
| MCLs | Maximum Contaminant Levels |
| Mg/l | milligram per liter |
| MIT | Mechanical integrity tests |
| MOA | Memorandum of Agreement |
| MOU | Memorandum of Understanding |
| mph | miles per hour |
| na | not applicable |
| NAAQS | National Ambient Air Quality Standards |
| NAGPRA | *Native American Graves Protection and Repatriation Act* |
| NEPA | *National Environmental Policy Act* |
| NHPA | *National Historic Preservation Act* (1966, as amended) |
| $NO_2$ | Nitrogen dioxide |

**LIST OF ABBREVIATIONS AND ACRONYMS (Continued)**

| | |
|---|---|
| $NO_x$ | Nitrogen oxide |
| NRC | Nuclear Regulatory Commission |
| NRCS | National Resource Conservation Service |
| NRHP | National Register of Historic Places |
| PA | Programmatic Agreement |
| pCi/L | picoCuries per liter |
| PLS | Pure live seed |
| $PM_{2.5}$ | Particulate matter of less than 2.5 microns |
| $PM_{10}$ | Particulate matter of less than 10 microns |
| POD | Plan of Development |
| POO | Plan of Operations |
| PPM | Parts per million |
| PRB | Powder River Basin |
| PSD | Prevention of significant deterioration |
| PVC | Polyvinyl chloride |
| RCRA | *Resource Conservation and Recovery Act* |
| RFFA | Reasonable Foreseeable Future Action |
| RMP | Resource Management Plan |
| ROD | Record of Decision |
| ROI | Region of influence |
| ROW | rights-of-way |
| RTV | Restoration target value |
| SARA | *Superfund Amendments and Reauthorization Act* |
| SDWA | *Safe Drinking Water Act* |
| SEIS | Supplemental Environmental Impact Statement |
| SERP | Safety and Environmental Review Panel |
| SGCN | species of greatest conservation need |
| $SO_2$ | Sulfur dioxide |
| SPF | Satellite processing facility |
| SHWD | Solid and Hazardous Waste Division |
| SMZ | Sage-grouse management zone |
| SOP | Standard operating procedure |
| SS | Sensitive species |
| SWCA | SWCA Environmental Consultants |
| SWPP | Storm Water Pollution Prevention |
| TCP | Traditional Cultural Property |
| TDS | Total dissolved solids |
| TEPC | Threatened, Endangered, Proposed, and Candidate |
| TPQ | Threshold planning quantity |
| TRC | TRC Environmental Corporation |
| TSD | Treatment storage or disposal |
| $U_3O_8$ | Triuranium octoxide |
| UCL | Upper control limits |
| $UF_6$ | Uranium hexafluoride |
| UIC | Underground injection control |
| Uranerz | Uranerz Energy Corporation |
| U.S.C. | *United States Code* |
| USACE | U.S. Army Corps of Engineers |
| USCB | U.S. Census Bureau |
| USDOT | U.S. Department of Transportation |
| USDW | U.S. Drinking Water |
| USFWS | U.S. Fish and Wildlife Service |
| VOC | Volatile organic compound |
| VRM | Visual Resource Management |
| WAAQS | Wyoming Ambient Air Quality Standards |
| WBC | Wyoming Business Council |

**LIST OF ABBREVIATIONS AND ACRONYMS (Continued)**

| | |
|---|---|
| WDERP | Wyoming Department of Employment, Research, and Planning |
| WDEQ | Wyoming Department of Environmental Quality |
| WEAD | Wyoming Economic Analysis Division |
| WGFD | Wyoming Game and Fish Department |
| WIA | wildlife inventory area |
| WOGCC | Wyoming Oil and Gas Conservation Commission |
| WQD | Water Quality Division |
| W.S. | Wyoming Statute |
| WSEO | Wyoming State Engineer's Office |
| WSGIT | Wyoming Sage Grouse Implementation Team |
| WUS | Waters of the U.S. |
| WYNDD | Wyoming Natural Diversity Database |
| WYPDES | Wyoming Pollutant Discharge Elimination System |
| WYSHPO | Wyoming State Historic Preservation Office |
| yd | yard |
| µg | micrograms |
| $\mu g/m^3$ | micrograms per cubic meter |

# 1.0 INTRODUCTION

## 1.1 BACKGROUND

Uranerz Energy Corporation (Uranerz) has proposed to the Bureau of Land Management (BLM), Buffalo Field Office (BFO) to develop and operate the Hank Unit Uranium In-situ Recovery (ISR) project (the Proposed Action). The Hank Unit project area is located west of the Pumpkin Buttes area in southwest Campbell County in northeast Wyoming, and is approximately 46 mi southwest of Gillette, and approximately 61 mi northeast of the city of Casper (Figure 1.1).

The Hank Unit project area includes a total of 2,250 acres and includes one wellfield in a single contiguous mine unit. Most of the Hank Unit lands are split-estate, meaning the surface and mineral ownerships are different. Approximately 1,970 acres (88%) of the surface lands are owned by private individuals, and 280 acres (12%) are owned by the U.S. Government and administered by BLM (Figure 1.1). The federal government categorizes minerals into three classifications: leasable, locatable, and salable minerals. Uranium is a locatable mineral. Uranerz owns or controls the mining claims located on the lands proposed to be mined in this project. Approximately 1,538 acres (68%) of the mineral lands in the Hank Unit are owned by the federal government, and approximately 712 acres (32%) are owned by various private entities. However, for locatable minerals, BLM administers only those federally-owned mineral lands that coincide with BLM-administered federally-owned surface lands; 280 acres in this project Facilities for the project located in the Hank Unit would include the buildings associated with a satellite processing facility (SPF), wells and associated components, power lines, pipelines, communication lines, and access roads. Over the life of the project approximately 33 acres of BLM–administered surface and approximately 126.4 acres of privately surface would be disturbed (refer to Section 2.0 for details).

This environmental assessment (EA) has been prepared to analyze the effects of developing and operating a uranium ISR wellfield located on federal surface by Uranerz within the Hank Unit of the Nichols Ranch uranium ISR project area. The Nichols Ranch ISR project area consists of the

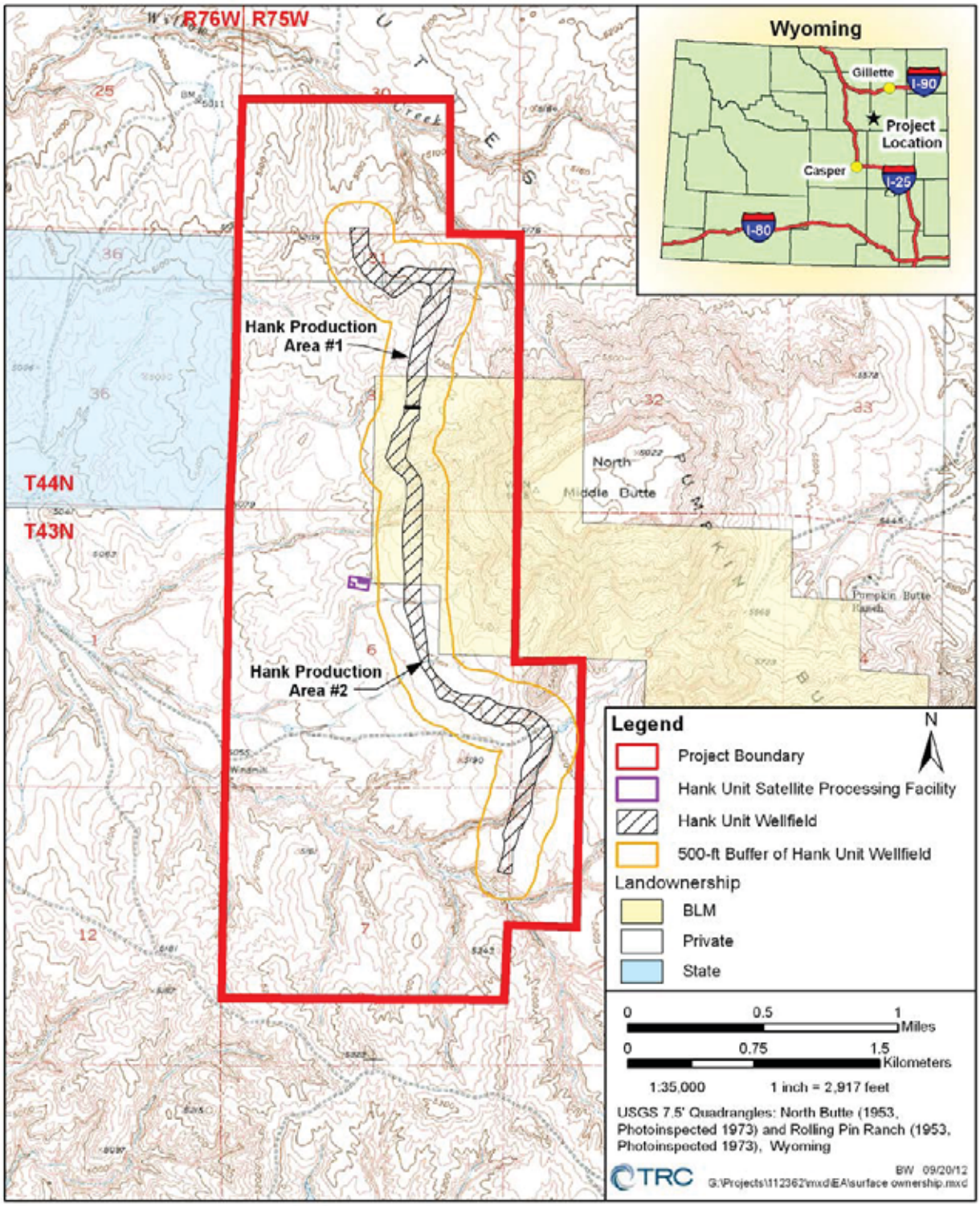



Figure 1.1 Hank Unit Uranium ISR Project Location Map.

Nichols Ranch Unit and the Hank Unit (refer to Figure 1.2). Uranerz has already obtained a source material license for the processing of the uranium from the Nuclear Regulatory Commission (NRC), a permit to mine from the Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD), and numerous other permits/approvals for the entire Nichols Ranch ISR project that includes the Nichols Ranch Unit and the Hank Unit. The Nichols Ranch Unit is located 4 mi west of the Hank Unit, and it does not contain any BLM-administered surface or locatable mineral. However, the federal government still retains leasable mineral (e.g., coal, oil, gas) within the Nichols Ranch Unit. In addition to reviewing and issuing a source material license for both units, the NRC completed a Generic Environmental Impact Statement (GEIS) (that addressed four specific regions in the western U.S., including the Wyoming East Uranium Million Region [where the Nichols Ranch Unit and Hank Unit are located]. The NRC also completed a site-specific Supplemental Environmental Impact Statement (SEIS) for the Nichols Ranch ISR Project that included both the Nichols Ranch Unit and Hank Unit ([NRC 2009a, 2011]).

Because there are no BLM-administered lands within the Nichols Ranch Unit, the Nichols Ranch Unit can be operated independently without the Hank Unit. The Nichols Ranch Unit project was fully addressed by the NRC SEIS and the reader should refer to this document for any additional information.

As described in detail in Section 2.0 of this EA, Uranerz would conduct third-party toll milling of the uranium resin at either the Uranerz Nichols Ranch Central Processing Plant (CPP) or Cameco Resources Smith Ranch-Highland CPP located approximately 50 mi south of the Hank Unit.

Uranerz has demonstrated written surface owner consent on split estate lands within the Hank Unit and as a result, BLM will exercise authority only over the ISR development on BLM-administered surface within the Hank Unit. For the remainder of the EA, unless specifically noted, any reference to BLM-administered lands, public lands, or similar terminology will refer to those lands that include both BLM surface and federally-owned minerals. The Nichols Ranch Unit is addressed in the cumulative impacts section of Section 4.0 of this EA.

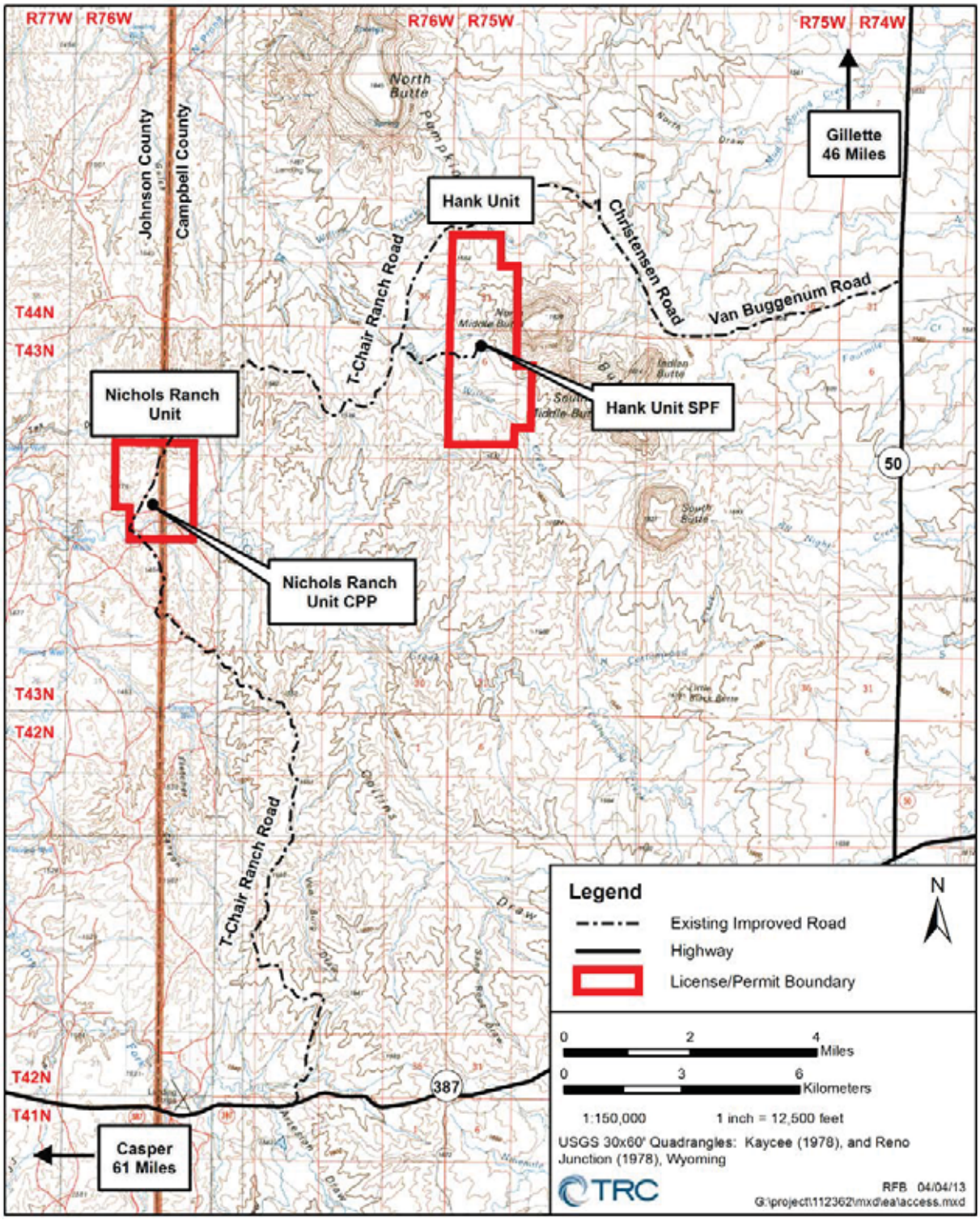



Figure 1.2 Nichols Ranch Uranium ISR Project Location Map.

## 1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

Expanding nuclear power is a key component of the *Energy Policy Act of 2005* (EPACT) signed into law on August 8, 2005. The policy calls for federal agencies "to develop a national energy policy designed to help the private sector, and, as necessary and appropriate, state and local governments, promote dependable, affordable, and environmentally sound production and distribution of energy for the future." In addition to providing this direction, the EPACT provides significant incentives for the continuation and expansion of nuclear power in the U.S. For example, the Department of Energy (DOE) is offering conditional commitments for a total of $8.33 billion in loan guarantees for the construction and operation of two new nuclear reactors at a plant in Burke, Georgia. The federal government is attempting to restart the domestic nuclear industry, helping to create valuable long-term jobs, and reduce greenhouse gas emissions (DOE 2010).

Exploration and development of locatable federal minerals by private industry is part of the BLM's minerals program under the authority of 43 *Code of Federal Regulations* (CFR) 3800, mining claims under the *General Mining Law* of 1872, the *Mining and Minerals Policy Act of 1970*, the *Federal Land Policy and Management Act of 1976* (FLPMA), and the *National Materials and Minerals Policy, Research, and Development Act of 1980*.

Uranerz's objective would be to produce an estimated 1.85 million pounds of uranium over the life of the project. Per the provisions of FLPMA, public lands are to be managed in accordance with the balance of several considerations including "in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values" and "in a manner which recognizes the Nation's need for domestic sources of minerals"…"from the public lands including implementation of the *Mining and Minerals Policy Act of 1970* (84 Stat. 1876, 30 U.S.C. 21a) as it pertains to the public lands" (FLPMA, Sec. 102((8) and (12)). The purpose of the Surface Management regulations in 43 CFR 3809 *et seq*., the implementing regulations for FLPMA with respect to mining, is to prevent "unnecessary or undue degradation of public lands by operations authorized by the mining laws" (43 CFR 3809.1(a)). Taking into account the BLM's multiple-use mandate, the purpose and

need for this EA is to analyze the site-specific impacts associated with the Proposed Action and its alternatives, identify mitigation measures to potentially reduce or eliminate those impacts, and provide agency decision makers with detailed information upon which to base their decision.

## 1.3 DECISION TO BE MADE

The BLM must complete the environmental review process (in accordance with BLM Handbook H-1790-1) required under *National Environmental Policy Act* (NEPA). Then BLM can issue a decision on the Plan of Operations (POO) for Uranerz Proposed Hank Unit Project. As a result of the NEPA process, the BLM will either issue a Finding of No Significant Impact (FONSI) or proceed with the preparation of an Environmental Impact Statement (EIS).

In accordance with BLM Handbook H-3809-1 and after NEPA has been completed, there are three possible courses of action BLM may take when issuing its decision on the POO. The BLM may decide to:

1) approve the POO as submitted;

2) approve the POO subject to changes or conditions that are necessary to meet the performance standards of §3809.420 and to prevent unnecessary or undue degradation. BLM may require Uranerz to incorporate other agency permits, final approved engineering designs and plans, or other conditions of approval from the review of the POO filed under §3809.401(b); or

3) disapprove, or withhold approval of the POO because it:

- (i) does not meet the applicable content requirements of §3809.401;
- (ii) proposes operations that are in an area segregated or withdrawn from the operation of the mining laws, unless the requirements of §3809.100 are met; or
- (iii) proposes operations that would result in unnecessary or undue degradation of public lands.

## 1.4 RELATIONSHIP TO STATUTES, REGULATIONS, PLANS, OR OTHER ENVIRONMENTAL ANALYSES

### 1.4.1 Conformance with Applicable Land Use Plans

The Proposed Action is in conformance with the Record of Decision (ROD) and the approved BFO Resource Management Plan (RMP) (1985) and Amendments (BLM 2003a). The signed ROD for the BFO RMP provides overall direction for management of all resources on BLM-administered lands in the BFO planning area. The RMP was prepared under the authority of the FLPMA, and other applicable laws and regulations, and includes broad land use plan decisions that provide overall direction for management of resources and resource uses within the BFO planning area. In the RMP, decisions are expressed as goals and objectives (desired outcomes), allowable uses, and management actions anticipated to achieve desired outcomes. The land use planning decisions for BLM-administered lands within the Hank Unit project area are contained in the BFO RMP, as amended (BLM 1985, 2003a, 2005).

### 1.4.2 Relationship to Other Plans or Environmental Analyses

BLM's NEPA review of the project area is not meant to duplicate the NRC's NEPA review, including the GEIS for In-situ Leach Uranium Milling Facilities (NRC 2009a) and SEIS prepared for the Nichols Ranch ISR project (which includes the Hank Unit) as part of its Source Material Licensing process. Rather, the NRC SEIS will be incorporated by reference into this EA. Incorporation by reference provides the opportunity to reduce paperwork and redundant analysis in the NEPA process, and allows BLM to briefly summarize the relevant portions of the NRC SEIS rather than repeat them. This EA will focus on those issues and mitigation measures not fully analyzed in sufficient detail in the NRC GEIS or SEIS in support of BLM's NEPA requirements and regulatory authorities. Additional analysis documents relevant to this project and incorporated by reference include:

- NUREG-1910 Supplement 2, SEIS for the Nichols Ranch ISR Project, Final Report (NRC 2011).

- NUREG-1910, GEIS for In-situ Leach Uranium Milling Facilities, Final Report (NRC 2009a).
- EA for the Third Party Processing of Ion Exchange Resin to Power Resources, Inc., Smith Ranch/Highlands Uranium Project (NRC 2009b).
- EA for the Yates Petroleum Corporation All Day Plan of Development (BLM 2011a).
- EAs for Anadarko Petroleum Corporation, Dry Willow Phase I and Dry Willow Phase II (BLM 2007).
- Final EIS and RMP Amendment for the Powder River Basin (PRB) Oil and Gas Project WY-070-02-065 (BLM 2003a).

On December 2, 2009, the NRC and BLM announced they had entered into a Memorandum of Understanding (MOU) that "outlines how the agencies will coordinate on future environmental analyses related to development of uranium resources on public lands" (BLM and NRC 2009a). This MOU is meant to eliminate duplicative NEPA analysis and conflicting jurisdiction in the future, but this MOU would not facilitate the current NEPA review for the Hank Unit Project due to timing issues.

There is also a MOU between the BLM and the State of Wyoming recognizing the authorities and responsibilities of both agencies when permitting mining operations on BLM-administered lands. The intent of the BLM and State of Wyoming MOU is to avoid unnecessary permitting duplication while providing protection for human health and the environment (BLM and WDEQ 2003). The POO for the Hank Unit project area is also incorporated by reference into this EA (Uranerz 2012).

In accordance with regulations contained in 43 CFR 1610.5, the information provided above demonstrates that the Proposed Action is within the intent, scope, and meaning of the BLM BFO RMP (1985). According to the BLM BFO RMP,

> "Unless formally withdrawn from mineral location, all lands in the resource area, including federally administered surface/minerals and split estate, are open to exploration, location, and development of locatable minerals on valid mining claims. In order to explore and develop locatable minerals (excluding casual use), a notice of intent or a Plan of Operation is required depending on the amount of disturbance and type of activity. All locatable minerals actions are reviewed to ensure compliance with the bonding policy for surface-disturbing activities."

### 1.4.3 NEPA Compliance

This EA is a site-specific analysis of the potential impacts that could result from implementation of the Proposed Action or alternatives thereof. The EA assists the BLM in project planning, ensuring compliance with NEPA, and in making a determination as to whether any significant impacts could result from the analyzed activities. This EA will assist the BLM authorized officer (AO) in making a determination to either issue a FONSI or begin the preparation of an EIS for this project. If appropriate, the FONSI would briefly present the reasons why implementation of the Proposed Action would not result in significant impacts (effects) to the environment beyond those already addressed in the BFO RMP as amended (BLM 1985). A decision record (DR) would be prepared and signed for the EA explaining the reason for the decision and approving the selected alternative. However, if the BLM AO determines that this project has significant impacts following the analysis in this EA, the BLM would start the process of preparing an EIS for the project.

The proposed project was analyzed in accordance with the requirements of NEPA, the Council on Environmental Quality (CEQ) regulations, BLM regulations codified in 43 CFR 3809, and the BLM NEPA Handbook (BLM 2008a). This EA serves several purposes:

- it provides the public and government agencies with information about the potential environmental consequences of the project and alternatives;
- it identifies all practicable means to avoid or minimize environmental harm from the project and alternatives; and
- it provides the responsible official (i.e., the BLM AO) with information with which to make an informed decision regarding the project.

### 1.4.4 Supplemental Authorities-Statues and Regulations

NEPA is only one of many statues that contain procedural requirements that pertain to treatment of elements of the environment when the BLM is considering a federal action. Table 1.1 provides an overview of the federal, state, county, and local laws applicable to uranium

Table 1.1 Major Federal, State, and Local Permits, Approvals, and Authorizing Actions Applicable to Hank Unit Uranium Development and Operation in Campbell County, Wyoming.

| Agency | Permit, Approval, or Action | Authority |
|---|---|---|
| BLM | POO | *Mining Claims Under the General Mining Laws of 1872,* as amended (30 *United States Code* [U.S.C.] §29 and 43 CFR 3800 et seq.); *Federal Land Policy and Management Act of 1976*, as amended (43 U.S.C. §1701 et seq. and 43 CFR 100-9260 et seq.) |
| | EA or EIS | *National Environmental Policy Act of 1969,* as amended (42 U.S.C. §4321 et seq. and 40 CFR 1500-1508 et seq.) |
| | Antiquities and cultural resource | *Antiquities Act of 1906*, as amended (16 U.S.C. §431-433 et seq.); *Archaeological Resources Protection Act of 1979*, as amended (16 U.S.C. §470aa-47011 et seq.); *Preservation of American Antiquities,* as amended (43 CFR 3 et seq.); *National Historic Preservation Act*, as amended (16 U.S.C. §470 et seq.) |
| | Native American Religious Concerns | *American Indian Religious Freedom Act of 1978* (42 U.S.C. §1996 et seq.); *Native American Graves Protection and Repatriation Act* (NAGPRA) (25 U.S.C. §3001 et seq.) |
| NRC | Source material licenses for the possession and use of source material and byproduct material | *Atomic Energy Act*, as amended 42 U.S.C. § 2011 et seq.; *Uranium Mill Tailings Radiation Control Act*; Requirements under Title 10 CFR Parts 20 and 40, and the guidance in NUREG-1569, "Standard Review Plan for In-Situ Leach Uranium Extraction License Applications," and Title 10, Part 51 |
| | EIS for Source Material License | *National Environmental Policy Act of 1969,* as amended (as amended) (42 U.S.C. §4321 et seq.) |
| U.S. Fish and Wildlife Service (USFWS) | Coordination, consultation, and impact review of federally listed, threatened, and endangered species required for BLM and NRC | *Fish and Wildlife Coordination Act* (16 U.S.C. §661-666c et seq.); Section 7 of the *Endangered Species Act of 1973*, as amended (16 U.S.C. §1536 et seq.); *Eagle Act of 1958* (43 U.S.C. §155 et seq.); *Bald and Golden Eagle Protection Act*, as amended (16 U.S.C. §668-668dd et seq.) |

Table 1.1 (Continued)

| Agency | Permit, Approval, or Action | Authority |
|---|---|---|
| USFWS | Migratory bird impact coordination required for BLM and NRC | *Migratory Bird Treaty Act* (16 U.S.C. §704 et seq.); E.O. 131186, "Responsibilities of Federal Agencies to Protect Migratory Birds" January 10, 2001 |
| U.S. Environmental Protection Agency (EPA) | Spill Prevention Control and Countermeasures Plans | *Federal Pollution Prevention Act of 1990* (30 U.S.C. §133 et seq.) (40 CFR 112 et seq.) |
| | Regulate hazardous waste treatment, storage, and/or disposal | *Resource Conservation and Recovery Act of 1976,* as amended (RCRA) (42 U.S.C. §6901 et req.). *Comprehensive Environmental Response Compensation and Liability Act of 1980*, as amended (43 U.S.C. §9615 et seq.) |
| | Regulate and protect drinking water supplies; provides criteria for exempted aquifers | *Safe Drinking Water Act*, as amended (43 U.S.C. §300f et seq.), 40 CFR 146.4 et seq.; *Clean Water Act of 1977* (33 U.S.C. §1251 et seq.) |
| | BLM and NRC assessment of Environmental Justice | E.O. 12898, "Environmental Justice" February 11, 1994 |
| U.S. Army Corps of Engineers (USACE) | Provide protection to wetlands | E.O. 11990, "Protection of Wetlands" May 24, 1977 |
| Wyoming Department of Environmental Quality/ Water Quality Division (WDEQ/WQD) | Permits to construct groundwater injection and disposal wells | *Wyoming Environmental Quality Act*, Article 3, Water Quality, as amended (Wyoming Statute [WS] 35-11-301 through 35-11-311 et seq.); Section 1421 of the Federal *Safe Drinking Water Act* (SDWA) codified at 40 CFR Parts 144 and 146). |
| | National Pollutant Discharge Elimination System permits for discharging waste water and storm water runoff | *Wyoming Environmental Quality Act,* Article 3, Water Quality, as amended (WS 35-11-301 through 35- 11-311); Section 405 of the *Federal Water Pollution Control Act* (*Clean Water Act*) (codified at 33 U.S.C. §1345); EPA administered (40 CFR 122); State Program Requirements (40 CFR 123); EPA Water Program Procedures for Decision-making, as amended (40CFR 124); WDEQ/WQD Rules and Regulations, Chapter 18 |
| | Administrative approval for discharge of hydrostatic test water | *Wyoming Environmental Quality Act,* Article 3, Water Quality, as amended (WS 35-11-301 through 35-11-311 et seq.) |

Table 1.1 (Continued)

| Agency | Permit, Approval, or Action | Authority |
|---|---|---|
| Wyoming Department of Environmental Quality/ Air Quality Division (WDEQ/AQD) | Permits to construct and permits to operate | *Federal Clean Air Act*, as amended (42 U.S.C. §7401 et seq.); *Wyoming Environmental Quality Act*, Article 2, Air Quality, as amended (WS 35-11-201 through 35-11-212 et seq.) |
| Wyoming Department of Environmental Quality/Land Quality Division (WDEQ/LQD) | Mine permits, impoundments, and drill hole plugging | *Wyoming Environmental Quality Act*, Article 4, Land Quality, as amended (WS 35-11-401 through 35-11-437 et seq.) |
| Wyoming Department of Transportation | Permits for oversize, over length, and overweight loads | Chapter 20 of the Wyoming Highway Department Rules and Regulations (WS 31-217.2 through WS 31-217.7) |
| | Access permits to state highways | Chapter 13 of the Wyoming Highway Department Rules and Regulations (WS 24-2-105 and WS 24-6-101 through WS 24-6-111) |
| Wyoming State Engineer's Office (WSEO) | Permit to appropriate groundwater | Chapter 1, Part V of State Engineer's Office Regulations (WS 41-4-503 et. seq.) |
| Campbell County | Land Use Plan compliance | *Wyoming Land Use Planning Act* (WS 9-8-101 through 9-8-302); Campbell County Natural Resource and Land Use Plan |
| | Noxious weed control | County Code |

development and the key regulatory requirements that would govern project implementation. Additional approvals, permits, and authorizing actions may be necessary.

The development of this project would not affect the achievement of the Wyoming Standards for Healthy Rangelands (BLM 2010b). The Proposed Action is also in conformance with the applicable provisions of the Campbell County Natural Resource and Land Use Plan (2007) and complies with all other relevant federal, state, and local laws.

The following authorities are used to process and evaluate uranium mining applications: NEPA and the *Wyoming Environmental Quality Improvement Act*. Additional guidance and regulations

are set forth in 40 CFR 1500 (Protection of Environment), 43 CFR 1601 (Planning, Programming, and Budgeting), and 43 CFR 3809 (Surface Management). Other relevant guidance includes BLM Manual Section 1601, Land Use Planning (2000), and BLM NEPA Handbook (H 1790-1) (2008a).

## 1.5 SCOPING, PUBLIC INVOLVEMENT, AND ISSUES

Development of the Hank Unit project area would result in the disturbance of public lands administered by the BLM. Under 43 CFR 3809, entities intending to conduct mining-related activities that involve greater than "casual use" disturbance on more than 5 acres of BLM-administered lands must submit a POO to BLM for review and approval. Uranerz initially submitted a POO to BLM on February 26, 2008. The BLM BFO determined that the POO was not complete per the requirements of 43 CFR 3809.401-421 and comments were submitted to Uranerz on September 6, 2011. Concurrently, BLM BFO determined that an EA would be required to facilitate their review of the proposed project; specifically, the resources outside the purview of the NRC and BLM assigned the Nichols Ranch project case number WYW-169904. Uranerz submitted response to comments and revised information for the POO to the BFO staff on March 16, 2012, and subsequently on May 22, 2012. The BLM determined the POO to be complete per 43 CFR 3809.401-.421 on June 8, 2012. These documents are available for review at the BLM BFO and the BLM website (http://www.blm.gov/wy/st/en/info/NEPA/documents/bfo/nichols-ranch.html).

In accordance with NEPA and CEQ regulations (40 CFR 1501.7), an early and open process for determining the scope of issues to be addressed and for identifying the issues related to a proposal is required. The BLM determined the Uranerz POO to be complete on June 8, 2012, and initiated the mandatory 30-day public review and comment period, pursuant to 43 CFR 3809.411. In compliance with environmental review requirements of BLM Handbooks H-3809-1 (Surface Management) and H-1790-1 (NEPA), the BLM BFO released a scoping notice on June 13, 2012, for a 30-day review period. The scoping period closed on July 15, 2012. The BLM received only one comment letter.

The BLM is in the process of conducting Native American consultation in accordance with the AIRFA, NAGRPA, NHPA, NEPA, Executive Order 13007 and all other applicable regulations and guidelines. BLM has discussed the Proposed Action with various tribal representatives in face-to-face meetings on January 26, 2012, May 22, 2012, and October 17, 2012 and by conference call on November 6, 2012. BLM is formally requesting assistance from the Cheyenne River Sioux, Crow, Eastern Shoshone, Fort Peck, Northern Arapaho, Northern Cheyenne, Yankton, Crow Creek Tribe, Lower Brule Tribe, Standing Rock, Rosebud, Sisseton Wahpeton Oyate, and Oglala Tribes to identify sites that have religious and traditional cultural importance.

The internal BLM review process and public scoping led to the identification of the following land and resource management issues and concerns potentially associated with the Proposed Action:

- impacts to the Pumpkin Buttes Traditional Cultural Property (TCP);
- impacts to cultural resources;
- impacts on wetlands and riparian areas;
- impacts to ephemeral and intermittent drainages from erosion from disturbed sites;
- groundwater;
- control of invasive, nonnative species (weeds);
- protection of special status wildlife and plant species including endangered, threatened, candidate, proposed, and BLM-sensitive species;
- potential effects on small and big game species, raptors, and migratory birds;
- the potential effects on the public health from the release of radon and other radioactive isotopes into the atmosphere;
- impacts to air quality;
- potential conflict with other land uses, mineral resource extraction activities, conventional oil/gas, coalbed natural gas (CBNG), uranium mining projects; grazing, etc.;
- impacts to visual resources, open space, and vistas;

- impacts on grazing lessees and private land owners including traditional rural lifestyles;
- reclamation; and
- cumulative effects.

# 2.0 PROPOSED ACTION AND ALTERNATIVES

## 2.1 INTRODUCTION

Uranerz proposes to develop and operate a uranium ISR project (Alternative 1) within the Hank Unit project area located in southwest Campbell County, Wyoming (refer to Figure 1.1). Approving the project would result in development of federal mineral estate and disturbance of public surface lands administered by the BLM. Under 43 CFR 3809, locatable mineral activities that involve greater than "casual use" disturbance on five or more acres of public lands must submit a POO to BLM for review and authorization. The POO for the Hank Unit project is available for review at the BLM BFO office and website, and a synopsis of the POO is presented in Section 2.2. This information is essentially identical to the information contained in NRC Source Material License and the WDEQ/LQD Permit to Mine, both of which have been reviewed by the NRC, WDEQ/LQD, and the public and both have been approved by those respective agencies.

In addition to analyzing the Proposed Action, this EA also analyzes the No Action Alternative (refer to Section 2.3). Under Alternative 2 (the No Action Alternative), no development of the Hank Unit on BLM-administered lands would be authorized. Because of the configuration of the BLM-administered and privately-owned lands in the Hank Unit, if BLM does not approve the POO, no portion of the Hank Unit project would be developed. Cutting out that portion of the ore body situated on BLM-administered lands would cut out approximately half the ore body, and would result in two relatively small portions of ore body located on private lands, separated by approximately 1 mile (mi). This configuration would leave too little of the ore body to be developed economically, especially given the higher costs associated with developing such widely separated, and relatively small parcels.

Under NRC and WDEQ/LQD rules and regulations, uranium ISR projects are required to collect extensive pre-mining baseline information during approval of the specific license or permit. In addition, Uranerz is required to implement extensive monitoring programs and mitigation measures prior to initiation of development and mining operations. The currently approved NRC license and WDEQ/LQD permit to conduct mining operations for the Hank Unit includes these

requirements. Monitoring programs and mitigation measures that are required by NRC and WDEQ/LQD regulations are considered part of the Proposed Action, and the alternatives considered in this EA.

In addition and in accordance with NEPA regulations presented in 40 CFR 1502.14, the BLM has developed and considered several other alternatives, but these alternatives were not carried through detailed analysis in this EA. Information concerning these alternatives and why they were not carried through detailed analysis is presented in Section 2.4 of this EA.

## 2.2 ALTERNATIVE 1 - PROPOSED ACTION

### 2.2.1 Summary of the Proposed Action

The Proposed Action analyzed here is that portion of the Hank Unit that would take place on BLM-administered lands, which are limited to 280 acres within the Hank Unit. The project would be constructed in multiple sections within Townships 43 and 44 North, Range 75 West, 6th Principal Meridian in Campbell County (refer to Figure 1.1), within the administrative boundary of the BLM BFO.

The project area encompasses a total of approximately 2,250 acres. Surface ownership is divided between private entities (1,970 acres or 88%) and the U.S. Government (280 acres or 12%) (refer to Figure 1.2 and Table 2.1). Most of the mineral estate is owned by the federal government (approximately 1,538 acres or 68%) (administered by the BLM) and the remainder by various private entities (approximately 712 acres or 32%). However, all of the uranium mineral rights to be mined as part of the Proposed Action are unpatented mineral rights held by Uranerz. Refer to Section 1.1 for more detailed information.

Under the Proposed Action, Uranerz would develop one wellfield in the project area and the wellfield would be divided into two production areas (refer to Figure 1.2). Production Area #1, located in the northern portion of the Hank Unit, would be developed first. Production Area #2, located in the southern portion of the Hank Unit, would be developed second. Total disturbance

Table 2.1 Surface Ownership Within Hank Unit Project Area.

| | Legal Location | | | Surface Ownership | | |
|---|---|---|---|---|---|---|
| Unit | Section | Township | Range | BLM-administered Lands (acres) | Privately-owned Lands (acres) | Total (acres)[1] |
| Hank | 30 | 44N | 75W | 0 | 256 | 256 |
| | 31 | 44N | 75W | 170 | 523 | 693 |
| | 5 | 43N | 75W | 0 | 80 | 80 |
| | 6 | 43N | 75W | 110 | 544 | 654 |
| | 7 | 43N | 75W | 0 | 487 | 487 |
| | 8 | 43N | 75W | 0 | 80 | 80 |
| Total | | | | 280 | 1,970 | 2,250 |

[1] Section totals are accurate and some sections exceed 640 acres per section.

within the entire Hank Unit would be approximately 159.4 acres, with approximately 33 acres of proposed disturbance on BLM-administered lands within the project area (Table 2.2). The life of the project is anticipated to be approximately 10 years, and the tentative project schedule is presented as Figure 2.1. The Proposed Action would take place in four major phases. The first phase would be infrastructure development and would include all construction-related activities. The second phase would be the uranium recovery phase and would include all uranium recovery and processing activities. The third phase would be the groundwater restoration phase and would include activities to return the groundwater quality to pre-construction conditions. The fourth phase would be the decommissioning and reclamation phase and would include the removal of all facilities and infrastructure and permanent reclamation activities.

For purposes of this analysis, the effects of the Proposed Action are defined as those actions taking place on all lands within the Hank Unit (refer to Table 2.2). Surface-disturbing activities would include the installation and operation of injection, recovery, and monitoring wells, as well as access roads, wellfield header houses, pipeline/utility trenches, and power lines. Figure 2.2 illustrates the project area and the proposed location of new facilities and infrastructure. Table 2.2 summarizes the amount of initial and life-of-project (LOP) disturbance by landowner.

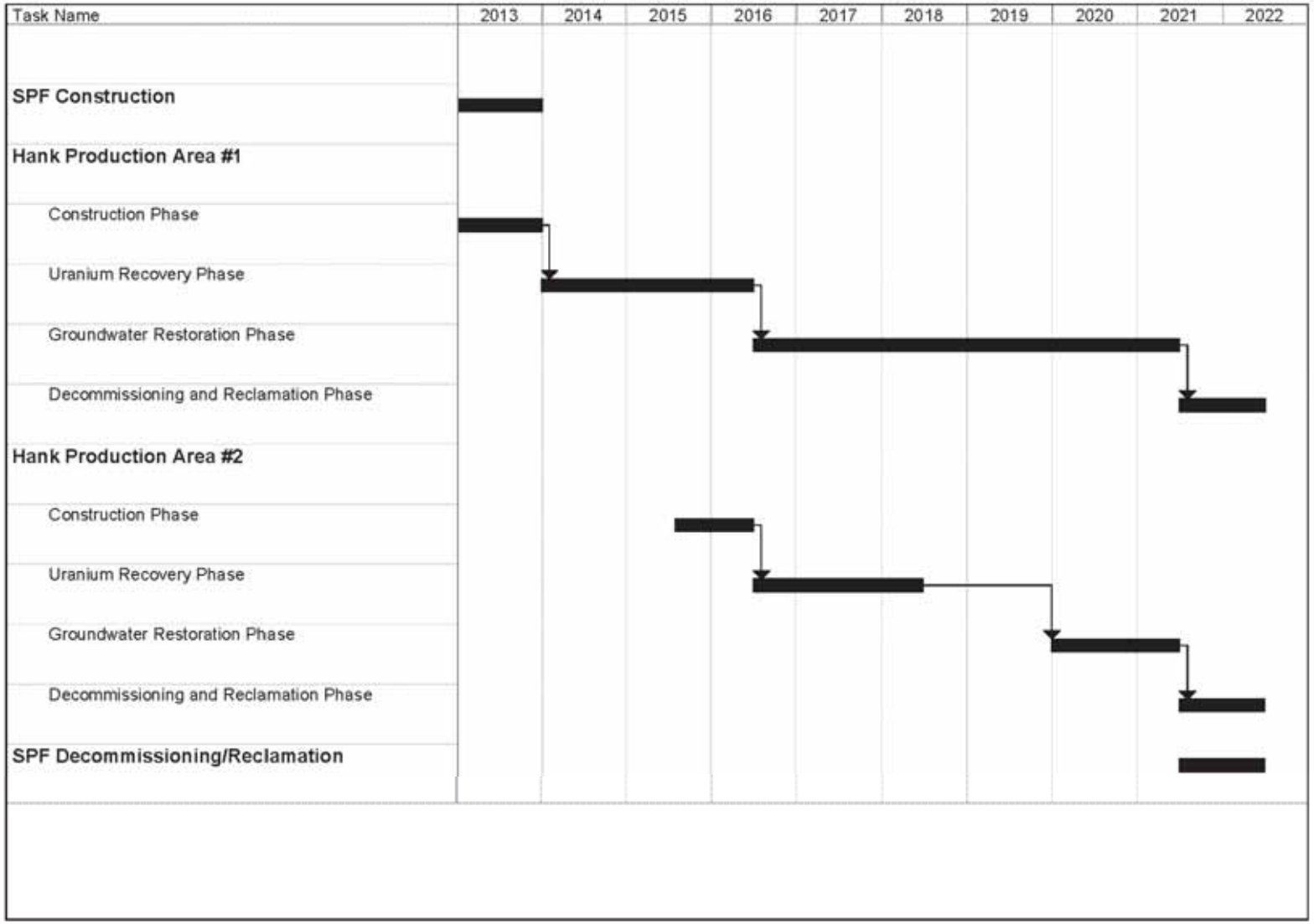



Figure 2.1 Project Schedule.

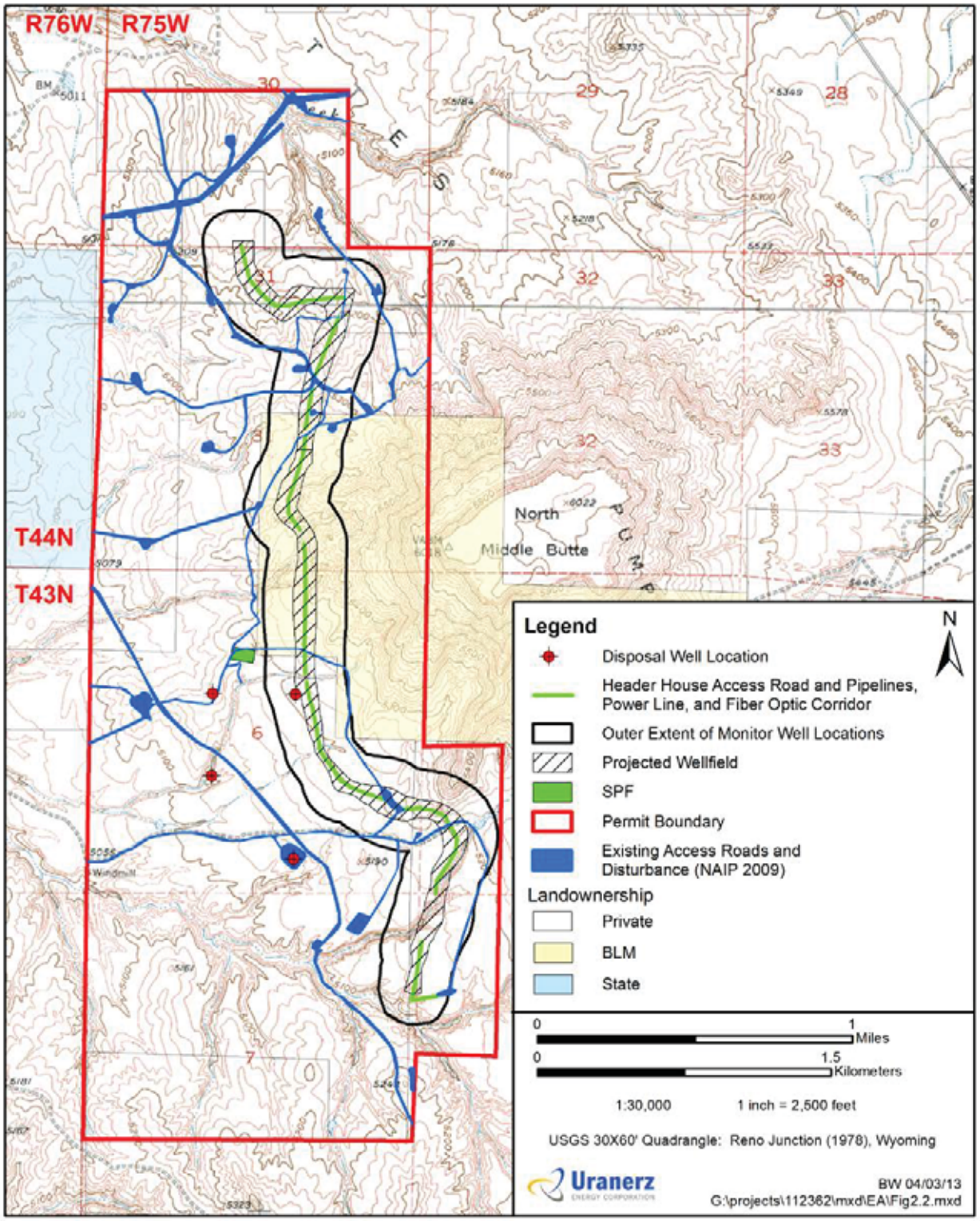



Figure 2.2 General Location of Wellfield Access Road and Adjacent Pipeline, Utility, and Communication Corridors.

Table 2.2 Estimated Acres of Surface Disturbance Within the Hank Unit (Proposed Action).

| | Initial Disturbance | | | Life-of-Project Disturbance | | |
|---|---|---|---|---|---|---|
| | BLM-administered Lands | Privately-owned Lands | Total | BLM-administered Lands | Privately-owned Lands | Total |
| SPF | 0.0 | 4.0 | 4.0 | 0.0 | 4.0 | 4.0 |
| Other Facilities[1] | 1.0 | 3.4 | 4.4 | 0.1 | 0.4 | 0.5 |
| Wellfield[2] | 32.0 | 119.0 | 151.0 | 2.2 | 5.6 | 7.8 |
| Total | 33.0 | 126.4 | 159.4 | 2.3 | 10.0 | 12.3 |

[1] Includes any disturbance associated with the wellfield access road and monitor wells that would not be located inside of the wellfield.
For initial disturbance on BLM-administered lands, it is assumed that there would be 15 monitor wells with 0.06 acres of disturbance per well (maximum of 50 ft X 50 foot [ft] area) for approximately 1 acre of total disturbance. On private lands, it is assumed that there would be 54 monitor wells with 0.06 acres of disturbance per well (3.2 acres of disturbance), plus 500 ft of additional wellfield access road not located inside of the wellfield (0.2 acres) for a total of 3.4 acres of initial disturbance.
For life-of-project disturbance on BLM-administered lands, it is assumed that 15 monitor wells with 0.002 acre per well disturbance (10 ft X 10 ft area) would result in a total of 0.1 acres of disturbance. For life-of-project disturbance on privately-owned lands, it is assumed that there would be 54 monitor wells with 0.002 acres disturbance per well for a total of 0.2 acres of disturbance, plus 500 ft of additional wellfield access road (0.2 acres) for a total of 0.4 acres of disturbance.

[2] For initial disturbance on BLM-administered lands, it is assumed to be all areas within the wellfield (32 acres). For initial disturbance on privately-owned lands, it is assumed to be all areas within the wellfield (119 acres). For life-of-project disturbance on BLM-administered lands, it is assumed that there would be 4,300 ft wellfield access road, with a width of 20 ft for a total disturbance of 2.0 acre, plus 8 header houses on BLM lands (0.02 acres per header house) for 0.2 acres of disturbance, and a combined total of 2.2 acres. For life-of-project disturbance on privately-owned lands, it is assumed that there would be 11,000 ft wellfield access road with a width of 20 ft for a total disturbance of 5 acres, plus 27 header houses on private lands (0.02 acres per header house) for 0.6 acres and a combined total of 5.6 acres.

Approximately 159.4 acres would be initially disturbed during development of the Proposed Action; 126.4 acres (79%) would be disturbed on privately-owned lands and the remaining 33 acres (21%) would be disturbed on BLM-administered lands. Total disturbance accounts for only 7% of the entire Hank Unit project area. Following project development, approximately 147.1 acres would be temporarily revegetated. There would be a total of 12.3 acres of life-of-project disturbance; 10 acres of life-of-project disturbance on privately-owned lands and 2.3 acres of life-of-project disturbance on BLM-administered lands. Total life-of-project disturbance accounts for approximately 0.5% of the entire Hank Unit area. Following

completion of uranium recovery and aquifer restoration, the project area would undergo decommissioning that would involve the redisturbance of previously reclaimed areas, the removal of project facilities, and the permanent reclamation of the project sites as described in Section 2.2.3.5.

### 2.2.2 Preconstruction Activities

#### 2.2.2.1 NRC, WDEQ/LQD, and Other Non-BLM Permitting

Regardless of surface or mineral ownership, prior to commencing development/construction or operation of an uranium ISR project in Wyoming, the operator must obtain a Source Material License from the NRC and a permit to mine from the WDEQ/LQD. Other required State of Wyoming permits include an air quality permit, a storm water discharge permit, well permits, etc., that would be obtained by Uranerz prior to project start-up (refer to Table 1.1). As discussed in Section 1.0, Uranerz has secured the NRC license, the WDEQ/LQD permit, the deep disposal well permit from the WDEQ/WQD, and other non-BLM permits/approvals required for the Nichols Ranch ISR project (including those required for the Hank Unit).

Development, recovery, restoration, and reclamation activities are described in detail in the POO, the NRC License, and the WDEQ/LQD Permit to Mine. The Source Material License (SUA-1597) was approved by NRC in July 2011, and the WDEQ/LQD approved the Permit to Mine (No. 778) in December 2010. These documents are incorporated by reference.

#### 2.2.2.2 BLM Approval Process

The NRC regulates uranium milling operations and WDEQ/LQD regulates uranium mining operations within the Nichols Ranch Unit and Hank Unit project areas regardless of surface or mineral ownership, but these agencies do not authorize disturbances on BLM-administered lands within the project area. As the Proposed Action would include land administered by the BLM, the BLM has an obligation under 43 CFR 3809 and NEPA to conduct a review of the project that would affect the BLM-administered lands. If appropriate, BLM would authorize the POO,

including the addition of any provisions or mitigation needed to ensure that no unnecessary and undue degradation of public lands would occur. The BLM authorization is different from those of the NRC and the WDEQ/LQD and the BLM is obligated to complete the required reviews.

The MOU between the WDEQ/LQD and BLM provides for the WDEQ/LQD to have lead review responsibility for analyzing information regarding surface owner interests except for BLM-administered lands within the project area and analysis of impacts related to climatology, hydrology, overburden, soils, vegetation, wildlife, and wetlands (BLM 1975). In addition, Uranerz would comply with all applicable state and federal regulations. The WDEQ/LQD analyzes and permits the entire project; however, the BLM analyzes the Proposed Action under the appropriate regulations as it includes BLM-administered lands.

The ISR uranium development issues addressed by the two federal agencies differ because of their different missions and authorities. BLM's NEPA review of the Proposed Action is not meant to duplicate the NRC NEPA review and NRC SEIS performed as part of its source material licensing process. The NRC GEIS and SEIS evaluated potential impacts associated with construction, operation, aquifer restoration, decommissioning, and reclamation of the entire Nichols Ranch project and these documents are incorporated by reference into this EA.

Uranerz submitted a POO for approval to disturb BLM-administered lands on February 26, 2008. The BLM determined that the POO was not complete as submitted and Uranerz submitted the last set of revised materials to the BLM on May 22, 2012. The revised POO was deemed complete by the BLM on June 8, 2012. Numerous mitigation measures required and approved by NRC and WDEQ/LQD are contained in the POO and the Proposed Action. Additional mitigation measures not adequately addressed in the POO are identified and included in this EA. BLM's authority to approve disturbance due to uranium exploration and/or development activities is limited to BLM-administered lands; however, BLM will analyze environmental effects originating from the entire Hank Unit. BLM reviews submitted POOs in accordance with 43 CFR 3809.411, and may approve a POO as submitted, if it is determined to not result in unnecessary or undue degradation of public lands.

There are two other possible outcomes from BLM's review of a POO.

1) approve the POO subject to changes or conditions that are necessary to meet the performance standards of §3809.420 and to prevent unnecessary or undue degradation. BLM may require Uranerz to incorporate other agency permits, final approved engineering designs and plans, or other conditions of approval from the review of the POO filed under §3809.401(b); or

2) disapprove, or withhold approval of the POO because the POO:

(i) does not meet the applicable content requirements of §3809.401;

(ii) proposes operations that are in an area segregated or withdrawn from the operation of the mining laws, unless the requirements of §3809.100 are met; or

(iii) proposes operations that would result in unnecessary or undue degradation of public lands.

The BLM initiated public scoping on the project on June 13, 2012, and the public comment period concluded on July 15, 2012.

### 2.2.3 Summary of the Plan of Operations

#### 2.2.3.1 Overview

Commercial uranium ISR has been conducted in the U.S. since the mid-1960s and is currently the leading extraction technology for uranium recovery in this country. Chapter 2.0 of the NRC SEIS and Mine Plan section of the POO provide a detailed description of the ISR process and that information will not be repeated here (NRC 2011; Uranerz 2012). The primary advantages of ISR over conventional mining include: 1) limited surface disturbance when compared to open pit mining; 2) reduced long-term environmental impacts; 3) lower capital costs; and 4) the ability to produce uranium from low-grade ores that would be economically unrecoverable using conventional open pit or underground mining techniques.

Uranerz proposes to produce uranium using the proven ISR recovery process over an anticipated production life of 4.5 years from the wellfield in the Hank Unit. The location of the proposed uranium recovery area called a wellfield is illustrated on Figure 2.2. There are two production areas within the Hank Unit wellfield and these areas would be developed sequentially. A portion of both production areas would be located on lands administered by the BLM (refer to Figure 1.1). The surface disturbance on the BLM-administered lands would be limited to the construction of injection, recovery, and monitoring wells; access roads; header house buildings; and various wellfield buried pipelines, power lines, and fiber optic communication lines. Similar facilities plus the SPF would be located on privately-owned lands.

Uranium ISR involves the use of conventional water wells and a leaching solution called a lixiviant to recover the uranium without physically removing and process the ore-bearing rock, as is done in conventional mining operations. The lixiviant consists of native groundwater to which an oxidant, such as oxygen, would be added to make the uranium soluble in the groundwater and a complexing ion, such as carbon dioxide, with which the uranium combines, allowing it to be transported in the groundwater to the surface. The resulting uranium-rich solution would be drawn to recovery wells where it is pumped and then transferred to the Hank Unit SPF. In the SPF the uranium-bearing fluid goes through ion exchange columns, where the uranium is recovered from the solution and loaded on to resin beads. The leaching solution is then recharged with the oxidant and reinjected to recover additional uranium from the wellfield. More detailed information is presented in the NRC SEIS (2011).

#### 2.2.3.2 Construction Phase

##### Topsoil Salvage Operations

Prior to the initiation of any construction activities, topsoil would be salvaged from all proposed disturbance areas during construction activities, including the SPF, wellfield access road, buried utility lines, well sites, and header house sites.

On BLM-administered lands topsoil would be directly hauled to areas that have been recontoured and are waiting retopsoiling, instead of stockpiling the topsoil. However, if direct replacement of topsoil is not possible, the topsoil would be stored in designated topsoil stockpiles in accordance with WDEQ/LQD rules and regulations. Maximum height of the topsoil stock piles would be 3 feet (ft) with a spread out base to retain the viability of the biological components of the soil. These stockpiles would be located to minimize topsoil losses from wind and water erosion. Topsoil stockpiles would not be located in any drainage channels or other locations that could lead to a loss of material.

Once the topsoil piles are completed, berms (or toe ditches) would be constructed around the base of each stockpile. All stockpiles would then be drill seeded at the first seasonally appropriate times with a seed mixture containing a mixture of 6 pounds of pure live seed (PLS) per acre of western wheatgrass, 6.0 pounds of PLS per acre thickspike wheatgrass, and 2.0 pounds PLS per acre slender wheatgrass. Seeding of topsoil piles would reduce soil loss from wind and water erosion. Additionally, in accordance with WDEQ/LQD requirements, all topsoil stockpiles would be identified with highly visible signs labeled "Topsoil." Topsoil salvaged during the construction of the wellfield access road, header houses (i.e., life-of-project facilities) would not be reapplied until final reclamation and restoration has taken place. However, topsoil salvaged during construction of wells and buried utility lines would be reapplied and seeded once construction is completed.

Other Site Preparation Activities

Tractor trailers would deliver materials and equipment necessary to construct the SPF and wellfields to the Hank Unit, and these deliveries would occur using existing access roads. Existing roads have been used over the past several years for coal bed natural gas (CBNG) development and are designed to accommodate these delivery vehicles (refer to Figure 2.2). Because the installation of uranium ISR facilities are relatively small-scale construction projects, the magnitude of trucking activities required to support this stage of the project is relatively minor compared to other industrial development activities. Therefore, no improvements to the existing access roads would be required under the Proposed Action. Although a variety of

construction vehicles would likely be required (e.g., bulldozers, excavators, front-end loaders, scrapers, etc.), many vehicles would be transported to the sites on flatbed trailers. Exceptions may include graders, cranes, drill rigs, and potentially oversized loads carrying ion exchange vessels or other nonstandard loads related to the construction of the Hank Unit SPF. Uranerz estimates eight passenger vehicles (standard light duty trucks or 3/4-ton trucks, gas or diesel fuel) per day per week, along with six tractor trailers (diesel) per week during the construction phase of the project.

Uranerz would install fencing to prevent livestock from entering the active (i.e., developed) portion of each wellfield. To minimize potential impacts to big game, Uranerz would utilize a three-strand fence that would comply with WDEQ/LQD Type III fence to prevent livestock from entering the wellfield, but it would allow the safe passage of wildlife through the wellfield (WDEQ/LQD 1994a). Once restoration and reclamation activities are completed, all fences would be removed from the BLM-administered lands.

Satellite Processing Facility

The Hank Unit SPF would be located in approximately the center of the Hank Unit on privately-owned surface land and it would include an ion exchange system (Figure 2.3). There would be approximately 4 acres of initial and life-of-project disturbance, which would include the Hank Unit SPF, a concrete batch plant, and temporary storage areas within the 4-acre foot-print. The Hank Unit SPF would consist of a main metal building approximately 80 x 180 ft with maximum eave heights of approximately 25 ft. The Hank Unit SPF would also include a 90 x 60-ft maintenance building with maximum eave heights of 18.5 ft, a dedicated area for vehicle, electric, and pump maintenance, and additional office space for field and operating personnel. Major processing equipment would be housed in the SPF with the exception, of 2-4 bulk chemical storage tanks of oxygen and carbon dioxide that would be located outside of the processing building (refer to Figure 2.3).

The Hank Unit SPF would be constructed on concrete pads with curbs to prevent liquids from leaving the building and entering the environment. Uranerz's proposed engineering controls and

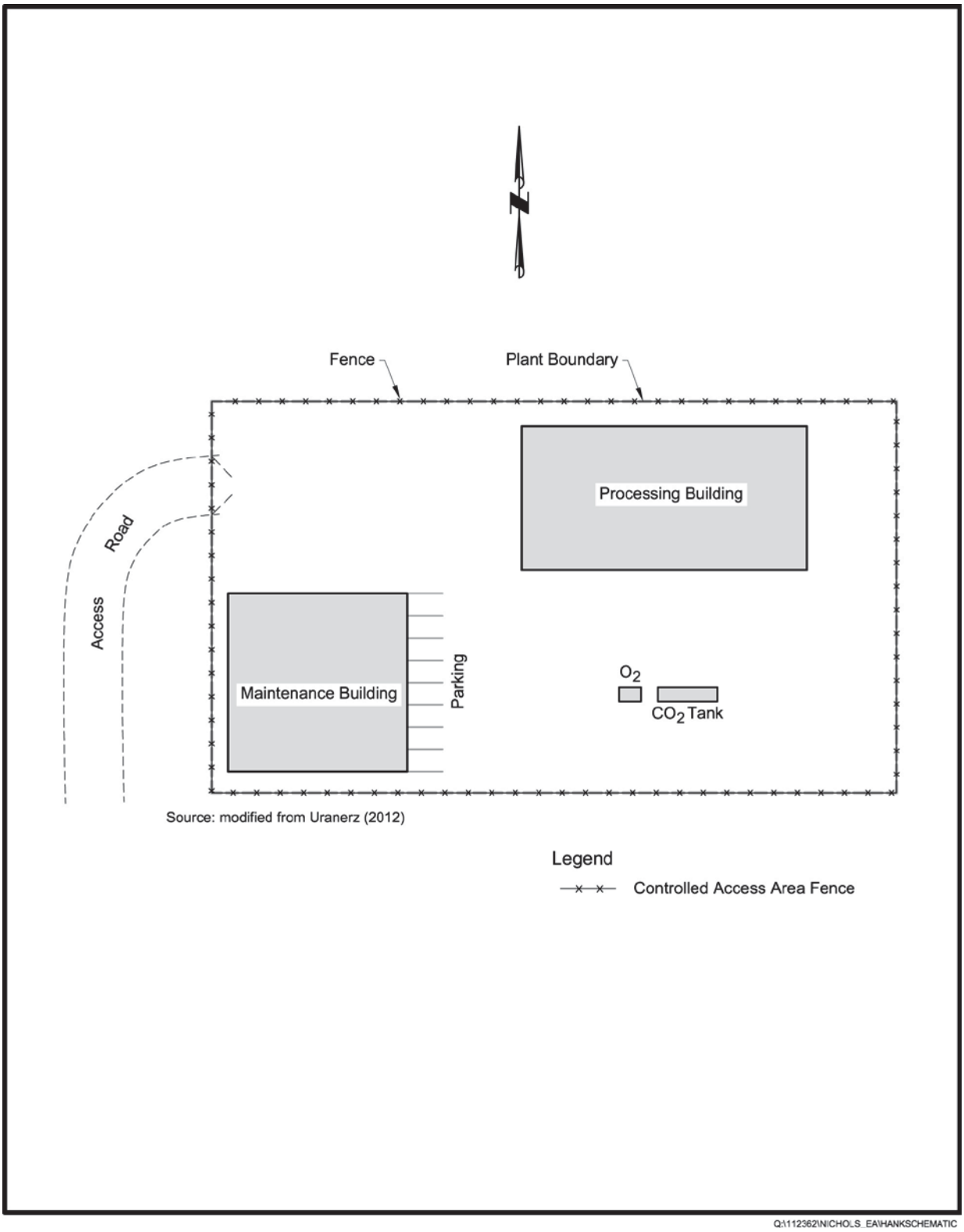



Figure 2.3 Layout of the Proposed SPF.

operational monitoring program, are designed to quickly detect and minimize spills and leaks. Leaks from vessels and equipment on these pads, including water from equipment wash down, would drain to a sump and either be pumped back into the process circuit or to a Class I deep disposal well that would be located near the Hank Unit SPF. This deep disposal well would be similar in design and depth to existing deep disposal wells at other active uranium ISR sites. Deep disposal wells are discussed in more detail later in this section of the EA. The concrete floors within the Hank Unit SPF would be designed to support the full weight of all processing vessels and other equipment to be housed therein and would be designed to meet all applicable building codes and standards. Outside chemical storage locations would be constructed with concrete curbed secondary containment for all tanks.

In accordance with NRC regulations, the entire Hank Unit SPF would be fenced with a 6-ft high chain-link fence, and gated to control access.

Primary Access Roads

The primary transportation routes, to and from the proposed Hank Unit project area, would be via existing state, county, and private roads (refer to Figure 1.1). The proposed Hank Unit project area is accessible from two directions State Highway 50 to the Van Buggenum road (County Road 102) to the Christensen Road (County Road 21) to T-Chair Ranch Roads (private roads) or via State Highway 387 north to T-Chair Ranch roads (private roads) (refer to Figure 1.1). The Van Buggenum Road (County Road 102) and the Christensen Road (County Road 21) are crowned-and-ditched public roads maintained by Campbell County and surfaced with gravel and range from 18 to 24 ft wide. These roads are capable of handling two tractor trailers passing one another and have a posted speed limit of 45 miles per hour (mph).

Ranch roads occurring on T-Chair Ranch property are privately-owned crowned-and-ditched roads ranging from 15 to 20 ft wide. They were constructed by either the property owner or by CBNG well operators that use the area and these roads are maintained by the CBNG operators. These roads have a posted speed limit ranging 20 to 30 mph and would allow for the safe passage of both passenger cars and tractor trailers. Both the county and private ranch roads are

currently being used by numerous oil and gas and CBNG companies that are active in the general area. It is this set of county and private access roads, including County Road 31 (only located on private surface lands), that would be used to provide access for the transportation of resin beads between the Hank Unit SPF and either the Nichols Ranch Central Processing Plant (CPP) or the Cameco Resources Smith Ranch-Highland CPP. Uranerz and Cameco Resources entered into an agreement in which Uranerz could transport uranium-loaded resin beads to Cameco Resources Smith Ranch-Highland CPP, if needed. Once delivered to either CPPs, the uranium would be processed into yellowcake.

No additional main access roads would be required or constructed. Only public roads or roads located on private surface lands would be crossed as part of the transfer of resin beads between the Hank Unit SPF and either of the Nichols Ranch Unit CPP or Cameco Resources Smith Ranch-Highland CPP.

Wellfield Access Road

While the Proposed Action would utilize existing roads to access the SPF, an additional access road to the header houses located in the wellfield would be required and would need to be constructed (refer to Figure 2.2). The wellfield access road would have a driving surface limited to 20 ft wide. The wellfield access road would be constructed pursuant to the surface owner's instructions or BLM specifications (for improved template roads for the portion of the wellfield access road located on BLM-administered lands). In accordance with BLM road guidelines, the portion of the wellfield access road located on BLM-administered lands which would be used by heavy equipment and would be surfaced for use during both wet and dry conditions (BLM 2008d). During construction, the roads would be watered as needed to minimize dust emissions. The water would be obtained from existing sources that have been permitted by the Wyoming State Engineer's Office. Access roads would cross ephemeral drainage channels at three locations in the Hank Unit and properly sized culverts would be installed at each channel crossing. The culvert designs would follow the design criteria listed in WDEQ/LQD Guideline 8 or BLM specifications.

In order to provide access from the wellfield access road to the individual wells, employees and equipment would utilize existing two-track roads or travel cross-county. No new roads would be constructed from the wellfield access road to the injection, recovery, and monitor wells. This approach is typical for uranium ISR projects and is based on the fact that there would be limited amount of traffic (only that needed to install the injection, recovery, and monitor wells and the associated facilities), and there would be only minimal vehicle traffic during operation of the project for maintenance and inspection activities. This approach is intended to avoid establishing additional permanent roads in the area and to minimize overall surface disturbance. With the exception of the header houses and access roads, all disturbed areas within the wellfield would be retopsoiled and revegetated at the first seasonal opportunity following wellfield development. The disturbed areas would be reclaimed according to the procedures described in the Section 2.2.3.5 of this EA. Although the exact location of all surface-disturbing activities that are anticipated to occur within the wellfield are unknown, the nature and extent of such disturbances would be similar to what has been implemented in the other ISR uranium projects in Wyoming and are described in this EA.

Header House

Uranerz would install a maximum of approximately 35 header houses within the Hank Unit. These buildings would serve to contain manifolds with valves, piping, electrical closures, flow meters, and instrumentation for approximately 30-60 injection and recovery wells per header house. Approximately 27 header houses would be located on privately-owned surface lands, and eight header houses would be located on BLM-administered lands. Piping contained in the header house would connect the feeder lines from the injection and recovery wells with the trunk lines that would be connected to the Hank Unit SPF. Electrical power would also be supplied to each header house via buried or above-ground power lines as site specific conditions dictate. A more detailed discussion on project power lines is presented below.

Each header house would be a metal building measuring a maximum of approximately 40 ft (L) x 20 ft (W) x 14 ft (H) in size and would be set on top of an excavated concrete or steel foundation measuring approximately 6 ft deep. The concrete foundation would be 6 inches thick

or the steel plate would be 3/16 inches thick. Piping would enter the header house through the walls of the foundation. Removable metal grating would serve as a raised floor across the top of the concrete foundation and would allow access to the subfloor area containing some valves and hose runs. Other manifolds and control equipment would be located on the main floor of the header house. The floor of the foundation would slope to a sump with an automatic level control sump pump. The sump would collect any fluids in the foundation and any fluids would be pumped into the recovery pipeline. The sump pump would also include check valves to prevent the flow of any material back into the header house.

Each header house would be located immediately adjacent to the wellfield access road. Once construction of a header house is completed, the area around each header house would be reclaimed and revegetated. All header houses would be painted with a color that blends into the surrounding topography. These colors would typically be Covert Green (PANTONE for Architecture Color Guide 18-0617 TPX) for header houses located on BLM-administered lands. The remaining header houses located on privately-owned lands would be painted Covert Green or Carlsbad Canyon (Munsell Soil Color 2.5Y 6/2) depending on which color best blends into the surrounding environment.

Individual well flow readings would be recorded on a per shift basis, and overall wellfield flow rates would be balanced at least once per day. Alternately, flow and volume data from equipment located in each header house would be transferred to the main plant and checked. In addition, an Uranerz Environmental Safety & Health staff representative or designate would conduct a daily walkthrough inspection of each header house. The inspection would provide for a visual survey of proper implementation of procedures, housekeeping, and contamination control.

Buried Pipelines, Power Lines, and Communication Lines

During the development of the wellfield, buried pipelines, power lines, and fiber optic communication lines would be installed within the wellfield. These facilities would all be placed in the same general corridor area. The pipeline, utility, and communication corridor would be a

maximum of 20 ft wide and would generally run adjacent to the wellfield access road. However, use of the full width of the utility corridor would be rare and limited to the construction phase of the project.

Trunk lines from the header houses to the SPF would be up to 14 inches in diameter and made of high-density polyethylene (HDPE). Feeder lines to and from each well head to the header houses would be 1- to 2-inch diameter HDPE or polyvinyl chloride (PVC) pipe. Pipelines would be buried a minimum of 2 ft below the surface using a conventional open trench method and would be backfilled after system testing has been completed. All electrical utilities and fiber optic communication lines to each individual injection and recovery well, the header house, and the Hank Unit SPF would also be buried a minimum of 2 ft below the surface. Where possible, and to minimize surface disturbance, buried electrical and fiber optic communication lines would be installed using a cable plow method. Interim and permanent reclamation procedures would be completed on all pipelines, power lines, and fiber optic communication lines where the lines have been buried.

To minimize potential environmental impacts, due to the installation of power lines, pipelines, and fiber optic communication lines, Uranerz would implement the following mitigation measures: 1) Uranerz (or its electrical contractor) would not construct any aboveground power lines, permanent high-profile structures such as storage tanks, or other potential perch sites within 0.5 mile (mi) of any active greater sage-grouse lek near the Hank Unit project area and 2) all pipelines and fiber optic communication lines within 2 mi of the base of the North Middle Butte (which is part of the Pumpkin Buttes Traditional Cultural Property [TCP]) would be buried to minimize potential visual impacts to the TCP that is eligible for the National Register of Historic Places (NRHP). In addition, wherever practical, power lines within 2 mi of the base of the Pumpkin Buttes TCP would be buried to minimize potential visual impacts to prehistoric sites that are eligible for the NRHP. Where the power lines could not be buried (due to local topographic or geological conditions), construction of overhead power lines within 2 mi of the base elevation of the North Middle Pumpkin Buttes would be designed to reduce visual contrast. Whenever possible, any power line would be installed in areas of existing disturbance. All aboveground power line would be constructed in compliance with *Suggested Practices for*

*Raptor Protection and Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006). Uranerz would also install buried fiber optic communication lines to allow for remote monitoring and controlling well uranium recovery and aquifer restoration activities at the header houses and wells from the SPF. The fiber optic communication lines would thus serve to reduce vehicle traffic and human presence in the wellfields.

Delineation Drilling, Well Drilling, and Wellfield Construction

Several types of wells would be installed in the project area, including injection wells, recovery wells, monitor wells, and deep disposal wells. Injection and recovery wells would be completed in the mineralized intervals of only one production zone at any one time. Injection and recovery wells would also be completed in a manner that isolates the ore-bearing interval from all other aquifers. Monitor wells would be used to monitor and detect migration of mining fluids, both vertically (to aquifers overlying and underlying the ore zone aquifer) and horizontally (latterly away from the wellfield. The deep disposal wells would be installed to properly dispose of liquid wastes generated during all phases of the ISR process.

Surface disturbance within the project area would occur over several years depending on the uranium recovery rate. In addition, to the NRC license and the WDEQ/LQD Permit to Mine, each production areas would be approved individually by the NRC and WDEQ/LQD prior to start-up. Regulatory review and approval for the "wellfield package" that includes detailed information for aquifer testing, pump testing, well installation, monitor well installation, utility installation, wellfield delineation and development, and interim surface reclamation, each production area would likely take up to a year to complete for each production area.

Prior to any drilling activities, topsoil from each drill site would be separated from the subsoil with a backhoe and stockpiled. The topsoil would be first removed and then placed in a topsoil stockpile. The subsoil for the mud pit would then be removed and placed next to the mud pit. When use of the mud pit is completed (usually within 30 days of initial excavation), subsoil would be backfilled in the mud pit followed by the replacement of the topsoil and revegetated as described later in Section 2.2.3.5 of this EA.

Delineation Drilling and Wellfield Development

Delineation drilling is the process of exploration drilling to delineate the exact location of the ore body within a wellfield. If a delineation borehole is determined to be within the ore body, the borehole would be developed into a recovery well as described below. However, if the delineation borehole is determined not to be within the ore body, the borehole would be geophysically logged, plugged, and abandoned in accordance with appropriate state and federal requirements.

The surface disturbance or footprint for each delineation borehole would be a maximum of approximately 800 $ft^2$ (0.2 acres). Drilling mud pits would be temporarily fenced to prevent human and animal intrusion and injury. The fencing would remain in-place until the drilling fluids have been removed or evaporated, after which the pits would be backfilled and permanently reclaimed according to the description presented in Section 2.2.3.5 of this EA.

The wellfields would consist of groups of injection and recovery well patterns typically arranged with four corner injection wells and a central recovery well per pattern (five spot injection/recovery layout) (Figure 2.4). Figure 2.4 also illustrates the movement of fluids to and from the wellfield. Flow from small groups of injection and recovery wells within the wellfield would be piped to the header houses. Fluids would then be transported between the SPF and wellfield header houses through buried trunk lines. Pipelines, power lines, and fiber optic communication lines would generally be constructed in the same corridor and adjacent to wellfield access roads to the extent possible.

The initial surface disturbance or footprint for each injection or recovery well would be a maximum of 800 $ft^2$. To the extent possible, Uranerz would minimize all surface-disturbing activities. In accordance with WDEQ/LQD regulations, topsoil would be salvaged from the production area.

Pilot holes, for recovery and injection wells, would be drilled through the target completion interval with a small rotary drilling unit using native mud and a small amount of commercial

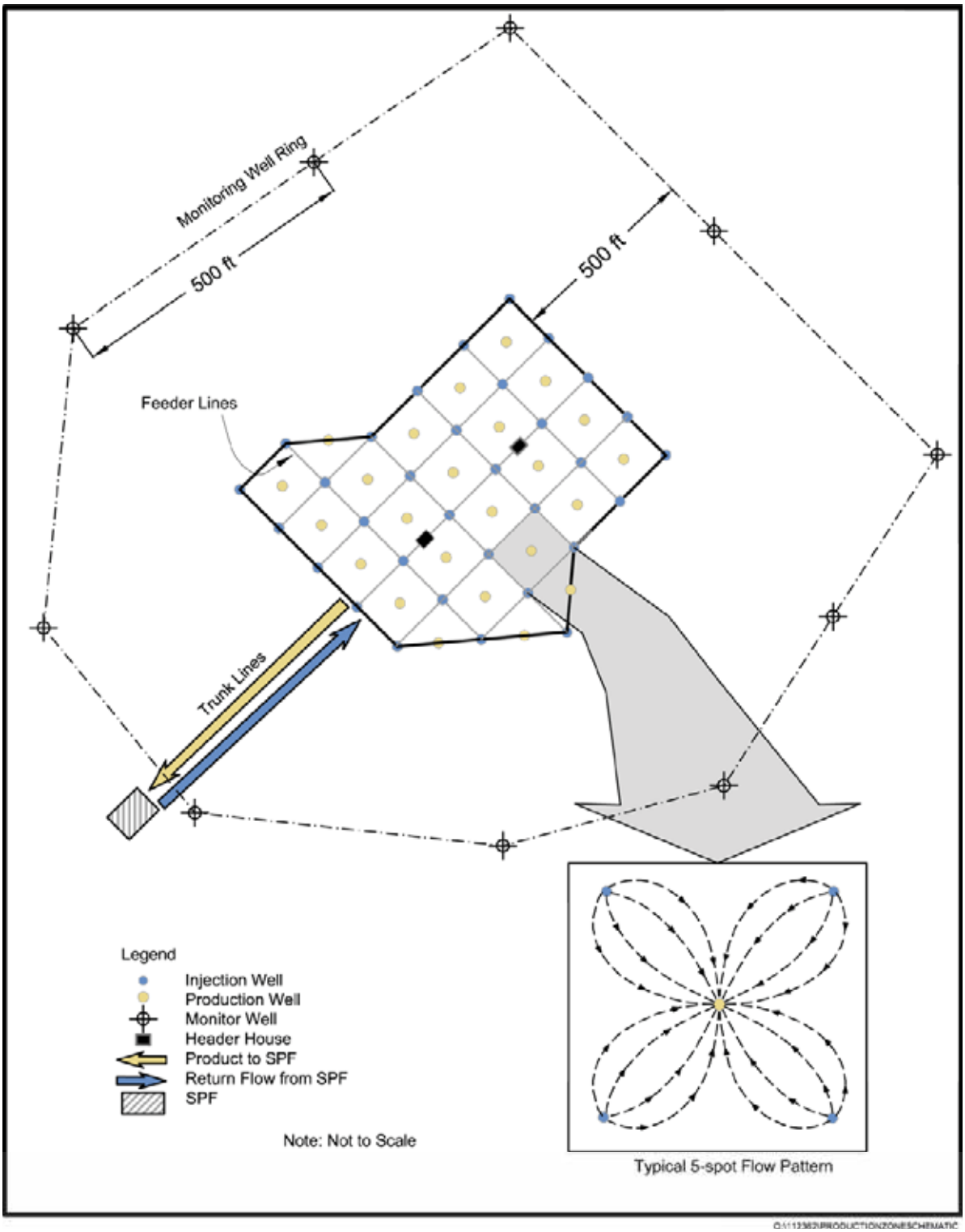



Figure 2.4 Plan View of Typical Wellfield Layout and Flow Pattern.

drilling fluid additive for viscosity control. The pilot hole would be logged, reamed, casing set, and cemented to isolate the completion interval from all other aquifers. The cement would be placed by pumping it down the casing and forcing it out the bottom of the casing and back up the casing-drill hole annulus to the surface. The pilot holes would be large enough in diameter to provide at least 3 inches of annulus space per regulations. After the well is cemented to the surface and the cement has set, the well would be drilled out and completed either as an open hole or fitted with a screen assembly (slotted liner), which may have a sand filter pack installed between the screen and the under-reamed formation. Figure 2.5 show the cross section of a typical injection/recovery well design.

Monitor Wells

Monitor wells would be installed to detect migration of mining fluids, both vertically and horizontally, away from the wellfield. Monitor wells would be completed into the production zone in a ring around the wellfield units. These monitor wells would be installed at a well spacing of approximately 500 ft between monitor well and wellfield and a maximum of 500 ft between each monitor well (refer to Figure 2.4). Monitor wells would be installed in the overlying and underlying aquifers at a density of one well for every 4 acres of wellfield area and would detect the vertical and horizontal movement of mining fluids. The distance between overlying or underlying monitor wells in the same zone would not exceed 1,000 ft and these wells would be installed within the confines of the wellfield unit area. Although the wells located on BLM-administered land are subject to BLM approval the approximate location of all monitor wells has already been reviewed and approved through the NRC license and WDEQ/LQD permitting process. The locations of the monitoring wells are illustrated on Figure 2.6. Detailed groundwater monitoring procedures are presented in Section 2.2.3.7 of this EA.

The surface disturbance or footprint for each monitor well during well installation would be a maximum of 800 $ft^2$ and each monitor well would be geophysically logged. Figure 2.7 shows the cross-section of a typical monitor well design.

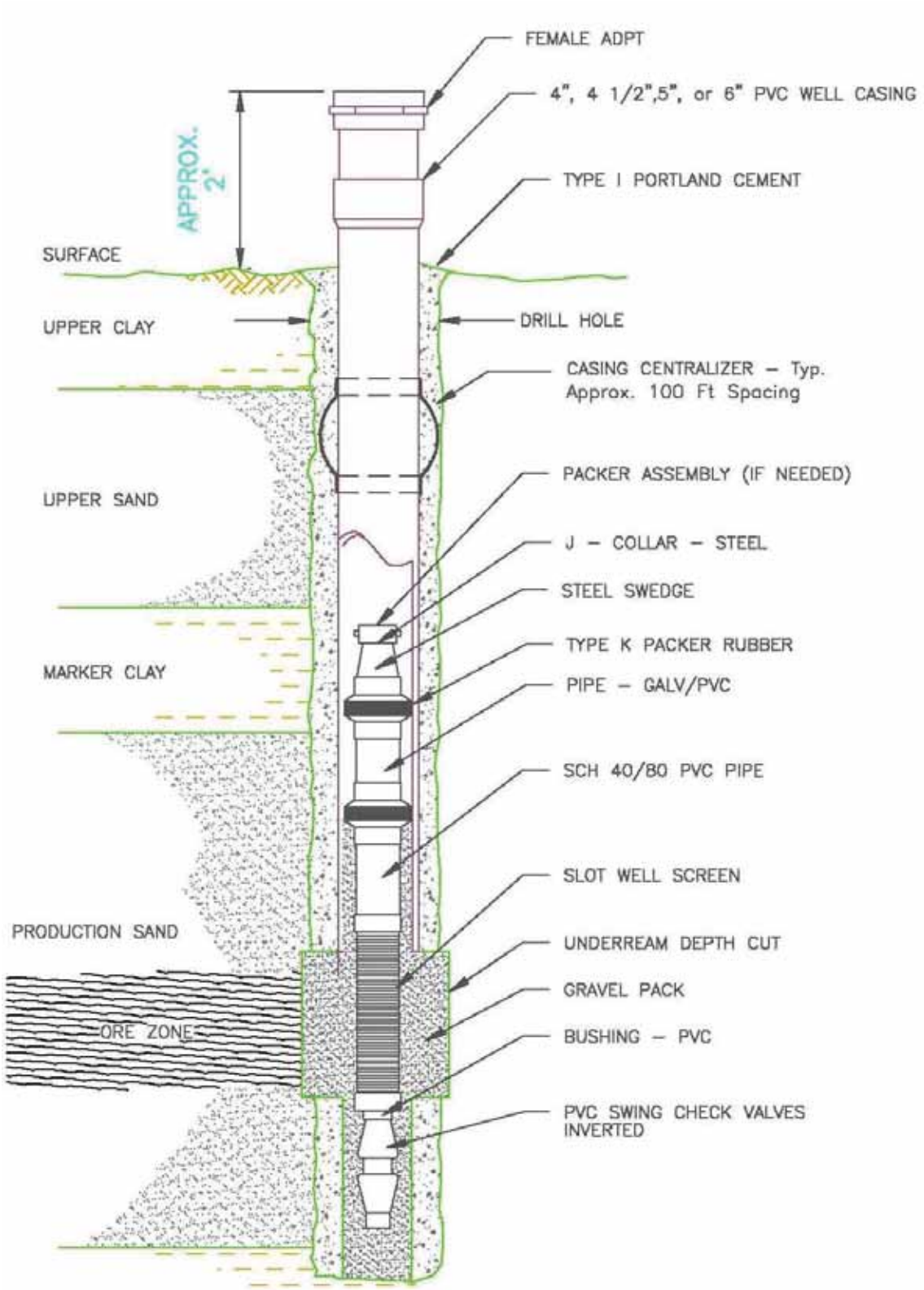



Figure 2.5 Typical Injection/Recovery Well Design.

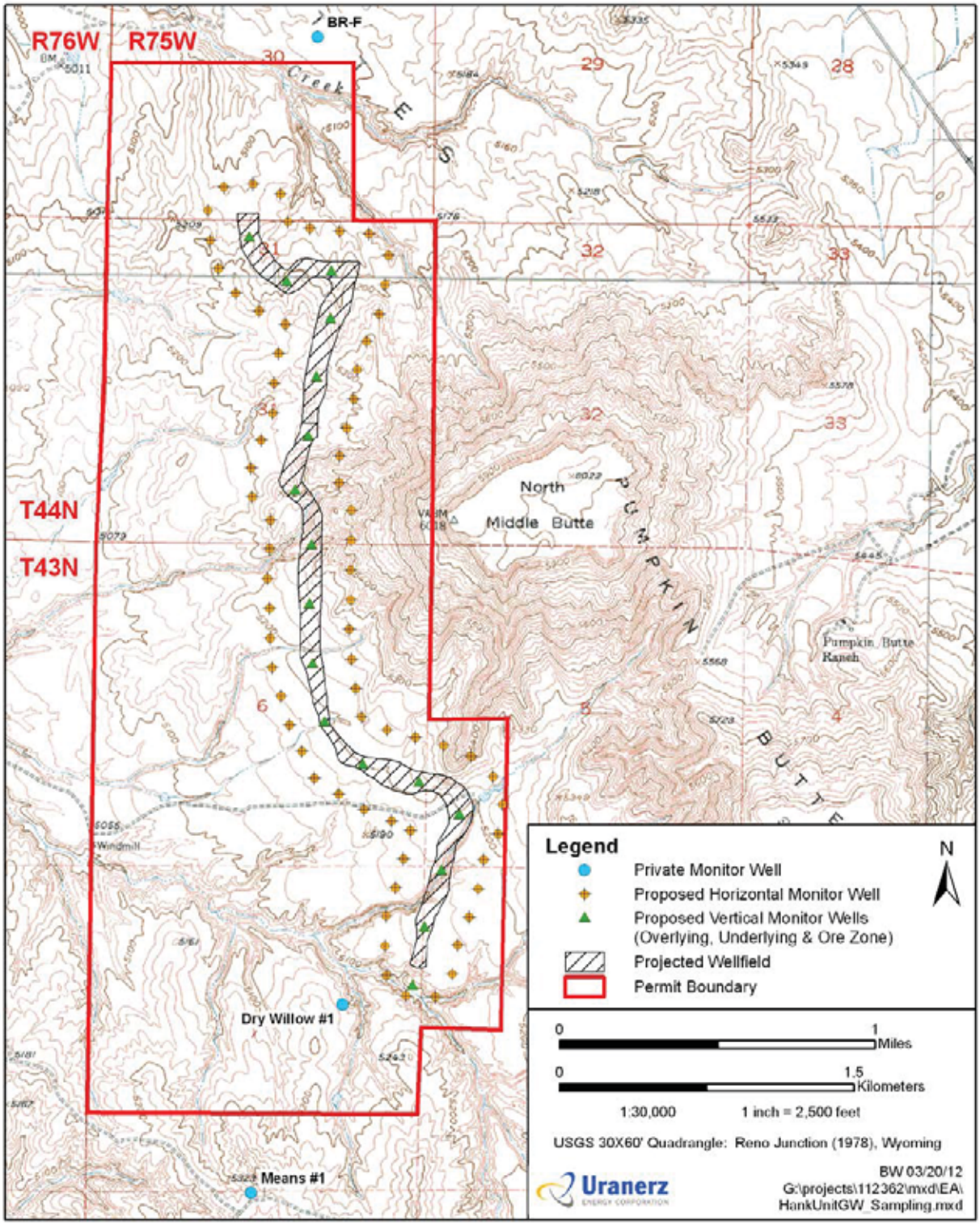



Figure 2.6 Hank Unit Groundwater Sampling Locations.

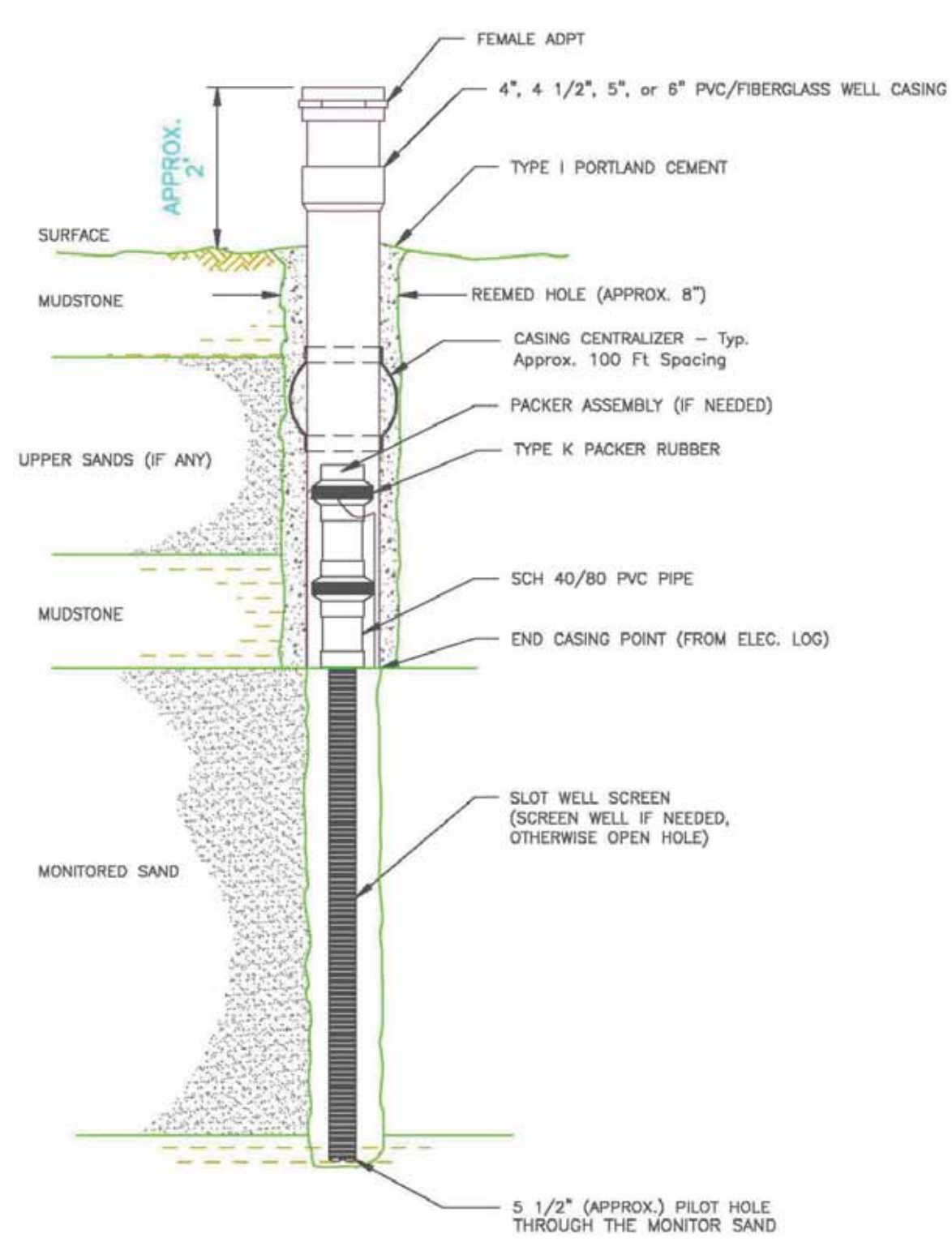



Figure 2.7 Typical Monitoring Well Design.

Well Mechanical Integrity Testing

Following well completion, all recovery, injection, and monitoring wells would undergo mechanical integrity tests (MIT). The Class III wells (injection wells) would also undergo MIT every 5 years thereafter to evaluate the continuing integrity of the well casing. If a well does not meet the mechanical integrity criteria, the casing would be repaired (if possible) and the well would be retested. If the well passes the subsequent MIT, it would be placed back in service. If a well cannot be repaired, it would be plugged and abandoned in accordance with appropriate state and federal regulations. The NRC and WDEQ/LQD maintain copies of records documenting MITs for all wells. The BLM would receive copies of MITs for each well completed on BLM-administered lands. An inventory of well tests and results are provided to the NRC and WDEQ/LQD in required periodic regulatory reports. A photograph of a typical completed and operating wellfield is presented in Figure 2.8.

Figure 2.8 View of Typical Operating ISR Wellfield.

Fresh Water Well

Uranerz would also drill a fresh water well within the Hank Unit project area; likely near the Hank Unit SPF on privately-owned land. This well would provide fresh water for plant wash down, processing, restoration, eye wash stations, and safety showers.

Deep Disposal Well

As is typical of all ISR projects, liquid wastes would be generated during all phases of the ISR process, and Uranerz would install four Class I (non-hazardous) deep disposal wells in the Hank Unit to properly dispose of these materials (refer to Figure 2.7). The deep disposal wells would be located on privately-owned land near the Hank Unit SPF. Liquid wastes that would be disposed include: process bleed, process solutions, wash down water, and restoration water.

Any wastewater generated during or after the uranium extraction phase (including aquifer restoration) of site operations are classified as "11e.(2) byproduct material" under NRC regulations 10 CFR Part 30 and must be properly disposed of according to specific regulations.

Each deep disposal well would be approximately 8,450 ft deep or greater depending on the depth selected and approved confining zone. Uranerz has obtained an Underground Injection Control (UIC) permit for the installation and use of Class I injection wells from the WDEQ/Water Quality Division (WQD), who has primacy for this program as delegated by the EPA. Each deep disposal well would be constructed as illustrated in Figure 2.9 and would be completed only to the approved formations for that well. For the deep disposal wells in the Hank Unit, the wells would only be completed in one of the following formations: the Teckla member of the Lewis Shale and the Teapot and Parkman Formations of the Mesaverde Group. Disposal would be strictly limited to these formations. The deep disposal wells would be drilled on privately-owned lands. The deep disposal wells would be installed, tested, operated, and monitored in accordance with the approved UIC permit. In accordance with the approved UIC permit issued by WDEQ/WQD Uranerz would limit the combined injection rates for the four disposal wells to a maximum of 150 gallons per minute (gpm) flow of liquid effluent wastes into the deep disposal wells over the life of the Hank Unit Project.

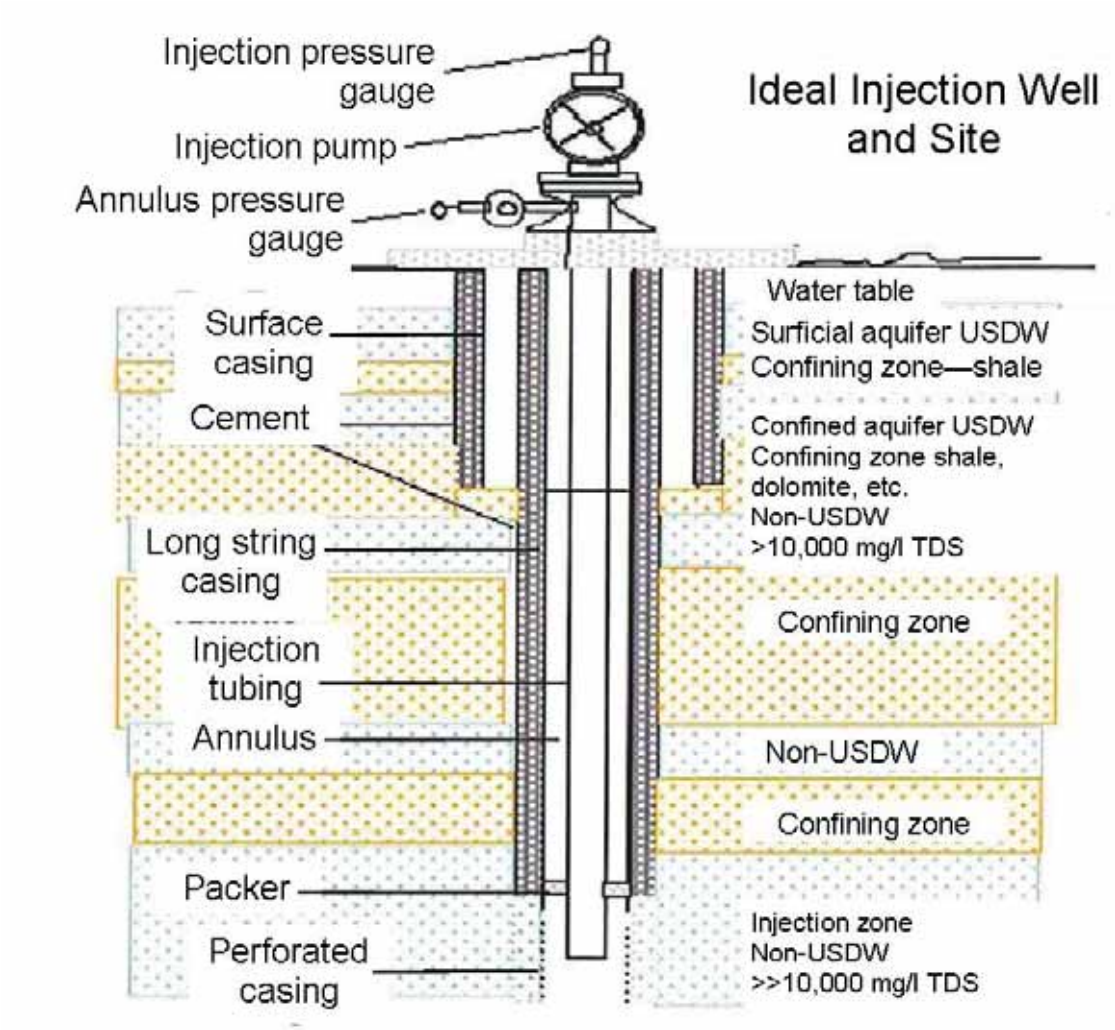



Figure 2.9 Deep Disposal Well.

Petroleum Products and Wastes

Uranerz and its contractors would manage, store, handle, and dispose of all petroleum products and wastes in compliance with all appropriate federal and state regulations. In addition, Uranerz would train its personnel to properly handle, transport, and dispose of all petroleum products and hazardous materials and waste to avoid and reduce the potential occurrence of spills. Uranerz would also develop and implement an emergency response plan (ERP) to address potential spills, leaks, or releases of such materials. Uranerz would also mitigate potential spills, leaks, or

releases of petroleum products and wastes by conducting routine maintenance and inspections on all appropriate vehicles and equipment, repair them as needed, and clean up any spills or leaks.

In the event of a spill, leak, or release of petroleum products and wastes, Uranerz would cleanup and dispose of the spill, leak, or release in accordance with state and federal regulations. All spills of petroleum products or hazardous chemicals in excess of the maximum allowable quantity as determined by WDEQ/WQD would be reported to that agency.

Hazardous Materials and Wastes

Wellfield development requires using hazardous materials such as, cement and commercial drilling mud products for well completions, corrosion inhibitors, glycol, antifreeze, new and used lube oils, paints, gasoline, and diesel fuel for equipment operation and infrastructure construction. Limited volumes of these materials would be temporarily stored in various locations within the field during different stages of construction and operations. The volume of any single material on hand at any one time would not exceed the threshold planning quantity (TPQ) of 10,000 pounds for hazardous materials, as specified by Title III of the *Superfund Amendments and Reauthorization Act* (SARA). This minimization is necessary as the geologic target zones are shallow. This maximum amount is not likely to be surpassed due to the small size of the drilling locations, the rigs used, and the short duration of each drilling operation (3 days). Extremely hazardous substances (EHSs), as defined in SARA, are not expected to be used in the operations. Uranerz would develop and implement management programs to meet the applicable WDEQ/SHWD regulatory requirements. All wastes generated from these materials would be handled and disposed of in accordance with applicable federal and state regulations.

Based on a typical uranium ISR operation and typical hazardous waste types generated at similar ISR facilities, it is anticipated that the Hank Unit would be classified as a CESQG under *Resource Conservation and Recovery Act* (RCRA) and applicable Wyoming regulations. This classification does not require a permit or license from WDEQ. A CESQG (i) must state whether its waste is hazardous; (ii) must not generate more than 100 kilogram (kg)

(220 pound [lb]) per month of hazardous waste or, except with regard to spills, more than 1 kg (2.2 lb) of acutely hazardous waste; (iii) may not accumulate more than 1,000 kg (2,205 lb) of hazardous waste on-site at any time; and (iv) must treat or dispose of its hazardous waste in a treatment storage or disposal (TSD) facility that meets the specific requirements of 40 CFR 261.5. If the facility fails to meet these four criteria, it would lose CESQG status and must be fully regulated as either a small-quantity generator (more than 100 kg [220 lb] but less than 1,000 kg [2,205 lb] of nonacute hazardous waste per calendar month) or a large-quantity generator (at least 2,205 lb of nonacute hazardous waste per calendar month). Any hazardous waste, such as organic solvents, paints, waste oil and paint thinners, empty chemical containers, tank sediments/sludges, chemical waste, and spent batteries, would be disposed of in accordance with a management program that the facility would develop to meet applicable local, federal, and state regulatory requirements for the disposal of nonradioactive hazardous waste. The Campbell County Landfill is permitted to accept hazardous waste for disposal.

The probability of a failure to a pipeline carrying pregnant lixiviant located in the wellfield would be limited because pipelines would be buried approximately two to five feet below the surface and made out of corrosion free high density polyethylene. The pipelines would also be inspected and tested prior to burial to ensure that the pipelines are sound and pressure test results would be documented.

If there were to be a discharge of pregnant lixiviant from pipelines located in the wellfield, Uranerz would implement numerous engineering and management controls. These controls include the installation and use of high and low pressure alarms/shutdowns and flow meters on the piping leading to and from the wellfield to the SPF. This would minimize the amount of process fluid that could be lost if a failure were to occur. If a spill would occur and the released has been controlled, Uranerz would survey the spill area with a gamma meter and soil samples would be collected throughout the affected area. A spill record would be made documenting the volume of the spill, the area affected and the corrective action taken (sampling and results of analysis). In accordance with NRC standards, areas exceeding twice background gamma would receive additional soil sampling to determine whether radiological concentrations (radium-226, thorium-230, lead-210) have increased significantly above background. Soils would also be

analyzed for uranium. If soil sampling results show an increase from baseline, 2.5 – 3 pCi/g, for example, the soil would be removed and placed in approved by-product storage containers prior to shipping to a licensed disposal site approved by the NRC.

Sanitary and Solid Waste

Sanitary wastes would be generated from restrooms, lunchrooms, and other areas where toilet facilities are provided. During construction, portable self-contained chemical toilets would be provided for human waste disposal. As required, the holding tanks for the chemical tanks would be pumped out and their contents disposed of at an approved sewage facility in accordance with applicable rules and regulations regarding sewage treatment and disposal. Upon completion of construction operations, sanitary wastes from toilets would be disposed of in an on-site septic system that would be constructed and operated by Uranerz. The septic system would be located on private-owned surface lands immediately north of the Hank Unit SPF. The septic systems would be designed in order to accommodate the estimated maximum of 35 permanent employees. Prior to construction of this facility, Uranerz would obtain a permit to construct the septic system from WDEQ/WQD. No septic system permit is required from Campbell County.

All phases of the proposed Hank Unit Project would generate solid wastes. These wastes would include spent resin, empty chemical containers and packaging, pipes and fittings, tank sediments, and domestic trash. Solid wastes would be classified as nonradioactive or radioactive prior to disposal. Nonradioactive solid wastes would be collected onsite in self-contained portable dumpsters or trash cages located near the SPF and disposed of in a sanitary industrial landfill located near the city of Gillette. Uranerz estimates that approximately 350 to 500 yard cubic yards $(yd)^3$ of nonradioactive solid waste would be generated annually by the proposed Hank Unit Project.

As soon as practical after completion of construction activities, all debris and other waste materials not placed in the dumpsters or trash cages would be cleaned up, removed from the construction area, and disposed of in an approved landfill. No potentially harmful materials or substances would be left on location, and all solid waste would be disposed at an appropriate

solid waste disposal facility. All facilities that would be used by Uranerz would be properly permitted through the appropriate state/local regulatory authority.

Radioactive solid wastes classified as a "11e.(2) byproduct material" would be disposed of at a licensed waste disposal site or mill tailings facility. Uranerz plans to temporarily store these wastes on-site within the fenced SPF in accordance with NRC regulations and they would periodically be transport to an appropriately permitted disposal facility located off-site. Uranerz estimates that approximately 30 to 45 $yd^3$ per year of radioactive solid waste would be generated at the proposed Hank Unit Project. Uranerz has not yet selected an off-site radioactive disposal facility, but options being considered by Uranerz include disposal facilities at Pathfinder-Shirley Basin in Wyoming; EnergySolutions facility in Clive, Utah; or White Mesa's facility in Blanding, Utah. Regardless of the location, all radioactive wastes would be disposed at a properly permitted and licensed waste disposal facility in accordance with applicable federal and state regulations.

Erosion Control Practices

As with all forms of disturbance, there would be a potential for wind and water erosion and movement of sediments into drainages during construction, operation, and reclamation operations associated with the Hank Unit Project. Therefore, to reduce potential erosion, Uranerz would develop and implement a Storm Water Pollution Prevention (SWPP) Plan in accordance with federal and state regulations and appropriate guidance documents. Uranerz would obtain SWPP permit coverage from WDEQ/WQD for the Hank Unit Project and would implement all appropriate best management practices (BMPs) to control erosion and would conduct required inspections of the project area to ensure that the BMPs are working properly. For example, berms and contouring would be utilized when and where possible, to minimize potential erosion and sediment movement. In addition, seeding with native seed mixture would also occur as part of interim and permanent reclamation operations. Seeding of an area would take place during the appropriate growing seasons, either spring or fall, whichever comes first, following disturbance.

All surface facilities, including the wellfields and associated structures, access roads, office and maintenance buildings, pipelines, and the SPF, would be designed and located to maintain the existing surface water drainage pattern. In the event that surface runoff could be impeded by any facilities, culverts and diversion ditches would be installed to control the runoff and prevent excessive erosion. If the surface runoff is concentrated in an area, erosion measures such as energy dissipaters, would be used to slow the flow of the runoff so that erosion and sediment transport are minimized in the runoff.

If an ephemeral drainage is crossed by roads or wellfield operations, appropriate measures (e.g., revegatation, grading and contouring, placement of hay bales, culvert installation, sedimentation breaks) would be utilized. This would minimize the impact to the ephemeral drainage, including the prevention of erosion and sediment movement into the drainage.

Whenever possible, construction of new access roads would be minimized by using existing roads within the project area. When new roads are needed, design and construction practices would incorporate such parameters as drainages, elevations contours, location with regard to weather conditions, and land rights to ensure the least amount of impact. If a new road has to cross an ephemeral drainage, efforts would be made to cross the drainage at right angles to minimize erosion with the appropriate-sized culverts installed. In the event that a drainage has to be crossed but cannot be crossed at a right angle or along elevation contours, appropriate measures for erosion control would be examined and implemented.

Wellfield construction activities would result in some short-term or temporary erosion. The ongoing drilling, well development, pipeline construction, header house construction, lateral pipeline placement, and access road construction activities would incorporate erosion protection measures based on the conditions where construction activities are taking place. Best management practices specified in the SWPP Plan that may be used include but are not limited to: revegetation, grading and contouring, placement of hay bales, culvert installation, sedimentation breaks, or placement of water contour bars.

In areas where steep grades are encountered during construction activities, interim reclamation measures such as seeding of the disturbed area would take place along with the erosion protection measures mentioned above. The seeding would take place in the spring or fall, whichever comes first, following disturbance.

Interim Revegetation Practices

Following the completion of facility construction and installation (including roads, header houses, wellfields, pipelines, power lines, and communication lines), all disturbed areas not needed for ongoing operations would be revegetated at the first seasonal opportunity. The goal of interim revegetation is to minimize wind and water erosion from disturbed areas. The disturbed areas would be leveled, recontoured to blend into the existing topography, scarified, and seeded with the seed mixture that would create a stable surface. The seed mixture for interim revegetation would include 6.0 pounds of PLS per acre of western wheatgrass, 6.0 pounds of PLS per acre thickspike wheatgrass, and 2.0 pounds PLS per acre slender wheatgrass on BLM-administered and private lands. These areas would remain revegetated until final wellfield decommissioning and permanent revegetation.

2.2.3.3 Uranium Recovery Phase

Introduction

Commercial uranium ISR has been practiced since the mid-1960s in the U.S. and is currently the leading extraction technology for uranium production in this country. The Mine and Reclamation Plan sections of the POO provides a detailed description of the ISR process (Uranerz 2012). The primary advantages of ISR over conventional mining include: 1) minimal surface disturbance when compared to open pit mining; 2) reduced long-term environmental impacts; 3) lower capital costs; and 4) the ability to mine low-grade ores that would be unrecoverable using conventional open pit or underground mining techniques.

Uranerz proposes to extract uranium using the ISR process over an anticipated project life of 10 years from the Hank Unit wellfields. Only the wellfields located in the Hank Unit would be

partially located on BLM-administered lands, and these areas would be mined as part of Hank Unit Production Areas #1 and #2 (refer to Figure 1.2). The proposed uranium recovery project schedule is illustrated on Figure 2.1. The surface disturbance for the entire Hank Unit would be limited to the installation of the processing facilities; injection, recovery, monitoring, water well, and deep disposal wells; wellfield access road; various pipelines, power lines, and fiber optic communication lines; and header house buildings. Surface disturbance on only the BLM-administered lands would be further limited to only injection, recovery, and monitoring wells, header houses, wellfield access road, and various pipelines, power lines, and fiber optic communication lines. The SPF, deep disposal wells, and fresh water well would not be constructed on BLM-administered lands. As mentioned earlier, Uranerz estimates that there would be approximately 33 acres of disturbance on BLM-administered lands and 126.4 acres of disturbance on privately-owned lands.

Uranium Recovery

The ISR process is a proven nonintrusive mining method. This method involves the use of conventional water well technology and the addition of an oxidant such as oxygen to form a leaching solution, called a lixiviant, to extract the uranium without physically removing the ore-bearing strata. The lixiviant is pumped via the injection wells into the groundwater into the uranium ore-bearing zone to make the uranium soluble in the groundwater. The oxygen is used as an oxidant to cause the uranium to dissolve. Carbon dioxide would be provided to both keep the pH around neutral and to provide another source of carbonate and bicarbonate ions. Small quantities of liquid chlorine acid would also be used to adjust the pH of the lixiviant to control bacterial growth in the wells. The oxidized uranium in the ore bearing zone would react with the lixiviant to form either a soluble uranyl tricarbonate complex or a bicarbonate complex. The resulting uranium-rich solution ("pregnant lixiviant") becomes mobile and is drawn into production wells where it is pumped to the surface and then transferred to the ion exchange unit at the SPF (refer to Figure 2.4 and Figure 2.10). Detailed information concerning the lixiviant chemistry is presented in the NRC SEIS (2011).

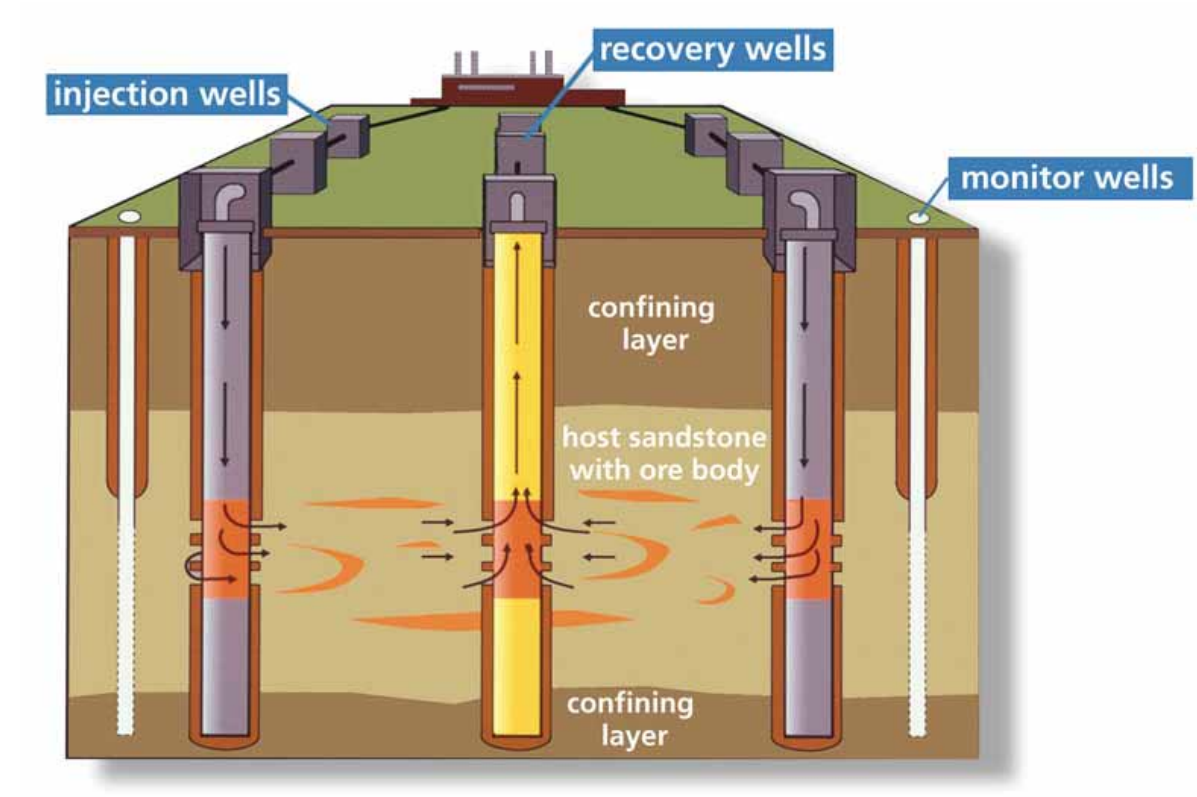



Figure 2.10 Idealized Schematic Cross Section to Illustrate Ore Zone Geology and Lixiviant Migration from an Injection Well to a Recovery Well.

On-site Uranium Processing

Once the uranium-rich solution is received at the SPF, it would be pumped into a series of downflow ion exchange columns (Figure 2.11). Uranerz estimates approximately four ion exchange columns would be used at the Hank Unit SPF. Uranium from the uranium-rich solution would be absorbed by ion exchange onto resin beads. As the resin beads in the ion exchange column become saturated with uranium, the column would be taken offline for the elution circuit which is discussed below.

Transportation of Resin Beads for Off-site Uranium Processing

The uranium-loaded resin beads would then be transported by truck to a CPP located in the Nichols Ranch Unit approximately 4.5 mi west of the Hank Unit (refer to Figure 1.1) and/or to

Cameco Resources Smith Ranch-Highland CPP located approximately 50 mi south of the Hank Unit. At the CPP the uranium would be stripped from the resin beads and the uranium would be processed into yellowcake. If off-site uranium is needed, Uranerz estimates that during peak production there would be approximately six round trips per week between the Hank Unit SPF and the Smith Ranch-Highland CPP. To address the transportation of resin beads from several uranium mining regions in Wyoming (including the PRB where the Hank Unit is located) to the Smith Ranch-Highland CPP, the NRC prepared an EA. The EA documented that there would be no significant impacts to the environment and the NRC issued a FONSI (NRC 2009b).

The trucks used to transport loaded resin are sole-use vehicles that are labeled and operated in accordance with U.S. Department of Transportation (USDOT) requirements contained in 49 CFR Parts 171-189 and NRC regulations contained in 10 CFR Part 71. At the CPP, the uranium is stripped (i.e., removed) from the resin beads and refined.

The resin beads (stripped of the uranium) would then be returned by truck from the CPP to the Hank Unit SPF where they would be placed back into the ion exchange column and reloaded with uranium. This process would be repeated until the productive life of the project is reached. Access from the Hank Unit SPF to the Nichols Ranch CPP would be from existing unnamed and improved T-Chair Ranch Roads (refer to Figure 1.1). These existing privately-owned roads do not cross any BLM-administered lands and Uranerz has a road use agreement with the landowner for use of these roads. Access to Cameco Resources Smith Ranch-Highland CPP would be east via T-Chair Ranch Roads, Christensen Road (County Road 21), and the Van Buggenum Road (County Road 102) (existing improved template roads that do not cross any BLM-administered lands), then south on State Highway 50, west on State Highway 387, then south on County Road 31 (Ross Road) to the Cameco Resources Smith Ranch-Highland CPP. Uranerz has road use agreements with the specific landowner for use of nonpublic roads, and no separate approvals are required for use of the public roads.

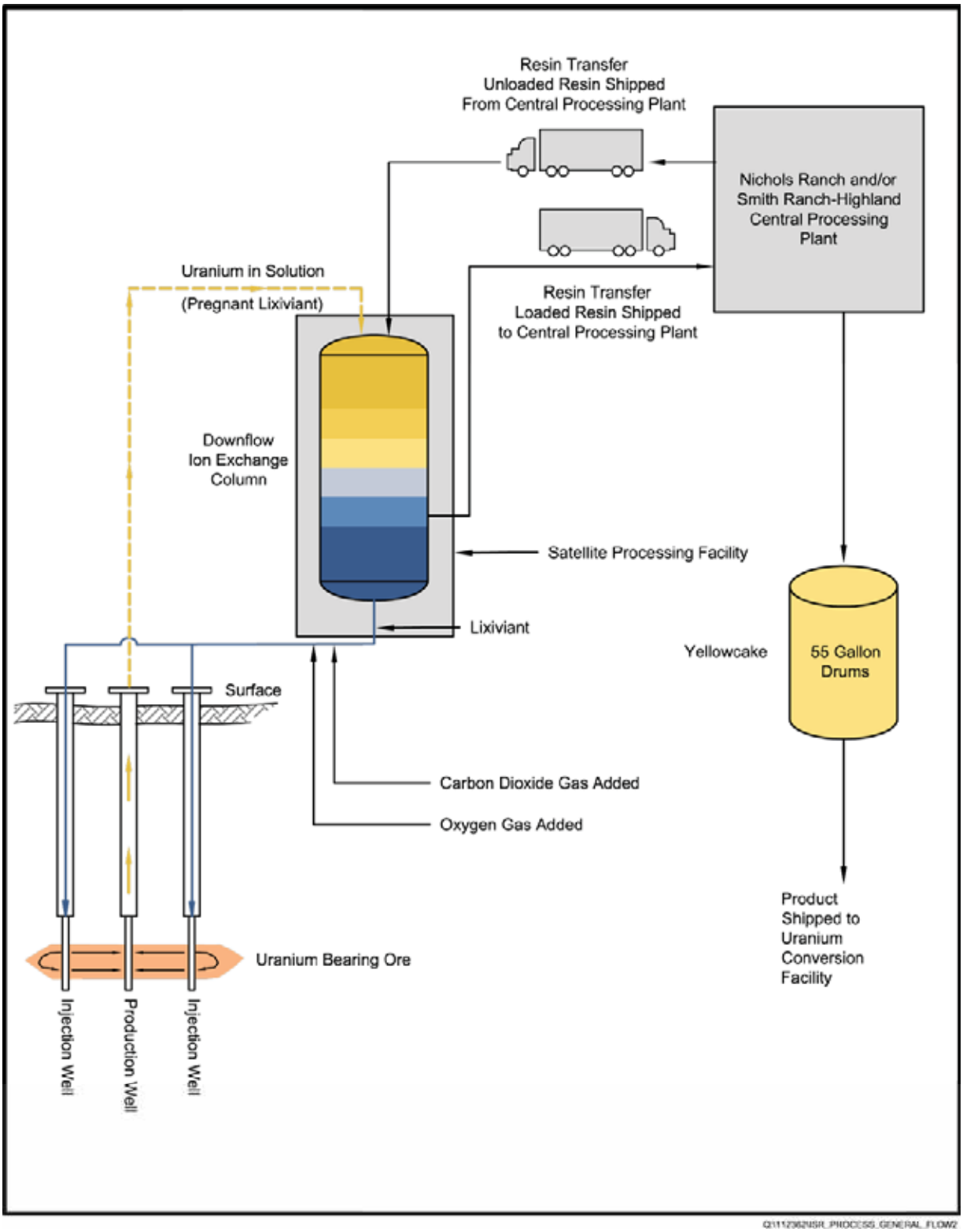



Figure 2.11 Flow Diagram of Typical ISR Uranium Recovery Process.

Precipitation, Drying, and Transportation

The precipitation and drying process would be conducted at either the Nichols Ranch and/or Cameco Resource's Smith Ranch-Highland CPPs (refer to Figure 2.11). This process would not be carried out at the Hank Unit SPF and is not considered part of the Proposed Action . After the uranium is precipitated, it is dried into yellowcake product, and packed into 55-gallon, 18-gauge metal drums holding an average of 950 pounds and classified by USDOT as Type A packaging (49 CFR Parts 171-189 and 10 CFR Part 71). A detailed description of the subsequent precipitation, drying, and transportation process is presented in the NRC GEIS (2009a). The packaged yellowcake is then shipped by truck to a remote conversion plant (located in Metropolis, Illinois), which transforms the yellowcake into uranium hexafluoride ($UF_6$) for the enrichment step of the reactor fuel cycle. Additional detailed information concerning this process is presented in the NRC GEIS (2009a).

Public Safety

Uranerz's existing NRC license requires the company to post notices to the public stating that permission must be obtained to enter the mining areas and give information on how to obtain this permission. This permission includes required use of proper personal protective equipment and a company escort. The wellfield and SPF would be fenced and off limits to all persons without specific safety training. The SPF would operate 24 hours a day 365 days per year, and would be secured, and controlled using locks and some header house buildings would be monitored using surveillance cameras.

Section 3.0 of the WDEQ/LQD Permit to Mine and the NRC Source Material License, state that the public would be protected from exposure to radiologic material by applying appropriate equipment control and work practices. Uranerz would maintain detailed environmental and radiological programs to monitor any releases from the CPP and SPF to the environment. The program scope encompasses monitoring of air, groundwater, surface water, soils, vegetation, and direct radiation. The program is designed to meet the NRC requirements codified in 10 CFR 40.65.

Water Management

Water management is critical to the project because water is needed for all aspects of the recovery and restoration processes. All water used in the project area would be obtained from groundwater sources in the project area, likely near the SPF, appropriated in accordance with the Wyoming State Engineer's Office regulations. More information concerning the fresh water well is presented in Section 2.2.3.2. The primary water uses in the project area would be drilling, mine unit recovery, uranium processing, groundwater restoration, and reverse osmosis make-up water. Groundwater restoration would consume the greatest volume of water. Process water recycling and wastewater minimization programs would be employed in the project area in an effort to minimize the volume of water to be disposed. Wastewater disposal would occur through deep disposal wells as discussed in Section 2.2.3.2.

Uranerz would conduct extensive surface and groundwater monitoring during the operation of the Hank Unit. Detailed information concerning this program is presented in Section 2.2.3.7 of this EA.

Workforce and Traffic

Uranerz estimates that a vast majority of the construction workers needed for this project would be available in the local areas including Gillette, Wright, and/or Casper with distances ranging from 22 to 61 mi away from the project site. Approximately 45 to 55 workers would be needed during the construction phase of the Proposed Action. The largest number of workers and the most diverse number of trades would occur during construction and wellfield development. Construction operations would occur only during daylight hours. Trades that would likely work on the project include dirt contractors, electricians, wellfield maintenance and construction crews (installing pipelines, header house structures etc.), well drillers (using truck-mounted rotary drilling rigs) and wellfield operation crews (pump installation, well development, MIT, etc.), water truck drivers, surveyors, reclamation crews, and operations supervisors.

During construction, recovery, and decommissioning phases of the project, Uranerz estimates that traffic volumes would consist of approximately eight pickup trucks trips per day along with six tractor-trailers per week. During the uranium recovery phase Uranerz estimates that there would be approximately six pickup round trips per week or one round trip per day between the SPF and the Nichols Ranch CPP or the Smith Ranch CPP. During the decommissioning phase of the project it is estimated that vehicle traffic would be less than half of that planned during construction phase (i.e., approximately four pickup trucks trips per day per week along with three tractor-trailers per week) (Uranerz 2012).

The equipment and supplies needed for completion of the construction and wellfield development activities would be stockpiled at various times and places until development activities were completed. Temporary staging areas would be established immediately adjacent to the SPF and would be used to maintain supplies of equipment to minimize the traffic throughout the project area.

Operations and wellfield maintenance activities would begin once field development activities are completed and the wellfield is put into production. Uranerz estimates approximately 20 to 35 workers would be needed during the uranium recovery phase of the Proposed Action. Workers would likely come from communities such as Gillette, Wright, and/or Casper, Wyoming, with distances ranging from 22 to 61 mi away from the proposed project site.

Ancillary equipment that would be used in the wellfield recovery operations would include truck-mounted pump pulling units, trailer-mounted hose reels, electrical generators, trenchers, backhoes, light duty 4-wheel drive vehicles, and 4-wheel all terrain vehicles. Downhole well maintenance operations would include the use of truck-mounted pulling units and contract well drillers, as needed. Concrete is used continually during construction and wellfield development activities and in ongoing operations. As a result, a temporary small concrete batch plant would be staged near the SPF and would be used as needed. The volume of concrete needed and the number of loads of cement delivered monthly would vary depending on drilling and abandonment activity levels.

Carbon dioxide and liquid oxygen would be delivered to the Hank Unit SPF on a regular basis once the operational phase of the project is initiated. Carbon dioxide would likely be delivered twice a week via tractor-trailers, while liquid oxygen would likely be delivered four to six times a month. Other products would be delivered on an as needed basis.

#### 2.2.3.4 Groundwater Restoration Phase

##### Introduction

At the termination of the uranium recovery phase but prior to starting final decommissioning, at least 12 months prior to the planned decommissioning of a production area a final decommissioning plan would be submitted to the WDEQ/LQD and NRC for review and approved.

After the decommissioning plan is approved by WDEQ/LQD and NRC, lixiviant injection would be discontinued and groundwater restoration would be initiated. Groundwater restoration would be accomplished using a combination of techniques including groundwater sweep, reverse osmosis with reinjection, and geochemical stabilization (Uranerz 2012).

Following uranium recovery in the mining unit, Uranerz would ensure that groundwater was restored to pre-mining conditions. The goal of groundwater restoration is to return the aquifer to the baseline conditions that existed prior to the start of uranium recovery; or, if approved, to a secondary standard of pre-mining "class of use." This secondary restoration standard is to return the groundwater to a quality of use that it was suitable for prior to mining. Restoration would involve groundwater sweep, clean water injection, and geochemical stabilization of the aquifer with a reductant. A detailed discussion concerning the entire aquifer restoration process is presented below.

Water to be used in this process would come from the wellfields and from the fresh water well that would be located near the SPF. All of these sources of water would be properly appropriated through the WSEO.

Aquifer Restoration

After the uranium is recovered, the groundwater in the wellfield contains constituents (including heavy metals) that would be mobilized by the lixiviant. Uranerz would begin aquifer restoration in each wellfield as the uranium recovery operations end. Consistent with current uranium ISR restoration practices, Uranerz proposes that restoration criteria or restoration target values (RTVs) be established on a parameter-by-parameter basis and that the primary goal of restoration be to return all parameters to pre-ISR baseline conditions. Prior to operation, background (baseline) groundwater quality would be determined. Baseline water quality data would be collected from the monitoring wells before any ISR operations take place. Uranerz expects that groundwater can be returned to pre-ISR baseline conditions. However, in the event that water quality parameters cannot be returned to average pre-ISR baseline levels through reasonable restoration efforts, Uranerz would propose an alternate standard to NRC and WDEQ/LQD for those constituents not returned to background levels. Uranerz would be required to demonstrate that the Alternate Concentration Limits (ACLs) would maintain public health and safety.

The aquifer restoration program for the proposed Hank Unit Project would include three stages: groundwater transfer, groundwater sweep, and groundwater treatment. These three stages would be designed to effectively and efficiently restore the groundwater so that groundwater loss is minimized and restoration is optimized. Depending on the progress of restoration, Uranerz may not need all of the stages of aquifer restoration to achieve the RTVs. Monitoring would also be conducted as part of the aquifer restoration program.

Groundwater Transfer Stage

During the groundwater transfer stage, water would be transferred between the wellfield where groundwater restoration is beginning and another wellfield where ISR operations are beginning or within the same wellfield, if one area is in a more-advanced state of restoration than another. Water containing higher total dissolved solids (TDS) from the wellfield during the process of restoration would be recovered and injected into the wellfield that is beginning ISR operations. This direct transfer of water would lower the TDS in the wellfield being restored and blend the

water in the two wellfields until they are similar in conductivity. If needed, the water recovered from the wellfield being restored may be passed through an ion exchange column and filtered if the concentration of suspended solids poses a blockage problem in the injection well screens. Groundwater transfer would reduce the amount of water that would eventually be sent to the deep disposal wells during restoration because water is transferred from one wellfield to another.

Groundwater Sweep Stage

During the groundwater sweep stage, groundwater from a wellfield beginning restoration would be pumped to the ion exchange systems at the SPF through all recovery wells without reinjection. To accomplish this, groundwater is drawn into the wellfield to flush contaminants from the ore zone or "sweep" the aquifer. The water produced by the groundwater sweep would then be sent to the Hank Unit SPF for treatment and removal of any remaining uranium. Following treatment, the swept water would be returned to the Hank Unit SPF for additional treatment. The rate of groundwater sweep depends on the ability of the wellfield to sustain the withdrawal rate and the capacity of the treatment equipment discussed below.

Groundwater Treatment Stage

During the groundwater treatment stage of the aquifer restoration process, groundwater would be returned to the SPF and passed through ion exchange and reverse osmosis treatment equipment. The groundwater would then either be sent to the deep disposal wells or back into the wellfield. The ion exchange columns would remove most of the soluble uranium and replace it with chloride or sulfate. Prior to or following ion exchange treatment, the groundwater may pass through a decarbonation unit to remove any residual carbon dioxide. During treatment, an amount of reductant, a substance capable of bringing about the reduction of another substance as it itself is oxidized, sufficient to reduce any oxidized minerals may be metered into the injection stream. The purpose of this addition is to decrease the concentrations of oxidation-reduction sensitive elements in the water. Sodium hydroxide may be used during this treatment stage to adjust pH levels. This pH adjustment would also assist in immobilizing certain parameters such

as trace amounts of heavy metals. All or some portion of the restoration recovery water may be sent to the reverse osmosis system.

The reverse osmosis system serves to reduce the TDS in groundwater being restored, reduces the quantity of water needed to be removed from the aquifer to achieve the RTVs, concentrates the dissolved contaminants in a smaller volume of water (brine) to facilitate waste disposal, and enhances ion exchange. A high percentage of water passes through the reverse osmosis membranes, leaving approximately 60% to 90% of the dissolved salts in the resulting brine water. The clean water or permeate, would either be re-injected into the wellfield, stored for use in the ISR process, or sent to the deep disposal well. The permeate may also be decarbonated prior to reinjection into the wellfield. The brine water contains most of the dissolved salts and is sent to the deep disposal wells. Make-up water coming from a number of sources may be added prior to reverse osmosis or wellfield injection stream to control the amount of bleed into the restoration area. These sources would include water from a wellfield in a more advanced state of restoration, water being exchanged with a new wellfield production area, water from a different aquifer, or the purge of an operating wellfield. The volume of water treated and re-injected through the ore body during this phase would depend on the efficiency of returning the production area back to pre-ISR baseline water quality conditions and thus the efficiency of the reverse osmosis in removing contaminants.

Groundwater Monitoring and Stabilization

During restoration, lixiviant injection ceases while improving the quality of the groundwater to restoration standards. Therefore, the possibility of an excursion is greatly reduced and frequencies of sampling the monitoring wells would be modified during aquifer restoration. During aquifer restoration, Uranerz would sample the horizontal overlying aquifer and underlying aquifer monitoring wells once every 60 days. The water samples would be analyzed for the excursion parameters of chloride, total alkalinity, and conductivity. Uranerz would also measure static water levels prior to sampling. Uranerz would sample the recovery wells on a frequent basis to determine the effectiveness and efficiency of their aquifer restoration techniques. Uranerz would sample the recovery wells for the parameters presented in Table 2.3.

Table 2.3 Sampling Parameters for the Recovery Wells During Aquifer Restoration.

| | | |
|---|---|---|
| Alkalinity | Copper | Nitrate |
| Ammonium | Electrical conductivity | pH @ 25 °C (77 °F) |
| Arsenic | Fluoride | Potassium |
| Barium | Iron | Radium-226 |
| Bicarbonate | Lead | Selenium |
| Boron | Magnesium | Sodium |
| Cadmium | Manganese | Sulfate |
| Calcium | Mercury | Total dissolved solids |
| Carbonate | Molybdenum | Uranium |
| Chloride | Nickel | Vanadium |
| Chromium | | |

Restoration would be deemed complete when Uranerz is able to demonstrate stability of the aquifers through monitoring. NRC and WDEQ/LQD regulations require that the groundwater quality be returned to the standards identified in Criterion 5(B)(5) of 10 CFR Part 40 Appendix A or an ACL established by NRC in accordance with Criterion 5B(6). According to this criterion, ACLs may be proposed when background concentrations are not practically achievable at the site and present no substantial hazard to human health or the environment.

Uranerz would have to provide the basis for these ACLs, including consideration of practicable corrective actions and that the ACLs are as low as reasonably achievable.

Once NRC and WDEQ/LQD deem the production area as being restored, a 12-month stability period would begin to ensure that the restoration goals are maintained. The monitoring ring wells would be sampled once every two months and analyzed for the upper control limit parameters for chloride, total alkalinity, and conductivity. Recovery wells would also be sampled and analyzed for the same parameters listed above.

2.2.3.5 Decommissioning and Reclamation Phase

Wellfield Decommissioning

Wellfield decommissioning would begin following the successful conclusion of the aquifer restoration stability period along with preparation and submittal of the wellfield restoration report and wellfield restoration approval by the NRC and WDEQ/LQD. Wellfield decommissioning would include plugging and abandonment of all recovery, injection, and monitor wells along with the removal of the pipeline, well heads, and associated equipment. All wells would be plugged and abandoned in accordance with state and federal rules and regulations and would include: 1) temporary removal and segregation of topsoil and subsoil such as occurred during installation; 2) removal of all pumps and tubing; 3) plugging the well with an appropriately formulated abandonment gel or slurry; 4) cutting off the well casing below the ground surface; 5) placing a cement plug to seal the well (on private surface lands); 6) backfilling, smoothing, and leveling the area to blend in with the surrounding terrain; and 7) replacement of topsoil in preparation for final revegetation.

If the wellfield equipment is still serviceable, the well equipment and pipeline materials would be taken to the new production area for continued use. Wellfield equipment that is no longer usable would be surveyed for gamma radiation (inside and out) and placed in either a contaminated or non-contaminated boneyard area located in the SPF for subsequent removal from the site. The nonsalvageable contaminated piping, well heads, and associated equipment would be transported from the site to an NRC-approved disposal facility. Otherwise, the non-contaminated materials would be transported to an appropriate landfill.

Plant Dismantling and Decommissioning

After groundwater restoration is complete, dismantling and decommissioning of the SPF would commence. All process equipment associated within the plants would be dismantled and either sold to another licensed facility or decontaminated in accordance with NRC Regulatory Guide 1.86 “Termination of Operating Licenses for Nuclear Reactors” and “Guidelines for

Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material." Any material that cannot be decontaminated to an acceptable level would be disposed of at an NRC-approved/licensed disposal facility. After decontamination, materials that would not be re-used or that do not have any resale value, like building foundations, would be removed and disposed of at an appropriate landfill. Uranerz does not have any specific plans regarding use or deposition of the dismantled SPF.

Road Reclamation

The constructed wellfield access road used for the project would likely be reclaimed and revegetated. If the private landowner desires, the roads would be left in place when operations are complete. If not, the roads would be removed, reclaimed, and revegetated. For this analysis, it is assumed that those portions of the wellfield access road located on BLM-administered lands would be removed, reclaimed, and revegetated.

If the road is to be reclaimed, the first step would be to remove the road surface materials and any fill materials. Once the fill materials have been removed, the roadbed would be disced or ripped to reduce compaction and promote vegetation establishment. Stockpiled topsoil would then be reapplied on all road disturbance areas, and the area would be mulched and seeded with the permanent seed mixture as discussed below.

Permanent Revegetation Practices

All revegetation practices would be conducted in accordance to the WDEQ/LQD and BLM regulations and the methods outlined in the approved mine and reclamation plan. Final revegetation of the mine area would consist of seeding the area with one final reclamation seed mixture. Tables 2.4 and 2.5 present the seed mixtures that will be used for permanent revegetation, for privately-owned surface lands and BLM-administered surface lands. The seed mixture shown in Table 2.4 was developed through discussions with the private landowner and

Table 2.4 Reclamation Seed Mixture for Use on Privately-owned Surface Lands.[1]

| Species | Percent of Mix | Pounds PLS/acre |
|---|---|---|
| Western wheatgrass | 28 | 4.2 |
| Revenue slender wheatgrass | 28 | 4.2 |
| Bozoisky Russian wildrye | 19 | 2.85 |
| Greenleaf pubescent | 9 | 1.35 |
| Gulf annual ryegrass | 6 | 0.9 |
| Yellow blossom sweet clover | 5 | 0.75 |
| Ladak 65 alfalfa | 5 | 0.75 |
| Total | 100 | 15.0 |

[1] Drill seeding rate. Seeding rates would be doubled for broadcast seeding.

Table 2.5 Reclamation Seed Mixture for Use on BLM-administered Surface Lands.[1]

| Species | Percent of Mix | Pounds PLS/acre |
|---|---|---|
| Western wheatgrass | 35 | 5.5 |
| Bluebunch wheatgrass | 19 | 3.0 |
| Green needlegrass | 9 | 1.5 |
| Slender wheatgrass | 19 | 3.0 |
| Needle-and-thread | 9 | 1.5 |
| Purple prairie clover | 3 | 0.5 |
| Prairie coneflower | 3 | 0.5 |
| Rocky Mountain bee plant | 3 | 0.5 |
| Total | 100 | 16.0 |

[1] Drill seeding rate. Seeding rates would be doubled for broadcast seeding.

approved by the NRC and WDEQ/LQD, and the seed mixture presented in Table 2.5 was approved by the BLM. Broadcast seeding rates would be doubled when drill seeding is not practical. Uranerz would mulch all permanent reclaimed areas immediately following seeding operations with 2 tons per acres of certified weed-free grass hay. The mulch would be blown on

and then crimped into the ground. Crimping would cause the mulch to stand up straight, thus securing the mulch to the surface and allowing the mulch to capture more moisture, thereby improving reclamation success.

Evaluation of Reclamation Success

The successful reclamation and restoration of the Hank Unit would be based on returning the affected land back to its original use of livestock grazing and wildlife habitat. This would be accomplished by removing all structures, except for those desired by the landowner, and reclaiming and revegetating all land disturbed within the Hank Unit.

As outlined in the POO, the success of the final revegetation for both privately-owned lands and BLM-administered lands would be determined by meeting pre-mining land use conditions and reclamation success standards using the "Extended Reference Area" outlined in WDEQ/LQD Guideline No. 2. The Extended Reference Area approach allows for a statistical comparison of the reclaimed area with an adjacent undisturbed area of the same or nearly the same vegetation type. The Extended Reference Area would be at least one half the size of the reclaimed area that is being assessed or at least no smaller than 25 acres in size.

Uranerz would consult with WDEQ/LQD on an appropriate area, which would ensure that the Extended Reference Area adequately represents the reclaimed area being assessed. Uranerz would collect vegetation data as outlined in the Reclamation Plan of the POO, and Uranerz would prepare a report documenting the results of revegetation monitoring. The success of the final revegetation would be determined by the private landowners (for privately-owned lands), BLM (for BLM-administered lands), and WDEQ/LQD.

The criteria for determining the success of the reclamation effort includes: 1) post-mining vegetation cover to that on an appropriate comparison area; 2) species composition and diversity capable of supporting the planned post-mining use; and 3) a reclaimed vegetation community able to sustain grazing pressure at a rate equal to that of the surrounding native areas. As a result of an MOA between BLM and WDEQ/LQD, WDEQ/LQD would take the lead on approval of

revegetation success on private and BLM-administered lands. In accordance with WDEQ/LQD regulations, all of the criteria listed above would be achieved for a period of two consecutive years prior to full bond release being approved by WDEQ/LQD. For BLM-administered lands, WDEQ/LQD would require BLM's concurrence with reclamation success prior to full bond release.

While the wellfield is in operation, the area would be fenced off not only for security measures, but also to exclude livestock from entering the wellfield. To protect newly revegetated areas, Uranerz would leave the fencing in place. Livestock grazing within the fenced and revegetated wellfields would not be allowed until WDEQ/LQD approves such a practice.

Post-mining Land Use

Uranerz's goal is to return all lands disturbed by the ISR project to their pre-mining land use of livestock grazing and wildlife habitat unless an alternate use is approved by the WDEQ/LQD, BLM (for BLM-administered lands), and the private landowner (e.g., a rancher who wishes to retain access roads and/or buildings on privately-owned lands). In addition, Uranerz's objective is to return the disturbed lands to a vegetation production capacity equal to or better than that which existed before mining.

Once full bond release has occurred, the area would be available for other land uses as deemed appropriate by the private landowner or the BLM.

2.2.3.6 Mitigation Measures

Overview

Regulations contained in 43 CFR 3809.420 states that operations and post-mining land use must comply with the applicable BLM land use plans and activity plans as appropriate, and operators must implement mitigation measures specified by BLM to protect public lands. In order to comply with these general operating standards, Uranerz would implement stipulated mitigations

as required by the BLM, NRC, WDEQ/LQD, and any other appropriate federal, state, or local agency.

As part of NRC licensing and WDEQ/LQD permitting requirements, uranium ISR projects are required to collect extensive environmental baseline information and implement extensive monitoring programs and mitigation measures. Mitigation measures and monitoring that are required by regulation and approved NRC license and WDEQ/LQD permit are considered part of the Proposed Action, included in this EA, and presented below.

All operations would be conducted in accordance with industry standards for a safe and efficient operation. Uranerz would periodically inspect project roads, wells, and reclamation areas to ensure they are in conformance with BLM requirements, the NRC license, the WDEQ/LQD permit, and other regulatory agency requirements. It is the responsibility of Uranerz to minimize resource damages or loss and to ensure safe operating conditions on all maintenance and monitoring activities. Numerous pre-operational, operational, and post-operational monitoring and reporting requirements would be undertaken, and the results would be reported to the appropriate regulatory agency.

Pre-construction Planning and Design Measures

All project facilities would be designed and located to minimize disturbance to areas of high-value wildlife habitat, including wetlands and riparian areas. Other examples include avoidance of raptor nests, compliance with greater sage-grouse seasonal stipulations, avoidance of NRHP eligible cultural resource sites. Addition pre-construction planning and design measures are presented below.

Cultural Resources and Native American Concerns

For the NRC Hank Unit license, the NRC performed section 106 consultations with the Wyoming State Historic Preservation Officer (WYSHPO), the Advisory Council on Historic Preservation (ACHP), BLM, the Cheyenne River Sioux Tribe, the Crow Tribe, the Eastern

Shoshone Tribe, the Fort Peck Assiniboine/Sioux Tribe, the Northern Arapaho Tribe, the Northern Cheyenne Tribe, and the Oglala Sioux Tribe. The NRC determined the issuance of the mine license would result in an adverse effect to the Pumpkin Buttes TCP (Site 48CA268) and four other sites that it considered to be TCPs (Sites 48CA6148, 48CA6748, 48CA6751, and 48CA6753) (NRC 2010). The NRC, WYSHPO, ACHP and the tribes consulted on a MOA to address adverse impacts from the proposed Hank Unit to the setting of the five TCPs, outlining mitigation measures intended to reduce impacts from the construction of the Hank Unit project. The NRC MOA was signed by the NRC, the Wyoming SHPO, the ACHP, the Eastern Shoshone Tribe, and Northern Arapaho Tribe, and Uranerz in September 2011. The BLM, the Cheyenne River Sioux Tribes, the Crow Tribe, the Fort Peck Assiniboine/Sioux Tribe, Northern Cheyenne Tribe, and Oglala Sioux Tribe were invited signatories to the MOA but, declined to sign the NRC MOA. The following mitigation measures addressing impacts to the TCPs, many of which are outlined in the NRC MOA, are considered to be a part of the current Proposed Action:

1) Uranerz would not conduct any ground-disturbing work within the boundaries of Sites 48CA268, 48CA6148, 48CA6475, 48CA6490, 48CA6748, 48CA6751, 48CA6753, 48CA6754, and 48CA6927.

2) To avoid physical impacts to three sites (Sites 48CA6148, 48CA6754, and 48CA6927) that could be physically impacted by the Proposed Action, Uranerz would maintain a 50-ft minimum disturbance avoidance buffer around the boundaries of these sites. In addition, Uranerz would delineate or mark the area around the physical boundaries of these three sites to help prevent inadvertent disturbance. Uranerz would delineate/mark these sites in consultation with the Tribal Monitor, and a professional meeting with the Secretary of Interior's Standards for Archaeology and History; thereby, ensuring that ground-disturbing activities do not adversely affect the historic properties. The delineation/marking of these sites would not interfere with livestock or wildlife movement and it would not be a safety hazard. The delineation/marking would be installed prior to construction of the Hank Unit and would be removed upon completion of construction operations.

3) If Uranerz determines that it must conduct ground-disturbing activities within the boundaries of a historic property listed in Table 4.1, Uranerz would notify NRC, WYSHPO, WDEQ/LQD and BLM (if on BLM-administered lands). Uranerz would provide the appropriate agencies with information on the ground-disturbing activity, the adverse effect to the historic property, and a proposed mitigation/treatment plan. The NRC would consult with parties who signed the Memorandum of Agreement (MOA) before making a determination of the proposed ground-disturbing activities' adverse effect and submit it to the WYSHPO for concurrence. If an adverse effect is found, NRC would consult with the signatory parties of the MOA and review the proposed mitigation/treatment plan. Once an appropriate mitigation/treatment plan has been agreed upon, the mitigation/treatment plan would be implemented.

4) Uranerz would also not conduct any ground-disturbing activities above the 5,500-ft elevation around the North Middle Butte of the Pumpkin Butte TCP.

5) Uranerz would provide for one qualified Tribal Monitor representing all Tribes to be present during construction activities at the Hank Unit. Construction activities include: ground clearing and excavation activities for the Hank Unit SPF, initial trunk line installation, and header house placement. Notification of the commencement of construction activities at the Hank Unit would be communicated to the Tribes at least one month prior to the start of construction.

6) The Tribes would decide how they would like to select the representative of all Tribes who would serve as the Tribal Monitor. The position can be rotated through each of the Tribes, but would not be shorter than a 2-week period for each Tribal Monitor.

7) The Tribal Monitor would be compensated at the prevailing rate of a comparable job for the State of Wyoming during periods of active construction only. In the event of a suspension of construction activities, Uranerz would be relieved of its obligations to compensate the Tribal Monitor until construction resumes.

8) The qualified Tribal Monitor would be considered a contractor to Uranerz and must comply with the Uranerz Contractor/Guest Environmental, Safety and Health Guidelines and Site Requirements, Occupational Safety and Health Administration, NRC, and any other state regulations. The Tribal Monitor must also agree to any NRC/state requirements imposed via license or permit. The Tribal Monitor would be expected to comply with the reasonable requests and instructions of Uranerz's Construction Manager. The Tribal Monitor would be permitted to observe construction, assist in cases of unanticipated discoveries, and to ask questions relating to construction activities and receive responses thereto, but he or she shall not participate in the construction activities and shall not impede or hinder construction activities in any way. In the event of any noncompliance by the Tribal Monitor with these requirements, the Tribal Monitor would be required to leave the construction site and Uranerz would be relieved of any further obligation to permit or compensate the attendance of that particular Tribal Monitor thereafter.

9) All disturbed lands associated with the project, including access roads, pipelines, well locations, power lines, management facilities, etc. would be expediently reclaimed and reseeded in accordance with the project-specific reclamation plan provided in the Uranerz POO.

10) Wherever possible, existing roads would be utilized. In order to minimize visual contrast, roads would be placed outside areas containing dense patches of sagebrush and follow natural contours wherever practicable. The gravel surface of new roads would be a color that does not create a visual contrast to the surrounding topography.

11) All pipelines would be located in corridors next to or within road areas wherever possible. Pipeline corridors would use existing disturbance areas and would be placed outside areas containing dense patches of sagebrush where practicable.

12) Wherever practicable, areas of existing disturbance would be used during development and operations. To minimize visual contrast, well locations would not be placed in areas

of dense sagebrush or other vegetation unless absolutely necessary. Brush hogging or other vegetation removal on drilling locations within areas of dense sagebrush or other vegetation would be feathered to reduce visual contrast and limited to 30 ft in diameter from each well. All aboveground infrastructures related to well production would be painted in a color that best blends in with the surrounding topography. These colors are typically Covert Green (PANTONE for Architecture Color Guide 18-0617 TPX) or Carlsbad Canyon (Munsell Soil Color 2.5Y 6/2). It may be determined that different colors are required on a site-specific determination based on visual assessment. The gravel surfaces surrounding the well locations, if any, would be a color that does not create a visual contrast to the surrounding topography.

13) Wherever practical, power lines servicing wells would be buried, and buried power lines would be placed inside or within 5 ft of the trench utilized for pipelines when possible. Construction of aboveground power lines within 2 mi from the base elevation of Pumpkin Buttes would be designed to reduce visual contrast. Any power line should use areas of existing disturbance whenever possible.

14) All permanent aboveground structures (e.g., production equipment, tanks, etc.) not subject to safety requirements would be painted to blend with the natural color of the landscape. The color would simulate the standard environmental colors established by the BLM for VRM. These colors are typically Covert Green (PANTONE for Architecture Color Guide 18-0617 TPX) or Carlsbad Canyon (Munsell Soil Color 2.5Y 6/2). It may be determined that different colors are required on a site-specific determination based on visual assessment. The gravel surfaces surrounding all permanent aboveground structures would be a color that does not create a visual contrast to the surrounding topography.

15) Uranerz would not conduct any ground-disturbing work in areas that have not been previously inventoried and cleared for cultural resources.

16) Uranerz would instruct all employees, contractors, subcontractors, and any additional parties involved in the project not to search for, retrieve, deface, or impact archaeological materials (e.g., arrowhead hunting), and that it is a violation of the federal *Archaeological Resources Protection Act* (16 U.S.C. 470aa-mm) to do so on federal land.

17) If previously unknown cultural resources are discovered at the site, Uranerz would immediately stop the ground-disturbing activities in the area of the discovery and would immediately notify the NRC, the WYSHPO, and BLM (if located on BLM-administered lands). Uranerz would have any discovered cultural materials evaluated for NRHP eligibility by a professional meeting the Secretary of Interior's Standard for Archaeology and History. Documentation of the discovery and evaluation would be promptly provided to the NRC and the BLM (if located on BLM-administered lands). The NRC and BLM would then consult with the WYSHPO on the determination of eligibility and adverse effect. If WYSHPO determines that there is an adverse effect to a historic property, NRC and BLM (if the property is located on BLM-administered lands) would follow the procedure to resolve the adverse effect as described above. Work may continue in other areas of the site; however, work in the area of discovery may not resume until such time as any additional actions are completed or deemed unnecessary.

18) Depending on the location of the discovery, cultural resource(s) would remain under the ownership of the private landowner or the U.S. Government. Applicable federal, state, or local laws would apply to the discovered cultural resources.

19) If human remains are encountered on private land, work would immediately stop in the vicinity of the discovery, the area would be secured, and Uranerz would immediately contact local law enforcement and the county coroner per Wyoming Statute (W.S.) 7-4-104. If the remains are not associated with a crime, then Uranerz would contact the NRC, WYSHPO, BLM (if located on BLM-administered lands) and the landowner to further consult on the treatment of the remains. Uranerz would assure compliance with applicable federal, state, and local regulations relating to burial discoveries through inadvertent construction-related disturbance of graves.

20) If Native American human remains and associated funerary objects as defined in the NAGPRA are encountered on BLM-administrated land, Uranerz would immediately stop all work in the area and notify NRC, BLM, and WYSHPO. BLM would be responsible for compliance with the provisions of NAGPRA on BLM-administered lands.

Control of Invasive Nonnative Species

The control of invasive nonnative species is important, and some species can enter the project area on equipment and vehicles, while others may spread from distant areas by seeds blowing onto the site on the wind. To minimize and control the spread of invasive nonnative species, Uranerz would design and build the project so that the least amount of ground disturbance occurs, thereby exposing the least amount of soil possible. Large construction equipment that travels off project roads would be cleaned prior to entering the project area. Uranerz would work with the BLM, landowners, other county or state agencies as appropriate, and the Campbell County Weed and Pest Board to control the spread of invasive nonnative species in the project area. This may entail spot spraying with an approved herbicide on disturbed areas for invasive nonnative species. A Pesticide Use Proposal would be submitted to the BLM, and approval would be obtained before the application of herbicides or other pesticides for the control of noxious weeds on federal lands.

Existing Roads

In accordance with BLM Handbook H-9113, existing roads would be maintained in the same or better condition than existed before the commencement of operations, and appropriate maintenance would continue until final abandonment and reclamation. Vehicles would remain on roads at all times, except for in the designated wellfield areas where development is occurring.

Threatened, Endangered, Proposed, and Candidate (TEPC) Animal and Plant Species, and BLM-sensitive Species

To minimize potential impacts to TEPC animal and plant species and BLM-sensitive species (BLM-SS), Uranerz would implement the following mitigation measures.

Greater Sage-grouse

To minimize potential impacts to greater sage-grouse, Uranerz would implement the following mitigation measures for the entire proposed project area.

1. Surface occupancy and/or disruptive activities would be prohibited on or within 0.25 mi radius of the perimeter of occupied greater sage-grouse leks.

2. To the extent possible, Uranerz would not construct any aboveground power lines, permanent high-profile structures such as storage tanks, or other perch sites within 0.5 mi of any active greater sage-grouse lek near the Hank Unit project area. In addition, wherever practical, power lines within 2 mi of the base of the Pumpkin Buttes TCP would be buried. Where the power lines could not be buried (due to local topographic or geological conditions), aboveground power line would be constructed in compliance with *Suggested Practices for Raptor Protection and Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006).

3. To minimize greater sage-grouse mortality due to vehicle collisions, Uranerz would advise project personnel of appropriate speed limits for specific access roads, that they are not allowed to haze or harass the animals, and that they should minimize any direct disturbance to the animals whenever possible.

4. Uranerz would minimize the removal of vegetation, wherever possible, and would revegetate disturbed areas as soon as practicable following completion of project activities.

Bald and Golden Eagles and Other Raptors

1. A seasonal minimum ground disturbance-free buffer zone of 1 mi would be established for all bald eagle winter roost sites (November 1-April 1). These buffer zones and timing, may be adjusted based on site-specific information through coordination with and written approval from the U.S. Fish and Wildlife Service (USFWS).

2. Within 0.5 mi of bald eagle winter roost sites, additional measures such as remote monitoring and restricting maintenance visitation would be implemented. This includes limiting all site visits to between 9:00 a.m. and 3:00 p.m. to prevent disturbance for the period of November 1-April 1.

3. No surface disturbing activity would occur within 0.5 mi of any identified active raptor nests from February 1 through July 31, annually, prior to a raptor nest occupancy survey for the current breeding season.

4. If a raptor nest occupancy survey identifies active raptor nests, a 0.5-mi timing buffer would be implemented. The timing buffer restricts surface disturbing activities within 0.5 mi of occupied raptor nests from February 1 to July 31.

5. Aboveground power line would be constructed in compliance with *Suggested Practices for Raptor Protection and Power Lines: The State of the Art in 2006* (Avian Power Line Interaction Committee 2006).

6. To minimize potential impacts to the local prey base for raptors, Uranerz would minimize the amount of disturbance associated with the Hank Unit Project.

7. Uranerz would also conduct annual raptor monitoring and mitigative planning to minimize conflicts between active nest sites and project-related activities.

BLM-sensitive Species

1. Uranerz would not conduct any ground-disturbing activities within the prairie dog towns in the Hank Unit illustrated on Exhibit D9-3 in Appendix D9 of the POO (Uranerz 2012).
2. To minimize potential impacts to BLM-sensitive species, Uranerz would minimize the amount of disturbance associated with the Hank Unit Project.

Vegetation

Removal or disturbance of vegetation would be minimized by construction site management and by use of previously disturbed areas and existing rights-of-way (ROWs), designating limited equipment/ materials storage yards and staging areas, and by other appropriate means.

Vegetation and soil removal would be accomplished in a manner that would minimize erosion and sedimentation. On BLM-administered lands, Uranerz would seed and stabilize all disturbed areas in accordance with Section 2.2.3.5.

Air Quality and Noise

Uranerz would control fugitive dust by the application of water or other measures as appropriate during times of high use and traffic speeds would also be held to appropriate levels. Uranerz would also ensure that all internal combustion equipment would be maintained in accordance with manufacturer recommendation and noise control equipment would be maintained. In addition, open burning of garbage or refuse at well sites or other facilities would not be allowed. Uranerz has committed to reseeding disturbed surface areas in the interim to minimize erosion from wind and water. Grass seed in the interim seed mixture would likely be reestablished within two years of initial disturbance (Uranerz 2012). In addition, permanent reclamation of all disturbed areas would include recontouring, topsoil replacement, and seeding and mulching. These activities would minimize long-term impacts to air quality.

Storm Water Pollution Prevention

To minimize potential impacts to soils resources, Uranerz would develop and implement a SWPP Plan for the newly affected areas. Uranerz's current Wyoming Pollutant Discharge Elimination System (WYPDES) permit and SWPP Plan for the Nichols Ranch Unit would be expanded to include the Hank Unit. This permit would be maintained pursuant to the *Federal Water Pollution Control Act* (Public Law 101-380) (also known as the *Clean Water Act*), the *Wyoming Environmental Quality Act*, Wyoming Statutes 35-11-101 through 35-11-1802, and the WDEQ/WQD Rules and Regulations Chapters 2 and 18. The SWPP Plan is designed to prevent and reduce the release of storm water-related pollution such as sediment and runoff from other exposed materials. The SWPP Plan would include erosion control measures to prevent and limit storm water pollution and procedures for periodic inspections of storm water pollution prevention devices and practices. Uranerz would install and maintain all appropriate runoff and erosion control measures as described in the SWPP Plan such as water bars, berms, and interceptor ditches, and copies of the SWPP Plan and inspection reports would be filed in the Uranerz's SPF.

Soils

Sufficient topsoil to facilitate revegetation would be segregated from subsoils during all construction operations and returned to the surface upon completion of operations. Topsoil stockpiles would be seeded to prevent erosion and to maintain viability of soil microflora and microfauna. Uranerz would keep the area of disturbance to the minimum necessary for development activities while providing for safety. Uranerz would minimize project-related off-road travel during periods when soils are saturated or when conditions result in excessive road rutting (>4 inches) may occur.

Interim erosion control measures such as use of mulch, jute netting, or other appropriate techniques (as outlined in the SWPP Plan) would be used on unstable soils, steep slopes, and wetland areas to prevent erosion and sedimentation until vegetation becomes established. Uranerz would also minimize disturbance to vegetated cuts and fills on new and existing roads.

Uranerz would replace topsoil or suitable growth materials over all disturbed surfaces prior to revegetation and would revegetate all disturbed sites as soon as practical following disturbance.

Wildlife

To protect big game, during construction operations and prior to installation of the wellfield fence, all drilling well pits would be fenced on at least three sides while drilling and four sides after the drill rig moves off for the duration of time that the pit is open.

Removal or disturbance of vegetation would be minimized through construction site management, and Uranerz would implement the interim and permanent reclamation procedures outlined in Section 2.2.3.2 and 2.2.3.5.

To minimize wildlife mortality due to vehicle collisions, Uranerz would advise project personnel of appropriate speed limits on designated access roads, that they are not allowed to haze or harass the animals, and that they should minimize any direct disturbance to the animals whenever possible. Potential increases in poaching would be minimized by informing employees and contractors that they are required to comply with all wildlife laws. If violations are discovered, the offending employee or contractor would be disciplined and may be dismissed by Uranerz.

Uranerz would also install buried fiber optic communication lines to allow for remote monitoring and controlling well uranium recovery and aquifer restoration activities at the header houses and wells from the SPF. The fiber optic communication lines would thus reduce vehicle traffic and human presence in the wellfields.

Visual Resources

All disturbed lands associated with the project, including access roads, pipelines, well locations, power lines, management facilities, etc. would be expediently reclaimed and reseeded in accordance with the project-specific reclamation plan.

Wherever possible, existing roads would be utilized. In order to minimize visual contrast, roads would be placed outside areas containing dense patches of sagebrush and follow natural contours wherever practicable. The gravel surface of new roads would be a color that does not create a visual contrast to the surrounding topography.

All pipelines would be located in corridors next to or within road areas wherever possible. Pipeline corridors would use existing disturbance areas and would be placed outside areas containing dense patches of sagebrush where practicable.

Wherever practicable, areas of existing disturbance would be used during development and operations. To minimize visual contrast, well locations would not be placed in areas of dense sagebrush or other vegetation unless absolutely necessary. Brush hogging or other vegetation removal on drilling locations within areas of dense sagebrush or other vegetation would be feathered to reduce visual contrast and limited to 30 ft in diameter from each well.

All aboveground infrastructure related to well production would be painted in a color that best blends in with the surrounding topography. These colors are typically Covert Green (PANTONE for Architecture Color Guide 18-0617 TPX) or Carlsbad Canyon (Munsell Soil Color 2.5Y 6/2). It may be determined that different colors are required on a site-specific determination based on visual assessment. The gravel surfaces surrounding the well locations, if any, would be a color that does not create a visual contrast to the surrounding topography.

Wherever practical, power lines servicing wells would be buried, and buried power lines would be placed inside or within 5 ft of the trench utilized for pipelines when possible. Construction of aboveground power lines within 2.0 mi from the base elevation of Pumpkin Buttes would be designed to reduce visual contrast. Any power line should use areas of existing disturbance whenever possible.

All permanent aboveground structures (e.g., recovery equipment, tanks, etc.) not subject to safety requirements would be painted to blend with the natural color of the landscape. The color would simulate the standard environmental colors established by the BLM for visual resource

management. These colors are typically Covert Green (PANTONE for Architecture Color Guide 18-0617 TPX) or Carlsbad Canyon (Munsell Soil Color 2.5Y 6/2). It may be determined that different colors are required on a site-specific determination based on visual assessment. The gravel surfaces surrounding all permanent aboveground structures would be a color that does not create a visual contrast to the surrounding topography.

Minerals

Potential conflicts could arise between numerous minerals projects in the area and the Proposed Action. Those most likely to conflict with the Hank Unit project are CBNG wells, as the zones of interest for both types of projects are shallow to relatively shallow. Uranerz would maintain close communication with CBNG operators in the project area to avoid potential conflicts. The uranium ISR process would be designed to work on a negative pressure basis, keeping the ISR and CBNG processes separated from a production standpoint. The prospective zones of interest (uranium as opposed to CBNG) would be kept at least 400 vertical feet apart. In addition, Uranerz would comply with all appropriate well completion standards specified by NRC, WDEQ/LQD, WOGCC, and BLM.

Petroleum Product and Waste Handling

Uranerz and its contractors would manage, store, handle, and dispose of all petroleum products and wastes in compliance with all appropriate federal and state regulations. In addition, Uranerz would train its personnel to properly handle, transport, and dispose of all petroleum products and hazardous materials and waste to avoid and reduce the potential occurrence of spills. Uranerz would also develop and implement an ERP to address potential spills, leaks, or releases of such materials. Uranerz would also mitigate potential spills, leaks, or releases of petroleum products and wastes by conducting routine maintenance and inspections on all appropriate vehicles and equipment to catch and fix problems early.

In the event of a spill, leak, or release of petroleum products and wastes, Uranerz would cleanup and dispose of the spill, leak, or release in accordance with state and federal regulations. All

spills of petroleum products or hazardous chemicals in excess of the reportable quantity as determined by WDEQ/WQD would be reported to WDEQ/WQD.

Uranerz would develop and implement waste management programs to meet the applicable WDEQ/SHWD regulatory requirements. All wastes generated from these materials would be handled and disposed of in accordance with applicable federal and state regulations.

Any hazardous waste, such as organic solvents, paints, waste oil and paint thinners, empty chemical containers, tank sediments/sludges, chemical waste, and spent batteries, would be disposed of in accordance with a management program that the facility would develop to meet applicable local, federal, and state regulatory requirements for the disposal of nonradioactive hazardous waste.

During construction, portable self-contained chemical toilets would be provided for human waste disposal. As required, the holding tanks for the chemical tanks would be pumped out and their contents disposed of at an approved sewage facility in accordance with applicable rules and regulations. Upon completion of construction operations, sanitary wastes from restrooms would be disposed of in an on-site septic system that would be constructed and operated by Uranerz. The septic system would be located on private-owned surface lands immediately north of the Hank Unit SPF. The septic systems would be designed in order to accommodate the estimated maximum of 35 permanent employees. Prior to construction of this facility, Uranerz would obtain a permit to construct the septic system from WDEQ/WQD.

As soon as practicable after completion of construction activities, all debris and other waste materials not placed in the dumpsters or trash cages would be cleaned up, removed from the construction area, and disposed of in an approved landfill. No potentially harmful materials or substances would be left on location, and all solid waste would be disposed at an appropriate solid waste disposal facility. All facilities that would be used by Uranerz would be properly permitted through the appropriate state/local regulatory authority.

All radioactive wastes would be handled and disposed at a properly permitted and licensed waste disposal facility in accordance with applicable federal and state regulations.

2.2.3.7 Monitoring

Introduction

In general, monitoring programs are developed for uranium ISR projects to verify compliance with standards for the protection of worker health and safety in operational areas and for protection of the public and environment beyond the facility boundary. Monitoring programs provide data on operational and environmental conditions so prompt corrective actions can be implemented when adverse conditions are detected. In this regard, these programs help limit potential environmental impacts at ISR facilities and the surrounding areas.

Radiological Monitoring

The purpose of the radiological monitoring program is to 1) characterize and evaluate the radiological environment, 2) provide data on measurable levels of radiation and radioactivity, and 3) provide data on the principal pathways of radiological exposure to the public (NRC 2003). In accordance with NRC regulations in 10 CFR Part 40, Appendix A, Criterion 7, a pre-operational monitoring program is required to establish facility baseline conditions. After establishing the baseline program, ISR facility operators are required to conduct an operational monitoring program to measure or evaluate compliance with standards and to evaluate the environmental impact of an operating ISR facility. Although not a regulatory requirement, NRC Regulatory Guide 4.14 (NRC 2008b) provides guidance for implementing monitoring programs at uranium mills (that includes ISR facilities) that are acceptable to the NRC.

Airborne Radiation Monitoring

In accordance with NRC regulations and the NRC Source Material License, Uranerz would conduct continuous air particulate sampling with weekly filter changes and to collect quarterly

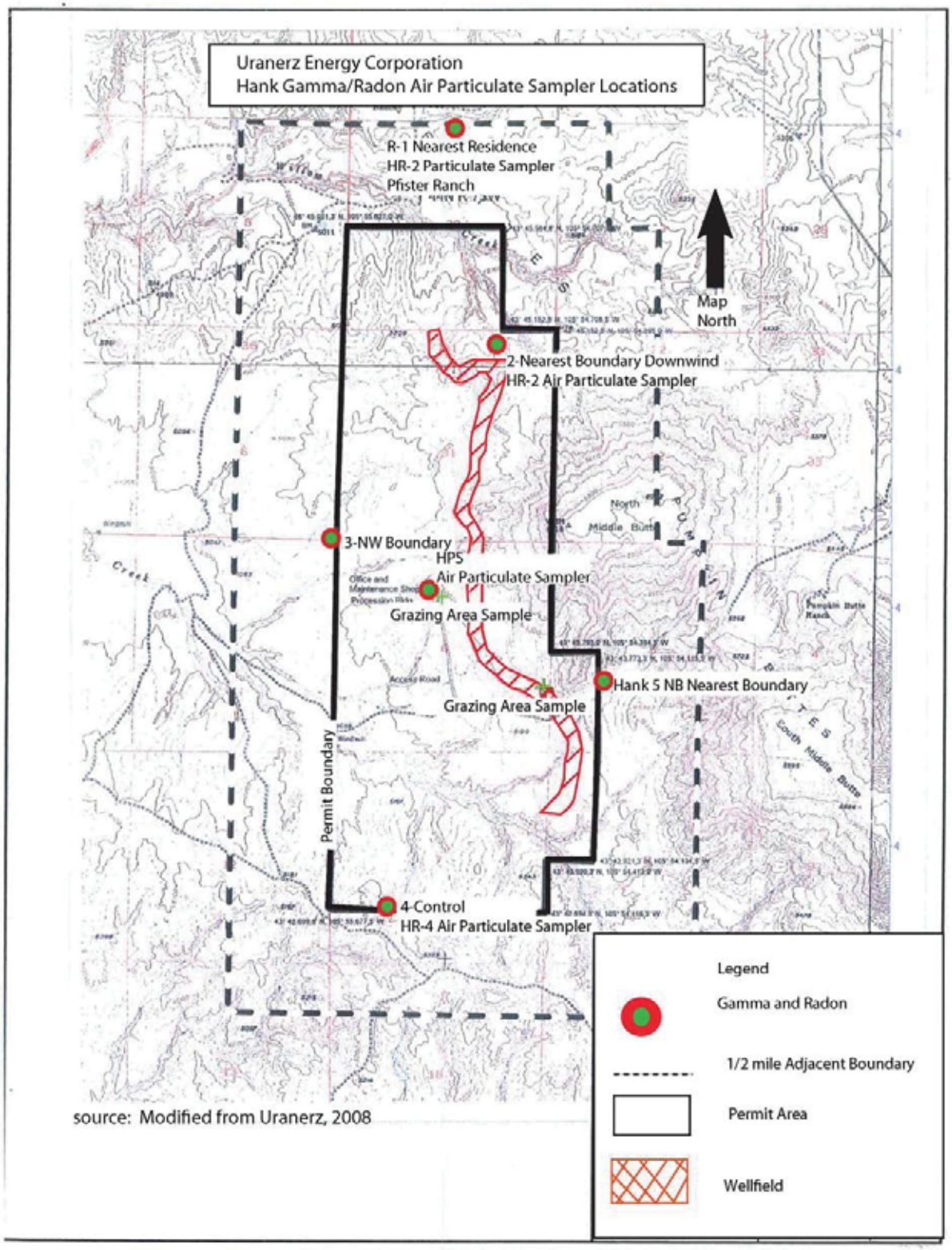
composite samples and analyze them for natural uranium, Ra-226, Th-230, and Pb-210. Uranerz would implement the airborne radiation monitoring program to detect radon and air particulate releases from the Hank Unit SPF. Results of the operational air particulate monitoring program would be reported to NRC in semiannual effluent reports, as required by 10 CFR 40.65. Sampling would be conducted at the same eight air particulate sampling locations used for air particulate sampling (Figure 2.12). Uranerz would use Track-etch radon detectors, which would be exchanged quarterly and analyzed for radon concentration.

Uranerz would implement an airborne radiation monitoring program to detect radon and air particulate releases from the Hank Unit SPF. The locations of the samplers are based on the recommendations in Regulatory Guide 4.14, which include air monitoring stations located at or near the site boundaries. Air particulate samplers would be located at four different locations within 0.5 mi the Hank Unit, including upwind, downwind, at the nearest residence, and at the Hank Unit SPF.

Soils and Sediment Monitoring

During the uranium recovery phase, Uranerz would annually collect surface soil samples at the locations sampled for radon illustrated in Figure 2.13. Surface soil samples would be collected as grab samples from the surface (0 to 6 inches) and analyzed for total uranium, Th-230, Ra-226, and Pb-210 in accordance with Regulatory Guide 4.14. Uranerz would also annually collect grab sediment samples at the same pre-operational sampling locations shown in Figure 2.13.

The sediment samples would be collected upstream at the permit boundary, at various locations overlying the ore body, and at the downstream permit and be analyzed for total uranium, Ra-226, Pb-210, and Th-230. Before decommissioning, but after operations ended, subsurface soil samples would be collected to compare with subsurface soil samples collected during the pre-operational monitoring program.




source: Modified from Uranerz, 2008

Figure 2.12 Location of Hank Unit Air Particulate and Radon Samplers.

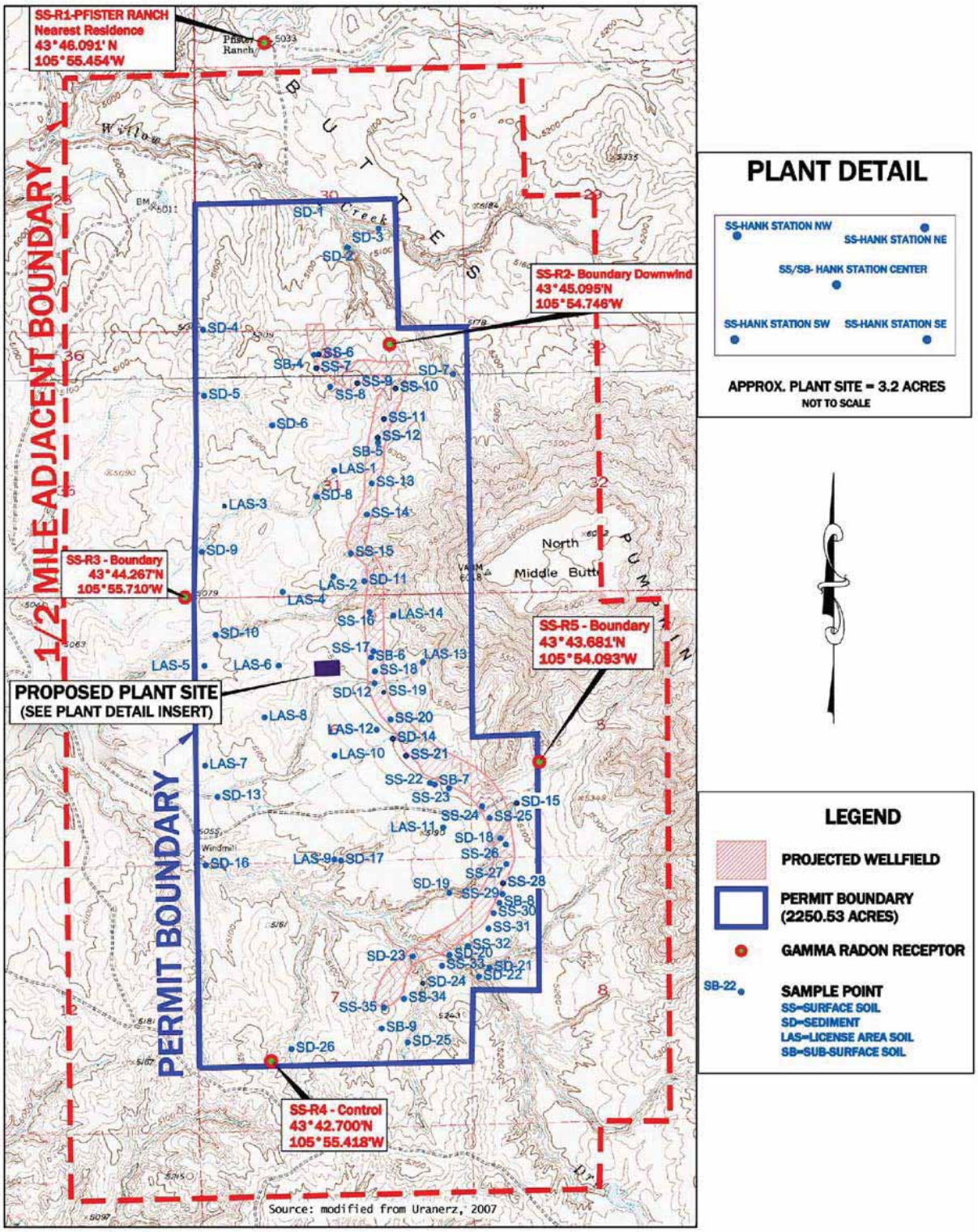



Figure 2.13 Hank Unit Sediment Sample Locations.

Vegetation, Food, and Fish Monitoring

Uranerz conducted pre-operational vegetation sampling at various locations on and adjacent to the Hank Unit project area. In its NRC license application, Uranerz stated that no liquid effluents would be dispersed via surface water and that the air pathway would be limited to the generation of radon emissions with no uranium particulate emissions. Uranerz would locate process equipment at the SPF on curbed reinforced concrete pads to prevent liquids from entering the environment. Any spills or releases within the Hank Unit SPF would be pumped back into the process circuit or sent to a deep disposal well.

Uranerz also evaluated predicted dose to an individual using the MILDOS-Area model, and the NRC confirmed that the ingestion pathway to individuals from vegetation, food, and fish would be insignificant. Therefore, in accordance with NRC Regulatory Guide 4.14, Uranerz is not required to conduct vegetation, food, or fish sampling because the predicted dose to an individual from these pathways would be less than 5% of the applicable radiation protection standard. However, if Uranerz determines that there are other significant potential sources of radioactive particulates that could be released from the process facilities, then Uranerz may be required by the NRC to conduct vegetation, food, and fish sampling in accordance with NRC Regulatory Guide 4.14.

Surface Water Monitoring

The proposed project area contains only ephemeral channels that remain dry for most of the year, and only flow in response to heavy snowmelt and large rainfall events. Uranerz would collect surface water samples at the same location sampled for the pre-operational baseline and measured for the constituents listed in the POO (Uranerz 2012) when water is present (Uranerz 2012). The sample location is in Dry Willow Creek in approximately the SE 1/4 SE 1/4 Section 1, T43N, R76W (refer to Figure 2.6).

Groundwater Monitoring of Private Wells

In accordance with Uranerz's approved NRC license, Uranerz would conduct groundwater monitoring of three private water wells located within 0.6 mi of the boundary of the operating wellfield to detect potential radiological contamination. For the Hank Unit, these private wells are identified as BR-F, Dry Willow #1, and Means #1 (refer to Figure 2.6). These wells would be sampled quarterly and analyzed for natural uranium and Ra-226 with the landowner's consent to monitor for potential radiological impacts from the uranium ISR operation.

Physiochemical Monitoring

The ISR process alters the water quality in the production zone aquifer. Therefore, before uranium extraction may occur in a production aquifer, the EPA must exempt the production aquifer as an underground source of drinking water in accordance with the *Safe Drinking Water Act* under 40 CFR Part 146. Appendix C of the NRC SEIS discusses the criteria EPA uses for an aquifer exemption, and that discussion is not repeated here (NRC 2011). During ISR operations, physiochemical groundwater monitoring is conducted by a NRC licensee to monitor potential impacts to groundwater quality in nonexempt aquifers surrounding the exempt production zone aquifer. Physiochemical monitoring provides data on operational and environmental conditions so that prompt corrective actions can be taken if an adverse condition is detected (NRC 2009a). Uranerz would also conduct physiochemical groundwater monitoring in the Hank Unit. This monitoring would include wellfield groundwater monitoring and wellfield and pipeline flow and pressure monitoring. The relevant guidance for conducting this monitoring is discussed below.

Wellfield Groundwater Monitoring

Prior to the initiation of ISR operations, Uranerz would install monitoring wells in a ring around each wellfield to monitor for horizontal excursions from the ore production zones (refer to Figure 2.6), specifically the Hank Unit F Sand. The F Sand would be monitored because uranium recovery would be from this geologic unit. Monitoring wells would be located approximately 500 ft from the production area boundary and spaced approximately 500 ft apart

within each unit. The NRC and WDEQ/LQD have determined that the well spacing and distance were appropriate to detect potential horizontal excursions. Uranerz would sample these wells four times, at least 14 days apart, prior to wellfield operation on a twice per month basis to establish baseline water quality and upper control limits for operational excursion monitoring. The first and second samples would be analyzed for the full set of WDEQ-required constituents; however, the third and fourth sample events could be analyzed for a reduced set of parameters depending on which parameters were not detected during the first and second sampling events. Uranerz has also proposed to measure groundwater levels in the monitoring wells; however, these data would not be used as excursion indicators.

Uranerz would also install monitor wells in the overlying and underlying aquifer in the wellfields to detect vertical excursions. The overlying and underlying aquifers at the Hank Unit are the C Sand or B Sand, respectively. Overlying and underlying monitoring wells would be spaced at a density of approximately one well to every 4 acres. In narrow areas of the wellfield, the overlying and underlying monitoring wells would be spaced no farther than 1,000 ft apart.

Uranerz would sample overlying and underlying aquifer wells four times prior to wellfield operation at least 14 days apart. The first and second samples would be analyzed for the full set of WDEQ-required constituents (Uranerz 2012:Table D6-6a). However, the third and fourth sample events could be analyzed for a reduced set of parameters depending on which parameters were not detected during the first and second sampling events.

Uranerz installed three additional monitoring wells in the surficial aquifer at the Hank Unit to better characterize the background groundwater quality. The water quality of the surficial aquifer could be impacted by (i) spills, piping, and casing leaks, which would provide an artificial connection (e.g., a wellbore) between the surficial aquifer and deeper aquifers (NRC 2011), and (ii) discharges from current and future CBNG-produced water to surface impoundments. To comply with NRC and WDEQ/LQD requirements, Uranerz would sample the surficial aquifer monitoring wells four times on a twice per month basis prior to wellfield operation at the Hank Unit to establish baseline water quality. The first and second samples would be analyzed for the full set of WDEQ-required constituents (Uranerz 2012). However, the

third and fourth sample events could be analyzed for a reduced set of parameters depending on which parameters were not detected during the first and second sampling events.

After completion of monitor well installation and all additional groundwater sampling and wellfield characterization at Hank Unit, Uranerz would conduct hydrogeologic wellfield pump tests to verify communication between the wellfield and monitoring well ring. The hydrogeologic test at the Hank Unit would occur prior to lixiviant injection and would be reported to NRC and WDEQ/LQD for review and approval. The hydrogeologic test would allow Uranerz to demonstrate that a hydraulic gradient can be maintained to prevent excursions beyond the perimeter production zone monitoring well ring.

After hydrogeologic testing is completed, Uranerz would prepare a recovery area pump test report for each production area describing the production area geology, hydrogeology, pumping test results, baseline groundwater quality for the overlaying, underlying, and production zone aquifer within the wellfield. Uranerz's Safety and Environmental Review Panel (SERP), responsible for monitoring any proposed change in the facility or process, would review these reports to ensure that the hydrologic testing results and planned ISR activities were consistent with the technical requirements and did not conflict with NRC regulatory requirements. The report would then be submitted to WDEQ and NRC for review and approval before ISR operations commence.

The Uranerz POO provides detailed procedures for sampling and analysis, including methods for measuring water levels, well purging and sampling protocols, sample preservation and documentation, analytical methods, and quality assurance/quality control requirements.

Uranerz would submit quarterly static water level measurements and water quality monitoring data to WDEQ and maintain copies on-site for NRC and BLM review.

After operations are complete, the wellfields would be restored (refer to Section 2.2.3.4). Uranerz would sample the same horizontal perimeter and overlying/underlying monitoring wells used during recovery for aquifer restoration. During restoration, lixiviant injection would cease,

thereby reducing the potential for an excursion. During the aquifer restoration phase, wells located in the perimeter monitor ring and completed in the overlying and underlying aquifers would be sampled every 60 days for chloride, alkalinity, and conductivity excursion parameters. An excursion would be defined in the same manner as during operations and subject to the same corrective action requirements.

Wellfield and Pipeline Flow and Pressure Monitoring

Uranerz would implement extensive programs of wellfield and pipeline flow and pressure monitoring at the Hank Unit. Injection well and recovery well flow rates and pipeline pressures, would be monitored at each header house to balance injection and recovery in each wellfield pattern and throughout the entire Hank Unit wellfield. Individual well flow readings would be recorded during each shift, and the overall wellfield flow rates would be balanced daily. Flow data would also be checked at the Nichols Ranch CPP and at the Hank Unit SPF. The recovery and injection trunk lines would be equipped with electronic pressure gauges, and information from these gauges would be monitored from the Hank Unit SPF control room. High and low pressure and flow alarms would alert wellfield and plant operators if specified ranges were exceeded. Automatic shutoff valves would stop the flow in the event of significant changes of volume or pressure. The wellfield and pipeline flow monitoring would alert the operators to detect malfunctions that could lead to either wellfield infrastructure or pipeline failures, thus minimizing the potential impact to groundwater.

Wildlife Monitoring

A greater sage-grouse lek survey would be conducted annually for all known leks within 2 mi of the Hank Unit permit boundary by a biologist following the most current Wyoming Game and Fish Department (WGFD) protocol. These surveys would include three surveys of known leks on or within 2-mi of the Hank Unit permit area. Arial searches for new leks would also be conducted every third year. All annual survey results would be provided to a BLM BFO biologist.

In addition, surveys to document raptor nest occupancy would be conducted annually (between April 15 and June 30) by a qualified biologist following BLM BFO protocol. All survey results would be submitted in writing to a BLM BFO biologist and approved prior to surface-disturbing activities. Surveys outside this window may not accurately depict nesting activity in the area.

## 2.3 ALTERNATIVE 2 - NO ACTION ALTERNATIVE

Regulations contained in 40 CFR 1502.14(d) and guidance contained in Section 6.6 of the BLM NEPA Handbook H-1790-1 (2008a) requires the analysis of a No Action Alternative to be included in the EA. Under this alternative, there would not be any development or construction within the Hank Unit for the purpose of uranium ISR (including mining and milling). Under this alternative, BLM would not approve or authorize the POO. There would be no surface disturbance on the BLM-administered surface lands, and no impacts to the existing physical or biological environment on these lands would take place beyond those that already exist.

The analysis of a No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of environmental effects of each action alternative. In accordance with BLM Handbook H-3809-1 and after NEPA has been completed, there are three possible courses of action BLM may take when issuing its decision on the POO. The BLM may decide to:

1) approves the POO as submitted;

2) approve the POO subject to changes or conditions that are necessary to meet the performance standards of §3809.420 and to prevent unnecessary or undue degradation. BLM may require Uranerz to incorporate other agency permits, final approved engineering designs and plans, or other conditions of approval from the review of the POO filed under §3809.401(b); or

3) disapprove, or withholding approval of the POO because the POO:

(i) does not meet the applicable content requirements of §3809.401;

(ii) proposes operations that are in an area segregated or withdrawn from the operation of the mining laws, unless the requirements of §3809.100 are met; or

(iii) proposes operations that would result in unnecessary or undue degradation of public lands.

## 2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

### 2.4.1 Conventional Mining and Milling at the Hank Unit Project Site

Uranium ore deposits may be accessed either by open pit (surface) mining or by underground mining techniques. Open pit mining is used to exploit shallow ore deposits, generally deposits less than 550 ft below ground surface (bgs) (EPA 2008a). To gain access to the deposit, the topsoil is first removed and may be stockpiled for later site reclamation, while the remainder of the material overlying the deposit (i.e., the overburden) can be removed via mechanical shovels and scapers, trucks, or front-end loaders (EPA 1995; 2008a). The depth to which an ore body is surface mined depends on numerous geologic, technical, and economic factors (EPA 1995).

Underground mining techniques vary depending on size, depth, orientation, grade of the ore body, the stability of the subsurface strata, and economic factors (EPA 1995; 2008a). In general, underground mining involves sinking a shaft near the ore body and then extending levels from the main shaft at different depths to access the ore. Ore and waste rock would need to be removed through shafts by elevators or by using trucks to carry these materials up inclines to the surface (EPA 2008a).

In addition, once the open pit or underground workings are established, the mine may need to be dewatered to allow the extraction of the uranium ore. Dewatering can be accomplished either by pumping water directly from the open pit for an open pit mine or through pumping of interceptor wells to lower the water table for an underground mine. The mine water likely would require treatment prior to discharge due to contamination from radioactive constituents, metals, and suspended and dissolved solids. Disposal of these mine waters may have subsequent impacts to surface water drainages and sediments, as well as to near-surface sources of groundwater (EPA 1995).

Following the completion of mining, either by open pit or underground techniques, reclamation of the mine would need to be undertaken. Stockpiled overburden can be returned to the mine, either during extraction operations or following the completion of mining operations. Topsoil

would then be re-applied to re-establish topography consistent with the surroundings. With the end of dewatering, the water table would likely rebound and fill portions of the open pit and underground workings. Historically, uranium mines have impacted local groundwater supplies and the waste materials from the mines have contaminated lands surrounding the mines (EPA 2008b).

Ore extracted from the open pit or underground mine would be processed in a conventional mill. As discussed in Appendix C of the NRC GEIS for ISR milling facilities (NRC 2009a), ore processing at a conventional mill involves a series of steps (handling and preparation, concentration, and product recovery). While the conventional milling techniques recovers approximately 90% of the uranium content of the feed ore (NRC 2009a), the process does generate substantial wastes (known as tailings) since roughly 95% of the ore rock is disposed as waste (NRC 2011). This process also can consume large quantities of water.

Tailings are disposed of in large lined impoundments, the design and construction of which are reviewed by NRC to ensure safe disposal of the tailings (NRC 2009a). Reclamation of the tailings pile generally involves evaporation of liquids in the tailings, settlement of the tailings over time, and covering the pile with a thick radon barrier and earthen material or rocks for erosion control. An area surrounding the reclaimed tailings piles would be fenced off in perpetuity and the site transferred to either a state or federal agency for long-term care (Energy Information Administration [EIA] 1995). The costs associated with final mill decommissioning and tailings reclamation can run into the tens of millions of dollars (EIA 1995).

As discussed in the NRC GEIS (2009a), the average ore grade of the uranium deposit at the Nichols Ranch Project is above 0.1%, while the depth to the deposit is approximately 300 to 700 ft bgs in the Nichols Ranch Unit and approximately 200 to 600 ft bgs in the Hank Unit. While the ore grade and depth to ore are consistent with deposits mined either by open pit or underground workings, the environmental impacts from mining and conventional milling are more substantial than impacts from the ISR process in this site (NRC 2009a). In addition, because of the low grade ore, an underground or surface mine in the Hank Unit project area

would likely be uneconomical. Therefore, for these considerations, this alternative is not carried forward for detailed analysis in this EA.

### 2.4.2 Use of Alternate Lixiviants

Alternate lixiviants such as acid or ammonium carbonate solutions have been used in the past in ISR operations but are not currently used by NRC-licensed facilities because of the difficulties in restoring and stabilizing the affected aquifers. In addition, the WDEQ/LQD has indicated that the composition of the soil in the PRB in combination with an acid lixiviant would result in the formation of gypsum, which would eventually plug the wells and reduce efficiency of wellfield circulation. Therefore, this alternative would have technological limitations compared to the Proposed Action, thus making this alternative technically not viable. For these reasons, this alternative was not carried forward for detailed analysis in this EA.

### 2.4.3 Use Alternative Waste Disposal Methods

Alternate waste disposal methods such as evaporation ponds or land application (typically spray irrigation) as opposed to deep well injection disposal have been used in the past or are in use at currently licensed ISR operations. Both of these disposal methods (evaporation ponds or land application) pose additional environmental impacts when compared to the Proposed Action (NRC 2009a). The construction and operation of evaporation ponds involves both land disturbance and the potential for additional impacts to soils and shallow aquifers from pond leaks. These impacts would be expected to be minimized through pond design features (e.g., double synthetic liners with a leak detection system) and BMPs (e.g., topsoil and erosion management controls).

The land application of treated wastewater could potentially impact soils, vegetation, and wildlife by allowing for the accumulation and bioaccumulation of residual radionuclide or chemical constituents in the irrigated soils and biotic systems in the area over time. Additionally, the USFWS did not recommend land application of treated waste water (personal communication September 28, 2012, with R. Mark Sattelberg, USFWS Field Supervisor,

Wyoming Field Office.). At existing NRC-licensed facilities, irrigation areas used for disposal are monitored to maintain radionuclide and other constituents within allowable release standards. Additionally, licensees monitor the wastewater prior to application to ensure release limits would be met. The deep well injection disposal method specified in the Proposed Action would be expected to have fewer potential impacts to soils, vegetation, and wildlife when compared to use of evaporation ponds and land application. In addition, the alternative disposal methods have higher life of project cost and cost more when compared to the deep well injection disposal method. Therefore, these alternate waste disposal methods were not carried forward for detailed analysis in this EA.